

**FINAL DRAWINGS FOR
MAIN ENGINE**

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(MECHANICAL PART)

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PLAN HISTORY	ENGINE TYPE	HYUNDAI-MAN B&W 6S90ME-C8.2
IMO NOx Tier II compliant 	SHIPYARD	HHI-SBD
	CLASS.	LR + UMS
	SHIP NO.	2585/86/87/88/89
	ENG. NO.	AA4624/25/26/27/28

TITLE : SPECIFICATION OF MAIN ENGINE

Elec. part :

배성준
[Signature]
2011.2.15

(25 SHEETS WITH COVER)

DRAWN	DESIGN	CHECK	APRD	DESCRIPTION	R
					5
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S.H.Shin 2011. 11. 29			<i>[Signature]</i> 2011. 11. 30	It was revised according to the shipyard comments.	1
S.H.Shin 2011-02-11		<i>A.B. 2/001</i> 2011.2.15	<i>[Signature]</i> 2011-02-17	FOR APPROVAL	0

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1. GENERAL

1.1) Engine type

HYUNDAI-MAN B&W, electronically controlled two-stroke, direct reversible, crosshead type diesel engine with constant pressure turbocharging.

Model : HYUNDAI-MAN B&W 6S90ME-C8.2

1.2) Rules and Regulations

The engine shall be designed and constructed in accordance with the Rules and Regulations of Classification Society prevailing at the date of the engine contract.

The Rule of Lloyd's Register of Shipping : + UMS

1.3) Scope of Supply

Some parts and arrangements described in this Specification may be mentioned more than once and in more than one place. The delivery comprises, however, only one such piece/set/part/arrangement.

The following shall be supplied for one(1) ship. (For the details, please refer to items 4, 5 and 6 in this specification.)

(1) Diesel engine complete	1 set
(2) Accessories	1 set
(3) Spare parts and tools	1 set

1.4) Engine design and manufacturing

HYUNDAI-MAN B&W diesel engine is to be manufactured based on the latest design received from the licensor as of the date of the engine contract at Ulsan works, Engine & Machinery Division of Hyundai Heavy Ind. Co., Ltd. under license of MAN Diesel & Turbo in Denmark.

However, should any development be made in the design in the course of construction such development shall be in cooperated as far as practicable provided that the work involved in such changes shall in no way increase the cost or delay in delivery of engine.

Some components can differ from Licensor's design because of production facilities or the application of local standard components.

However, spare parts for major engine components are interchangeable with Licensor designed parts.

Materials and standards applied to the engine design and construction shall be in accordance with Korean Industrial Standard (equivalent to JIS) and the manufacturer's standard based on the MAN Diesel & Turbo drawings.

All plans such as plans for approval, finished plans, instruction books and other documents shall be written in English. Also, name plates and caution plates shall be written in English.

Generally, screws and threads shall be ISO-Metric system.

1.5) Details of specification

Details not specified in this specification are in accordance with the enginebuilder's practices and as agreed upon with shipbuilder.

1.6) Electric source

AC 440V, 60 Hz, 3 Phase
AC 220V, 60 Hz, 1 Phase
DC 24V

1.7) Grease nipple

JIS B 1575 PT 1/8" (Ball type)

1.8) Unit of instruments

- Temperature : °C
- Pressure : bar

2. PARTICULARS

Type		HYUNDAI-MAN B&W, electronically controlled two-stroke, direct reversible, crosshead type diesel engine with constant pressure turbocharging	
Model		HYUNDAI-MAN B&W 6S90ME-C8.2	
Number of cylinder		6	
Cylinder bore		mm	900
Stroke		mm	3,188
SMCR	Output	kW	30,423
	Revolution	rpm	75.6
	MEP	bar	19.8
	Pmax	bar	170.0
	Mean piston speed	m/s	8.0
CSR	Output	kW	27,380
	Revolution	rpm	73
	MEP	bar	18.5
Engine net weight *1) *2)		ton	1,010
Direction of rotation (Ahead)		Clockwise (looking from aft)	
Cooling medium	Cylinder jacket	Fresh water	
	Piston	Lubricating oil	
	Scav. air cooler	Fresh water	
Starting system		Compressed air (max. pressure 30 bar)	
Remarks) *1) Engine net weight is dry basis including flywheel, turbocharger(s), thrust bearing, turning gear and aux. blower with motor, but excluding water and oil in the engine, spare parts and tools. *2) The mass can vary up to 10% depending on the design and options chosen. 3) Dimensions and piston overhaul height are shown separately in the drawings. 4) The above output is valid at sea level and up to tropical conditions; - Fresh water inlet temperature : 36 °C - Blower inlet pressure : 1,000 mbar (750 mmHg) - Blower inlet temperature : 45 °C - Relative humidity : 60 %			

3. GUARANTEE

3.1) Specific Fuel Oil Consumption

- (1) The specific fuel oil consumption at 100% SMCR(i.e. 30,423 kW at 75.6 rpm) shall be guaranteed to be :

167.8 g/kWh with using high efficiency turbocharger

with tolerance margin of +5% during the shop trial using marine diesel fuel oil based on following conditions.

- Blower inlet temperature: 25 °C
- Blower inlet pressure: 1,000 mbar
- Charge air coolant temperature: 25 °C
- Fuel oil lower calorific value: 42,700 kJ/kg
(10,200 kcal/kg)
- To comply with IMO NOx Tier II.

- (2) Conversion formulas for fuel oil consumption

The fuel oil consumption measured will be adjusted according to the conversion factors in the below table provided that the maximum combustion pressure (Pmax) is adjusted to the nominal value, or if the Pmax is not re-adjusted to the nominal value.

Parameter	Condition change	With Pmax adjusted	Without Pmax adjusted
		SFOC change	SFOC change
Scavenge air coolant temperature	per 10 °C rise	+ 0.60%	+ 0.41%
Blower inlet temperature	per 10 °C rise	+ 0.20%	+ 0.71%
Blower inlet pressure	per 10 mbar rise	- 0.02%	- 0.05%
Fuel oil lower calorific Value	rise 1% (427 kJ/kg)	-1.00%	- 1.00%

3.2) Guarantee period

The guarantee period is to be in accordance with the engine contract.

4. ACCESSORIES

The following accessories are to be supplied with the engine as included in enginebuilder's scope of supply.

Any modifications from the following specification shall be regarded as extra works.

4.1) Exhaust Gas Turbocharger

- (1) Type : HYUNDAI-MHI MET71 MB 2 sets
- (2) T/C placement: Exhaust side
- (3) Plain bearing with common L.O. branched from main L.O. system.
- (4) Turbocharger cleaning device shall be provided.
 - Dry cleaning for turbine side
 - Water washing for blower side

4.2) Air Cooler

2 sets

- (1) Air cooler shall be installed at the manufacturer's standard position.
- (2) Cooler cleaning system: Showering system is to be incorporated.
However, cleaning pump unit including pump, tank, filter and fittings required for air cooler cleaning at engine standstill condition to be provided by shipbuilder.
- (3) Inside coating of water chamber: Tar-free epoxy coating to be applied
- (4) Level switch with drain box from air cooler water mist catcher 1 set/AC

4.3) Hydraulic Cylinder Unit

1 eng. set

- (1) Distributor Block and Base Plate
- (2) Fuel oil booster
- (3) Exhaust valve actuator
- (4) FIVA valve for control for both fuel oil booster and exhaust valve actuator
- (5) Alpha cylinder lubricator

4.4) Hydraulic Power Supply Unit

1 set

- (1) Filter unit installed on engine
- (2) Electrically driven start-up pumps
- (3) Engine driven pumps
- (4) Safety and accumulator block

4.5) Motor Driven Auxiliary Blower with Starter

2 sets

- (1) Electric motor and its starter
 - Type: Single speed, continuous rating, horizontal, totally enclosed fan-cooled, Class "F" insulation type.
 - Power source: AC 440V, 60Hz, 3 Phases.
 - Control source for starter: AC 220V, 60Hz, 1 Phase, DC24V
 - Protection grade
Electric motor: IP44, Starter: IP44

- (2) Auxiliary blower shall be installed at the enginebuilder's standard position.

4.6) Turning Gear with motor

1 set

- (1) Electric motor, starter and remote control box with cable (Length = 20m), one plug and two receptacles are to be provided.
- (2) Electric motor
 - Type : Single speed, reversible, horizontal, totally enclosed, three-phase induction, one(1) hour rating, Class F insulation type.
 - Power source: AC 440V, 60Hz, 3 Phases.
 - Control source for starter: AC 220V, 60Hz, 1 phase, DC24V
 - Protection grade
Electric motor: IP44, Starter: IP44

4.7) Cylinder oil heating cable

1 eng.set

Electric heating tracing and insulation for cylinder L.O. line to be required for hull & engine side piping.

4.8) Thrust bearing and thrust shaft

1 set

Thrust shaft is incorporated with crankshaft.
Coupling bolts and nuts between thrust shaft and intermediate shaft to be provided by shipbuilder.

4.9) Flywheel standard type

1 set

Upper part of cover for flywheel is to be provided by engine builder.

4.10) Manoeuvring and reversing device

1 set

Electric wiring between engine and manoeuvring console stand placed at engine control room is to be provided by shipbuilder.

4.11) Main starting valve with non-return valve

1 set

4.12) Engine Control System (ECS)

1 set

The ME engine type control system consists of the following main components:

- Engine Control Units (ECU) 2 sets
- Engine Interface Control Units (EICU) 2 sets
- Cylinder Control Units (CCU) 1 set/cyl
- MOP A and MOP B including track ball and service keyboard each 1 set
- Auxiliary equipment Control Units (ACU) 1 eng.set
- Tacho system 1 set
- Various sensors 1 set

4.13) Pneumatic interlocking apparatus for turning gear

1 set

4.14) Local Operation Panel (LOP)

1 set

The LOP is normally located at engine side and, consequently, the panel must be suitable for mounting directly at engine side.

4.15) Fire extinguishing steam pipe for scavenge air space 1 set

4.16) Steam tracing on fuel oil inlet pipe and return main pipe excluding branch pipes on fuel oil line, and high temperature water tracing on fuel oil drain pipe. 1 set

4.17) Standard piping on engine for cooling water, fuel oil, lubricating oil, starting air and drain. 1 set
 (Mating flanges, packings, bolts and nuts for connection to the shipbuilder's pipe line are to be provided by shipbuilder.)

4.18) Standard gallery 1 set

Ladders are to be provided by shipbuilder.

4.19) Integrated axial vibration damper 1 set

4.20) Local thermometers and pressure gauges fitted on the engine

The quantity of all thermometers and pressure gauges specified herein is per engine except those specially specified such as per cyl, T/C etc.

Item	Symbol	Q'ty
(1) Fuel oil system line		
- Fuel oil, inlet engine	TI	1
※ - Fuel oil, inlet engine	PI	1
(2) Lubricating oil system line		
- Lubricating oil inlet to main/thrust bearings, axial vibration damper and piston cooling oil	TI	1
- Piston cooling oil outlet	TI	1/Cyl.
- Thrust bearing segment	TI	1
- Lubricating oil inlet to turbocharger	TI	1
- Lubricating oil outlet from turbocharger	TI	1/T.C.
※ - Lubricating oil inlet to main/thrust bearings, axial vibration damper and piston cooling oil	PI	1
- Lubricating oil inlet to turbocharger	PI	1/T.C.
(3) Low temperature cooling water system line for air cooler		
- Cooling water inlet to air cooler	TI	1
- Cooling water outlet from air cooler	TI	1/A.C.
※ - Cooling water inlet to air cooler	PI	1
(4) High temperature jacket cooling water system line		
- Jacket cooling water inlet	TI	1
- Jacket cooling water outlet	TI	1/Cyl.
※ - Jacket cooling water inlet	PI	1

(5) Scavenge air system line

- Scavenge air before air cooler	TI	1/A.C.
- Scavenge air after air cooler	TI	1/A.C.
- Scavenge air receiver	TI	1
- Scavenge air receiver (common use for exhaust gas receiver pressure)	PI	1

(6) Exhaust gas system line

- Exhaust gas inlet before turbochager	TI	1/T.C.
- Exhaust gas after cylinder	TI	1/Cyl.
- Air inlet for dry cleaning of turbocharger	PI	1

(7) Control air system line

- Control air	PI	1
※ - Main starting air	PI	1

(8) Differential pressure gauge

- Pressure drop across air cooler	PDI	1/A.C.
- Pressure drop across turbocharger blower filter	PDI	1/T.C.

(9) Position switches

- Main starting valve position "SERVICE"/"BLOCKED"	ZS	1 eng.set
- Turning gear "ENGAGED"/"DISENGAGED"	ZS	1 eng.set
- Pilot air air blocking valve "OPEN"/"CLOSE"	ZS	1

Note !

- TI : Oil filled thermometer for local indication
- PI : Oil filled pressure gauge for local indication
- PDI : Differential pressure gauge for local indication
- ZS : Position switch (i.e. limit switch)
- ※ : The pressure gauges marked with "※" are to be arranged on the gauge board which is in vicinity of the LOP(Local operating panel), whereas the other pressure gauges as well as thermometers are arranged on the pipe line directly.

4.21) Emergency trip

Under the following conditions, main engine to be automatically stopped with alarm

- * a) Over speed (Speed pick-up sensor)
- b) Main L.O. low pressure (Pressure switch)
- c) Turbocharger L.O. inlet low pressure (Pressure switch)
- * d) Thrust pad high temperature (Temperature switch)
- e) One common signal from ECS for the shut-down as listed below:
 - * - Pump inlet oil pressure low
 - * - Hydraulic low pressure sensors failed
 - * - Hydraulic high pressure fails during running engine
 - Leakage from hydraulic unit, high level

The item marked with " * " are to be applied as non-cancelable item.

4.22) Electric sensors for alarm and slow-down

For the details, please refer to the drawings for electric equipments to be separately submitted for approval.

The commissioning for all sensors supplied by engine builder, cabling from the sensors to the junction box on engine and the sensor's installation are to be provided by engine builder.

However the AMS function test using the sensor should be done by shipyard.

4.23) Fuel index to be monitored by Main Operation Panel (MOP)

4.24) Revolution pick-up unit

- | | |
|------------------------|-------|
| - for control & safety | 1 set |
| - for back up | 1 set |
| - for T/C speed | 1/TC |

4.25) Instruments and indicators for control room console

The following parts and instruments are to be supplied loosely for fitting on the maneuvering console placed at shipbuilder's control room.

The wirings and the wiring works required for connections between the engine and shipbuilder's control room are to be provided by the shipbuilder.

Maneuvering console is to be provided by shipbuilder.

- | | |
|--|-------|
| (1) EICU, MOP and accessories for ECS | 1 set |
| (2) High speed tachometer for turbocharger | 1/TC |
| (3) Oil mist detector monitor | 1 |

4.26) PMI Off-line system

Please refer to the detail drawing to be submitted for approval.

4.27) Slow-turning device

Slow turning before starting is a program incorporated into the basic Engine Control System.

4.29) 2nd order moment compensator for fore and after side 1 set

4.30) Expansion joint for lub. oil outlet 1 set

4.31) Hyd. jack for holding down bolts and hyd. jack for end chock bolt 1 set

4.32) Hyd. top bracing with on/off function 1 set

4.33) Air venting by auto-venting valve 1 set

4.34) Pressure reduction unit 1 set

4.35) Exhaust gas outlet transition pieces and dial type thermometer 1 set

4.36) Electric grinding machine for exhaust valve spindle and seat 1 set

5. SPARE PARTS

The spare parts shall be supplied in accordance with the manufacturer's standard and the fulfilled requirements of the Classification Societies.

The additional spare parts required by owner, if any, shall be supplied with additional cost.

5.1) Main bearing

- | | |
|-------------------------------------|-----------|
| (1) Main bearing shell | 1 bearing |
| (2) Studs and nuts for main bearing | 1 bearing |

5.2) Cylinder liner

- | | |
|--------------------------------------|--------|
| (1) Cylinder liner with sealing ring | 1 cyl. |
| (2) Non-return valve for lubrication | 1 cyl. |

5.3) Cylinder cover

- | | |
|---|----------|
| (1) Cylinder cover complete with fuel, exhaust, starting and indicator valves, studs and nuts for valves excluding cooling jacket.
(Indicator valve to be delivered as disassembled) | 1 cyl. |
| (2) Studs and nuts for cylinder cover tightening | 1/2 cyl. |

5.4) Connecting rod bearing

- | | |
|--|--------|
| (1) Crank pin bearing shell | 1 cyl. |
| (2) Studs and nuts for crank pin bearing | 1 cyl. |
| (3) Crosshead bearing shell | 1 cyl. |
| (4) Studs and nuts for crosshead bearing | 1 cyl. |
| (5) Thrust piece | 1 cyl. |

5.5) Piston

- | | |
|--|--------|
| (1) Piston complete with cooling insert, piston rings and piston rod | 1 cyl. |
| (2) Piston rings | 1 cyl. |
| (3) Piston rod stuffing box complete | 1 cyl. |
| (4) O-ring for stuffing box | 1 cyl. |
| (5) Telescopic pipe with bushing for piston cooling oil. | 1 cyl. |

5.6) Exhaust valve

- | | |
|--|--------|
| (1) Exhaust valve complete | 2 cyl. |
| (2) High pressure pipe with connection | 1 cyl. |

5.7) Fuel valve

- | | |
|----------------------------------|--------|
| (1) Fuel valve complete | 1 eng. |
| (2) Sealing rings for fuel valve | 1 eng. |

5.8) Starting valve

- (1) Starting valve complete 1 cyl.

5.09) Indicator valve

- (1) Indicator valve complete 1 cyl.

5.10) Thrust bearing

- (1) Segments for ahead (one side) 1 set

5.11) Alpha cylinder lubricator

- (1) To be in accordance with maker's standard 1 set

5.12) ME components

- (1) To be in accordance with maker's standard 1 set

5.13) Others

- (1) Manufacturer's standard spare for turbocharger 1 set
(2) Manufacturer's standard spare for air cooler 1 set
(3) Manufacturer's standard spare for auxiliary blower and motor 1 set
(4) Manufacturer's standard spare for turning motor 1 set

5.14) Additional spare part

- (1) Aux. blower motor 1/eng.

Note : For more details, please refer to "List of spare parts for main engine" submitted separately for approval.

6. TOOLS

The standard tools for overhauling and inspection are to be supplied in accordance with the manufacturer's standard.

Most of tools are to be furnished on steel plate panels in order to facilitate maintenance, dismantling and overhauling.

* Note : For more details, please refer to "List of tools for main engine" submitted separately for approval.

7. PAINTING

7.1) Outer side of the engine

Outer side of the engine (including the pipes) shall be painted with a primer (two coatings) and a finish paint (two coatings) which colour is MUNSSELL No. 7.5BG7/2

Platform and handrails also to be painted as the same colour of outer side of main engine.

7.2) Inner side of the crankcase

Inner side of the crankcase shall be painted with an oil resistant paint (two coatings, Munsell No. N-9 in white colour).

7.3) Exhaust manifold

Surface for the exhaust manifold prior to insulation shall be painted with a heat-resistant paint (two coatings).

7.4) Others

Others shall be in accordance with manufacturer's standard.

8. INSPECTION AND SHOP TEST

8.1) Inspection

All inspections are to be carried out in accordance with the Rules of Classification Society and enginebuilder's inspection standard.

Only the material tests and inspection required by the Rules of Classification Society are to be carried out in the presence of Surveyor of the Classification Society.

IMO NOx survey and certification is to be conducted in accordance with IMO NOx technical code and the EIAPP (Engine International Air Pollution Prevention) certificate is to be issued.

8.2) Shop test

Only the shop test and overhaul inspection are to be carried out in the presence of the owner's representative and surveyor of the Classification Society.

However, if the owner's representative cannot attend the foresaid test and inspection due to his convenience, these tests and inspections are to be entrusted to the surveyor of the Classification Society and/or the enginebuilder's inspector, and results of those inspections are to be accepted by the owner.

At the time of the shop test, marine diesel fuel oil is to be used, and lube oil is to be in accordance with the engine manufacturer's standard.

(1) Load test

<u>Load</u>	<u>Running hours</u>
25%	0.5 hour
50%	0.5 hour
75%	0.5 hour
90%(Service rating)	0.5 hour
100%	1.0 hour
110%	0.5 hour

(2) Safety device test (i.e. emergency trip test), including ECS FAT specified by MAN Diesel & Turbo

(3) Starting and reversing test.

(4) Minimum revolution test (abt. 5 minutes).

(5) Astern running test at no load (abt. 5 minutes).

(6) F.O. consumption measurement at each load.

(7) IMO NOx measurement to be carried out for only one engine in series.

8.3) Overhauling

Main parts of the engine shall be overhauled and inspected after the shop test.

Following overhauling items shall be in accordance with manufacturer's standard.

No.	Overhaul. item	Quantity	Inspection
1	Crank shaft	1 bearing (Upper & lower)	Appearance inspection without lifting up from bedplate.
2	Main bearing		Main and crank pin bearing only to be dismantled.
3	Crank pin bearing		
4	Crosshead bearing		
5	Cylinder liner	1 cylinder	Appearance inspection of inner surface without dismantling
6	Cylinder cover	1 cylinder	Appearance inspection of inner surface(to be dismantled from engine)
7	Crosshead pin & Guide shoe	1 cylinder	Appearance inspection of bearing surface without dismantling
8	Piston complete	1 cylinder	Appearance inspection of piston surface (to be dismantled from engine)
9	Hydraulic Power Supply	1 engine	Appearance inspection(to be remained in engine) without dismantling

Remarks:

1. The bearing and the cylinder unit to be carried out for the open-up inspection shall be determined by the ship-owner, but the bearing and the cylinder unit are to be of the same cylinder.
2. The above-mentioned parts shall be visually inspected.
3. The confirmation running test after the open-up inspection is not to be executed at the shop.

9. DRAWINGS TO BE SUBMITTED

Drawings shall be submitted as follows.

No.	Name of Drawing	For Approval *(1) (1 st eng./later)	For Working	For Finished *(2) (1 st eng./later)
1	List of drawings to be submitted	2	2	-
2	Specification of main engine	15	10	7/5
3	Engine outline	15	10	7/5
4	Technical data	-	10	-
5	Gallery outline	15	10	7/5
6	Engine pipe connection	15	10	7/5
7	List of spare parts	15	10	7/5
8	List of tools	15	10	7/5
9	Piping diagram of main engine	15	10	7/5
10	Arr. of holding down bolt holes	-	10	-
11	Electric apparatus for main engine	15	10	7/5
12	Shop trial results	-	-	7/5
13	Instruction book	-	-	7/5
14	Code book	-	-	7/5

Remarks : *(1) Including one(1) copy for return after approval.

*(2) Including for owner and shipbuilder.

Note : These drawings and instructions are to be used exclusively by the owner and his personnel; and the owner has to guarantee that they will not be published or transferred to the third party.

10. CONSTRUCTION AND MATERIALS

These explanations as hereinafter are made for general understanding. So, they can be changed without notices according to enginebuilder's modification and Licensor's latest design

10.1) Bedplate and main bearing

The bedplate can be divided into sections of suitable size, in accordance with the production facilities available. It consists of longitudinal girders and cross girders with bearing supports. For fitting to the engine seating, long, elastic holding down bolts tightened by hydraulic tools are to be used.

The bedplate is made without taper on its bottom sides based on epoxy chocks installation.

The oil pan is integrated in the bedplate and it collects the return oil from the forced lubricating and cooling oil system. It is provided with a suitable number of drains with grating.

The main bearings consist of steel shells lined with bearing metal. The bottom shell can, by means of special tools, and hydraulic tools for lifting the crankshaft, be rotated around and in. The shells are kept in position by a bearing cap and are secured by long elastic studs, with nuts tightened by hydraulic tools.

10.2) Thrust bearing

The thrust bearing is of the B&W-Michell type, and consists, primarily, of a thrust collar on the crankshaft, a bearing support, and segments of mild steel with bearing metal. The thrust shaft is an integral part of the crankshaft.

The propeller thrust is transferred through the thrust collar, the segments, and the bedplate to the engine seating and end chocks.

The thrust bearing is lubricated by the engine's main lubricating oil system.

10.3) Turning wheel and turning gear

The turning wheel has cylindrical teeth and is fitted to the thrust shaft. The turning wheel is driven by a pinion on the terminal shaft of the turning gear, which is mounted on the bedplate. The turning gear is driven by an electric motor with built-in gear and brake.

The turning gear is provided with a blocking device that prevents the main engine from starting when the turning gear is engaged. Engagement and disengagement of the turning gear is effected manually by an axial movement of the pinion.

10.4) Frame box

The frame box is of welded design, and can be divided into sections of suitable size, determined by the production facilities available.

On the exhaust side, it is provided with relief valves for each cylinder while, on the camshaft side, it is provided with a large hinged door for each cylinder.

The cylinder frame and the frame box are fixed to the bedplate with stay bolts. The stay bolts are made in one part and are tightened with hydraulic jacks.

10.5) Cylinder frame, cylinder liner and stuffing box

The cylinder frame units are depending on enginebuilder's practice and together with the cylinder liners they form the scavenge air space.

On the manoeuvring side of the engine, the cylinder frame units are provided with covers for cleaning the scavenging air space and for inspection of scavenge ports.

A piston rod stuffing box for each cylinder unit is fitted at the bottom of the cylinder frame unit. The stuffing box is provided with sealing rings for scavenge air, and with oil scraper rings to prevent oil from entering the scavenge air space.

The cylinder liner is made of alloyed cast iron and is mounted on the cylinder frame. The top of the cylinder liner is surrounded by a cast iron cooling jacket. The cylinder liner has scavenge ports and drilled holes for cylinder lubrication.

10.6) Cylinder cover

The cylinder cover is of steel, made in one piece and has bores for cooling water. It has a central bore for the exhaust valve and bores for fuel valves, starting valve and indicator valve.

The cylinder cover is attached to the cylinder frame with 8 studs and nuts tightened by the hydraulic jacks.

10.7) Exhaust valve

The exhaust valve consists of a valve housing and a valve spindle. The valve housing is of cast iron and arranged for water cooling.

The housing is provided with a bottom piece of steel with a flame hardened seat. The bottom piece is water cooled. The housing is provided with a spindle guide.

The exhaust valve is tightened to the cylinder cover with studs and nuts. The exhaust valve is opened hydraulically and closed by means of air pressure. In operation, the valve spindle slowly rotates, driven by the exhaust gas acting on small vanes fixed to the spindle.

10.8) Fuel valves, starting valve and indicator valve

Each cylinder cover is equipped with fuel valves, starting valve and indicator valve. The opening of fuel valve is controlled by the fuel oil pressure created by the fuel oil booster, and the valve is closed by a spring.

An automatic vent slide allows circulation of fuel oil through the valve and high pressure pipes, and prevents the combustion chamber from being filled up with fuel oil in the event that the valve spindle sticks when the engine is stopped. Oil from the vent slide and other drains is led away in a closed system.

The mechanically driven starting air distributor used on the MC engines has been replaced by one solenoid valve per cylinder, controlled by the CCUs of the Engine Control System.

The CCUs of Engine Control System controls the starting air valve's ON/OFF timing.

10.9) Crankshaft

The crankshaft is of the semi-built type, made from forged steel throws.

The crankshaft is built integral with the thrust shaft and is, on the aft end, provided with a flange for the turning wheel and for coupling to the intermediate shaft. At the fore end, the crankshaft is provided with a flange for a counterweight and for a tuning wheel, in the event that these are to be installed.

10.10) Axial vibration damper

The engine is fitted with an axial vibration damper, which is mounted on the fore side of the crankshaft.

The damper consists of a piston and a split-type housing located forward of the foremost main bearing.

The piston is made as an integrated collar on the main journal, and the housing is fixed to the main bearing support.

10.11) Connecting rod

The connecting rod is made of steel and provided with bearing caps for the crosshead and crankpin bearings.

The crosshead and crankpin bearing caps are secured to the connecting rod with studs and nuts which are tightened by hydraulic jacks.

The crosshead bearing consists of a set of steel shells lined with bearing metal. The crosshead bearing cap is in one piece, with an angular cut-out for piston rod.

The crankpin bearing is provided with steel shells, lined with bearing metal. Lube oil is supplied through ducts in the crosshead and connecting rod.

10.12) Piston, piston rod and crosshead

The piston consists of piston crown and piston skirt. The piston crown is made of heat-resistant steel and has ring grooves.

The uppermost piston ring is CPR type(Controlled Pressure Relief) whereas the other piston rings are with an oblique cut. The piston skirt is of cast iron.

The piston rod is of forged steel and is surface-hardened on the running surface for the stuffing box. The piston rod is connected to the crosshead with tightened studs. The piston rod has a central bore which, in conjunction with a cooling oil pipe, forms inlet and outlet for cooling oil to the piston.

The crosshead is of forged steel and is provided with cast steel guide shoes with bearing metal on the running surface.

The telescopic pipe for oil inlet and the pipe for oil outlet are mounted on the guide shoes.

10.13) Fuel oil booster and fuel oil high pressure pipe

The engine is provided with one hydraulic activated fuel oil booster for each cylinder. Fuel injection is activated by a proportional valve, which is electronically controlled by the cylinder control unit.

10.14) Reversing

Reversing of the engine is performed electronically, by changing the timing of the fuel injection, the exhaust valve activation and starting valves.

10.15) Hydraulic cylinder unit (HCU)

The HCU, one per cylinder, consists of a support console on which a distributor block is mounted. The distributor block is fitted with a number of accumulators to ensure that the necessary hydraulic oil peak flow is available.

The distributor block serves as a mechanical support for the hydraulically activated fuel pressure booster and the hydraulically activated exhaust valve actuator.

10.16) Alpha cylinder lubricator

The Alpha lubrication system is designed to supply cylinder oil intermittently, e.g. every four, five, six, etc. engine revolutions, at a constant pressure and with electronically controlled timing and dosage at a defined position.

Electronically controlled lubrication system integrated with ME principle.

10.17) Gallery arrangement

The engine is provided with gallery brackets, gratings, and stanchions. The brackets are placed at such a height that the best possible overhauling and inspection conditions are achieved. Some main pipes of the engine are suspended from the gallery brackets, and the upper gallery platform on the camshaft side is provided with overhauling holes for piston. The number of holes depends on the number of cylinders.

10.18) Scavenge air system

The air intake to the turbocharger takes place through the intake silencer of the turbocharger.

From the turbocharger the air is led via the charging air pipe, air cooler and scavenging air receiver to the scavenge air ports of the cylinder liners.

The charging air pipe between turbocharger and air cooler is provided with a compensator and is heat insulated on the outside.

10.19) Exhaust turbocharger

The turbochargers are arranged on the exhaust side of the engine.

The turbocharger is delivered with electromagnetic tachometer.

10.20) Scavenge air cooler

The engine is fitted with air cooler(s) divided in elements for cooling system.

The end covers are of coated cast iron.

The cleaning is to take place only when the engine is stopped.

A water mist catcher of the through-flow type is located in the air chamber after the air cooler.

10.21) Exhaust gas system

From the exhaust valves the gas is led to the exhaust gas receiver where the fluctuating pressure from the individual cylinders is equalized, and the total volume of gas led further on to the turbocharger at a constant pressure. After the turbocharger, the gas is led to the external exhaust pipe system.

Compensators are fitted between the receiver and the exhaust valves, and between the receiver and the turbocharger.

The exhaust gas receiver and exhaust pipes are provided with insulation, covered by galvanized steel plating. There is a protective grating between the exhaust gas receiver and the turbocharger.

10.22) Auxiliary blower

The engine is provided with electrically-driven blowers. The suction side of blowers is connected to the scavenge air space after the air cooler.

Between the air cooler and the scavenge air receiver, non-return valves are fitted which automatically close when the auxiliary blowers supply the air.

The auxiliary blowers will start operating before the engine is started and will ensure sufficient scavenge air pressure to obtain a safe start.

During operation of the engine, the auxiliary blowers will start automatically each time the engine load is reduced to about 30-40% and they will continue operating until the load again exceeds approximately 40-50%.

In cases where one of the auxiliary blowers is out of service, the other auxiliary blower will automatically compensate without any manual readjustment of the valves, thus avoiding any engine load reduction.

10.23) Starting air System

The starting air system comprises a main starting valve, a non-return valve, a bursting disc for the branch pipe to each pipe, a starting air distributor, and a starting valve on each cylinder. The main starting valve is connected with the manoeuvring system, which controls the start of the engine.

The solenoid valve controlled by each CCU regulates the supply of control air to the starting valves so that they supply the engine cylinders with starting air in the correct firing order.

10.24) Engine protecting system

This system is designed to protect the main engine from the abnormal condition. It has such functions as emergency shut down and manual emergency stop.

Emergency shut-down

Regardless of manoeuvring position of the main engine, the emergency shutdown function is always effective.

10.25) Piping arrangement

The engine is equipped with the following piping arrangements to complement the engine hydraulic system;

- Fuel oil piping
- Heating of fuel oil pipes
- Lubrication oil system
 - Main lubrication circuit for lubrication and cooling
 - Exhaust valve hydraulic oil
 - Hydraulic servo oil circuits via automatic filter
 - Vertical lubricating oil drain from oil pan in bed
- Cylinder lubricating system
 - Driven by pressurized hydraulic control oil from HPS
- Cooling water to scavenge air cooler
- Jacket and turbocharger cooling water
- Starting and Control air system
 - Main starting air control device
 - Slow turning device
 - Electronically controlled starting air valve replaced starting air distributor
 - Interlock valve for turning gear engaged
- Various drain pipes
- Common Hydraulic cylinder lube oil system
- Common Turbocharger lube oil system

11. FUEL OIL AND LUBRICATING OIL

11.1) Fuel oil

The engine is designed to operate with heavy fuel oil having a viscosity of up to 700 cSt at 50 degree Celsius.

11.2) Lubricating oil

(1) Circulating oil (Lubricating and cooling oil)

The circulating oil(lubricating and cooling oil) must be rust and oxidation inhibited engine oil, of SAE 30 viscosity grade.

In order to keep the crankcase and piston cooling space clean of deposits, the oils should have adequate dispersion and detergent properties.

(2) Cylinder oil

It is recommended that the use of cylinder oils of the SAE 50 viscosity grade. During shop trial and sea trial, it is recommended the use of cylinder oil with a high detergency level. Using a "Total Base Number (BN)" of 70 as a 70 BN oil will be normally give good results. Use higher BN oils in the event of high sulphur content in the fuel oil.

Note : Some high alkaline cylinder oils are not compatible with :

- Certain low sulphur fuels having poor combustion properties.
- Some diesel oils.

Such incompatibility may be indicated by poor cylinder condition during scavenge air port inspection. In such cases, change to a lower BN cylinder oil.

(3) Turbocharger oil

Common (forced L.O. system branched from main L.O. system) oil feed is applied for the turbocharger.

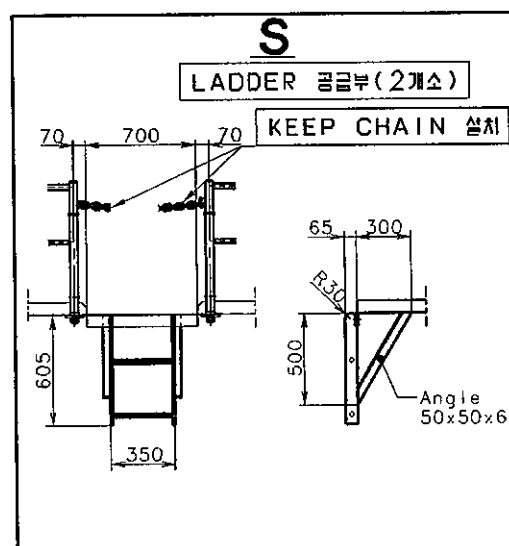
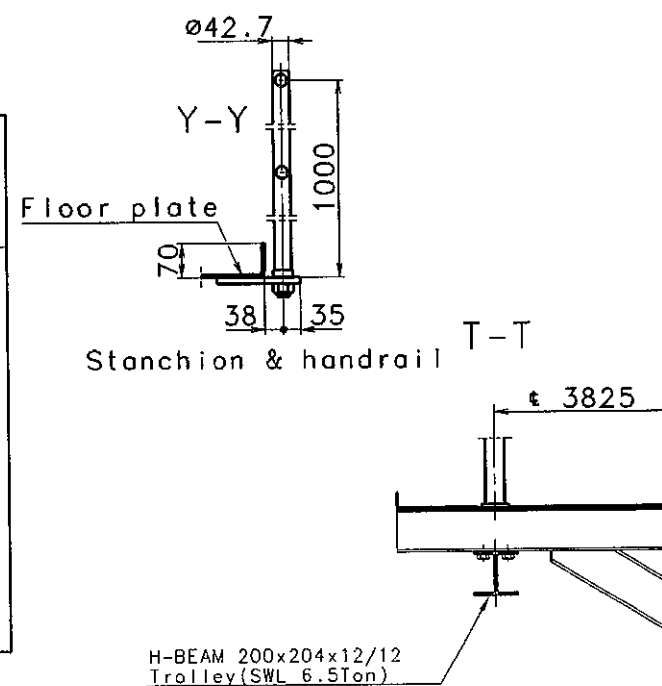
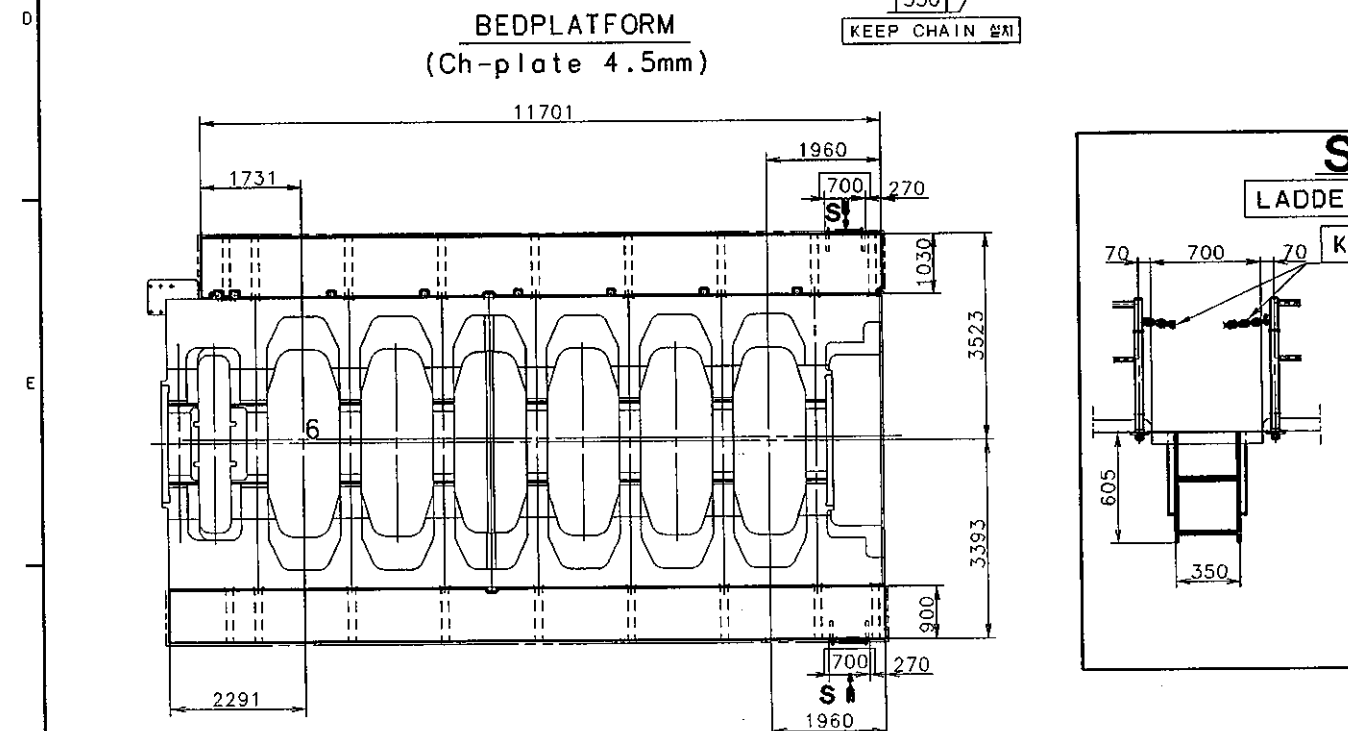
12. COOLING FRESH WATER

In order to prevent corrosion of cooling water passage in engine components and pipes, the chemical inhibitor is to be added into cooling water, thus pipe for cooling water is not to be galvanized.

13. NECESSARY AUXILIARIES

The below-mentioned equipments are not supplied by engine builder.

- | | |
|---|-------------------------|
| (1) Fresh water pump | (Electric motor driven) |
| (2) Sea water pump | (") |
| (3) Lubricating oil pump | (") |
| (4) Fuel oil circulating pump | (") |
| (5) Fuel oil supply pump | (") |
| (6) Lubricating oil cooler | |
| (7) Fresh water cooler | |
| (8) Starting air reservoir | |
| (9) Starting air compressor | |
| (10) Fuel oil preheater | |
| (11) Exhaust manifold after turbocharger | |
| (12) Cleaning pump unit for air cooler | |
| (13) Drain tank for air cooler cleaning | |
| (14) Fuel oil primary filter | |
| (15) Lubricating oil filter | |
| (16) Scavenging air box drain tank. | |
| (17) Others, which are provided in external system. | |



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Standard for surface roughness					
The basic symbols and class numbers are in					
Class No.	N1	N2	N3	N4	N5
$R_{\max}$	0,025	0,05	0,1	0,2	0,4

												tolerances for dimensions without tolerance indications (ISO 2768-1039)			
This standard states the permissible deviations for dimensions without direct tolerance indications on metallic components manufactured by machining															
Non-measurement = Permissible deviations												0,5 up to 6			
												over 6 up to 30			
												over 30 up to 120			
												over 120 up to 315			
												over 315 up to 1000			
												over 1000			
Medium series												±0,1 ±0,2 ±0,3 ±0,5 ±0,8			

☐ 안의 치수는 No-handrail & Down-coaming
(Line type :)

(☐)안의 치수는 No-handrail & Up-coaming
(Line type :)

 Lifting lug(1ton)

Supplement Drawing No.:						Project:						Mass (sg):						Material / Blotn:					
						Licensor's Ident. no.:						Dist.:						Licensor's Material / Blotn:					
						SIB1627-7.1						A92											
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32 CAD Drawing - do not correct by hand

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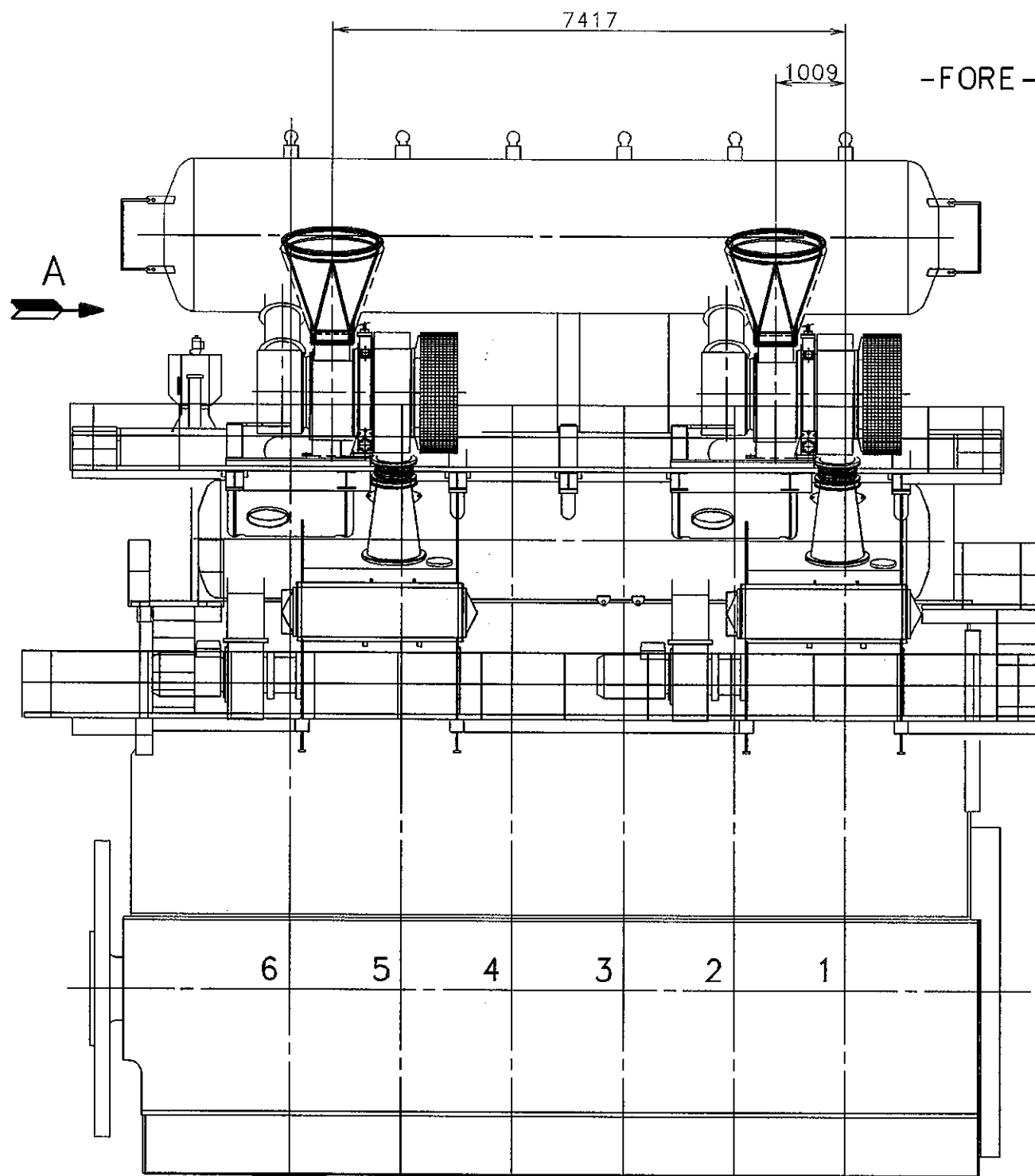
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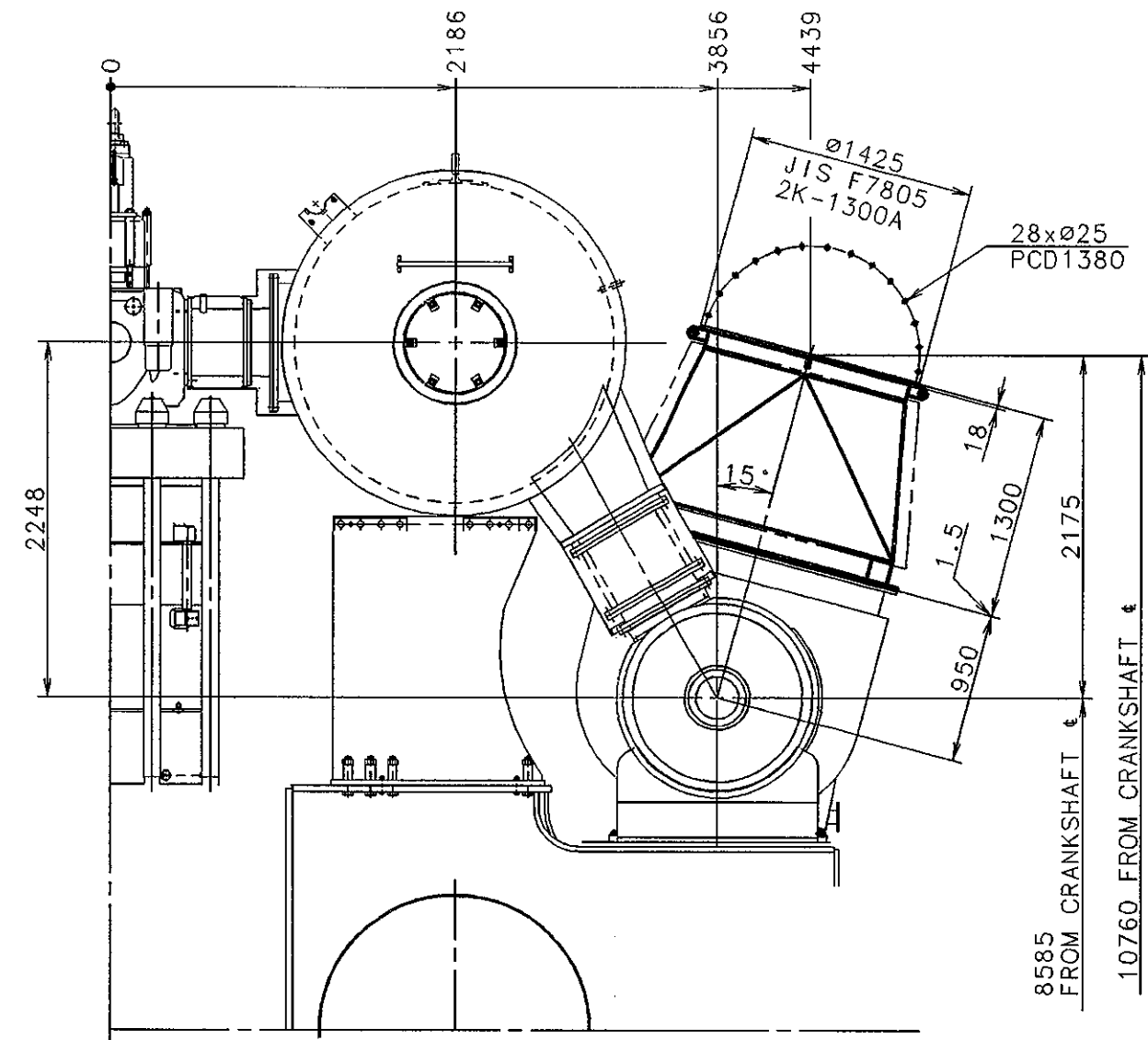
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Standard for surface roughness												
The basic symbols and class numbers are in accordance with ISO 1502-1978.												
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
R _a max. value in µm	0,025	0,05	0,1	0,2	0,4	0,8	1,6	3,2	6,3	12,5	25	50

Tolerances for dimensions without tolerance indication (ISO 2768-1989)									
This standard states the permissible deviations for dimension without direct tolerance indications on metal parts manufactured by machining.									
Non-measurement	0,5	over 0,5	over 30	over 120	over 315	over 1000	over 2000	over 5000	over 10000
Permissible deviations	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±1,6	±2,5	±4,0

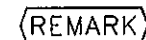
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Date	Des.	Chk.	Appd.	A.C.	E	Change / Replacement				C.No			
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				*	*					7			
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110221KNHJYGPBS										0			
Similar Drawing No.:										Replacement of Ident. No.:			
Scale: 1:30										Size: A2	Type: 6S90MC-C8.2, 2xMET71MB	Page No.: 01 (01)	HYUNDAI HEAVY INDUSTRIES CO., LTD.
Info. No.: 065000										Description: EXHAUST GAS OUTLET PIPE(1300A)		Ident. No.: A12-388619-6	
HSEF-k210-011(R1)										현대중공업(주) 엔진사업본부		A2(594mmx420mm) 1/25	

F

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do not correct by hand

AFT



6x4 ZUMWJ

		S. Page	T. Page
PLAN HISTORY	ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2	
	MESSRS.	HHI-SBD	
	RULE	LR	
	SHIP NO.	2585/6/7/8/9	
	ENG. NO.	AA4624/5/6/7/8	

TITLE : PIPING DIAGRAM FOR MAIN ENGINE

- Specifications.

No.	ITEM	DESCRIPTION	REMARK
14	F.o.hp.pipe	Double walled type	
13	Oil mist detector	G.MK-6	492D2S
12	Press. gauge unit	bar	462010
11	Drain box with level switch	1set/Air cooler	444200
10	Fire extinguishing system	Steam	444100
9	T/C L.O. system	Common	441280
8	T/C cleaning system	Dry	441260
7	Turbo charger type	2xMET71MB	441100
6	Press. reduction station (30k->7k)	Applied	437300
5	Slow turning device	Applied	437200
4	Jacket C.W. outlet	Auto-venting v/v	436200
3	Cyl.lubricating system	Alpha	434100
2	Hydraulic control oil system	Common-pco	433100
1	P.C.O. & M.L.O.	Common	432100

Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R
				*		5
				*		4
111019	OYS	KJY	LGH	*	REV.THE PAGE NO.*1,11,12,18,22"DESIGN DEAL.	3
110408	OYS	KJY	LGH	*	REV.THE PAGE NO."17"ACC.TO YARD COMMENT	2
110329	OYS	KJY	LGH	*	REV.THE PAGE NO."13,15,17"ACC.TO YARD COMMENT	1
110222	IHHS	OYS	LGH	*	Replacement for Ident.no.:	0

Licenser Ident.no.:	Type:	6S90ME-C8.2	
Info.no.:	Description:	Piping diagram for main engine	
Page.no.:			
370010			Ident.no.:
01 OF 02			A14-321591-9

SYSTEM		FLUID CON.		NOM. DIA. (JIS)	PIPE		PIPE CONN.		REMARKS			
		PRESS. (KG/CM ²)	TEMP. (°C)		THICK- NESS	MAT'L	TEST PRESS. KG/CM ²	TYPE		MAT'L		
T/C L. O. PIPES (PART NO.09)		-	-	150A	7.1	JIS G3454 STPG370-E SCH.40	-	JIS B2220 SLIP-ON 'FF' FLANGE JIS 5K	JIS G3101 SS400	ONLY NA MET TPL T/C		
				100A	6.0							
				65A	5.2							
CYL. L.O. PIPES (PART NO.10)		-	-	25A	3.7	JIS G3454 STPG370-S SCH.40	-	BITE TYPE JOINT	FORGED STEEL			
				10A	2.3							
				φ8	1.5							
STUFFING BOX DRAIN (PART NO.11)		-	-	32A	3.6	JIS G3454 STPG370-E	-	JIS B2220 FL. JIS 5K	JIS G3101 SS400			
				10A	2.3			JIS G3454 STPG370-S	BITE TYPE JOINT		FORGED STEEL	
A/C COOLING PIPES (PART NO.12)	FRESH.W.	2.0- 4.5	36	250A	9.3	JIS G3454 STPG370-E		JIS B2220 FL. JIS 5K	JIS G3101 SS400	SEA WATER : GALVANIZING OR POLYETHYLENE COAT'G(option) FRESH WATER: PARKERIZING		
				200A	8.2							
				32A	3.6							
	SEA W.	2.0- 2.5		-	-	JIS H3300 G1220T-1/2H		BITE TYPE JOINT	COPPER ALLOY			
F.W. COOL'G PIPES (PART NO.13)	INLET & OUTLET	3.0- 3.5	90	250A	9.3	JIS G3454 STPG370-E SCH.40	-	JIS B2220 SLIP-ON FLANGE JIS 5K	JIS G3101 SS400			
				200A	8.2							
				65A	5.2							
				50A	3.9							
				20A	2.9							
	DRAIN			32A	3.6	JIS G3454 STPG370-S		BITE TYPE JOINT	FORGED STEEL			
				10A	2.3							
STARTING AIR PIPES (PART NO.14)		30	-	150A	7.1	JIS G3454 STPG370-S	70	JIS B2220 SLIP-ON FLANGE JIS 30K	S20C-N			
				100A	6.0							
				50A	3.9							
				25A	3.4	φ 1		JIS G3454 STPG370-S	BITE TYPE JOINT		FORGED STEEL	
				20A	2.9							
				10A	2.3							
				φ10	1.5	JIS G3454 OST-2						

NOTE #1;ABS GRADE 2
BV GRADE 360
DNV NVR 1-1
GL GRADE R-360W
KR RST 138
LR GRADE 360
NK KST PG370
R.I.NA RI/1-A

#2;ABS GRADE 5
BV GRADE 410
DNV NVR 1-3
GL GRADE R-410W
KR RST 342
LR GRADE 410
NK KST PT410
R.I.NA RI/1-A

#3;ABS APPROVED
BV APPROVED
DNV APPROVED
GL APPROVED
KR APPROVED
LR APPROVED
NK APPROVED
R.I.NA APPROVED

PART NUMBER : 01

Date	Des.	Chk.	Appd.	A.C	Replaced by	Ident.no.:	R
				*			5
				*			4
				*			3
110425	OYS	KJY	LGH	*	MAT'L ST2R-->S19R, S20C-N-->SF440A		2
060825	KYI	YSB	PBS	*	MAT'L ST52.4-->S12R, HF440-->S20C-N		1
031217	HAH	KYI	SDG	*	Replacement for Ident.no.:		0
Licensor Ident.no.:		Type:		S90ME-C			
Info.no.:		Description:		Spec.for piping system		Ident.no.:	
370011						A14-243825-2	
Page.no.:							
02 OF 04							

SYSTEM		FLUID CON.		NOM. DIA. (JIS)	PIPE			PIPE CONN.		REMARKS	
		PRESS. (KG/CM ²)	TEMP. (°C)		THICK- NESS	MAT'L	TEST PRESS. KG/CM ²	TYPE	MAT'L		
SCAV.AIR DRAIN PIPES (PART NO.16)		3	-	80A	5.5	JIS G3454	-	JIS B2220 SLIP-ON FLANGE JIS 5K	JIS G3101 SS400		
				50A	3.9	STPG370-E					
				32A	3.6	SCH.40					
				10A	2.3	JIS G3454 STPG370-S					
				φ16	2.0	JIS H3300 C1220T-1/2H					
A/C CLEANING PIPES (PART NO.17)		-	-	50A	3.9	JIS G3454	-	JIS B2220 SLIP-ON FLANGE JIS 5K	JIS G3101 SS400		
				40A	3.7	STPG370-E					
				25A	3.4	SCH.40					
				20A	2.9	JIS G3454 STPG370-S					
FIRE EXTINGUISH SCAV.AIR SPACE (PART NO.18)	STEAM	-	-	40A	3.7	JIS G3454 STPG370-E	-	JIS B2220 JIS 10K	JIS G3101 SS400	INSUL- ATION	
	CO ₂			10A	2.3	JIS G3454					
				8A	2.2	STPG370-S					
				20A	3.9	JIS G3454					
				15A	3.7	STPG370-S					
T/C CLEANING PIPES (PART NO.20)		3.5- 7.0	-			JIS G3454	-	JIS B2220 JIS 10K	JIS G3101 SS400		
				20A	2.9	STPG370-E					
				15A	2.8						
				10A	2.3	JIS G3454					
				8A	2.2	STPG370-S					
BEDPLATE DRAIN PIPES (PART NO.21)		-	-	32A	3.6	JIS G3454 STPG370-E	-	JIS B2220 FL.JIS 5K	JIS G3101 SS400		
20A	2.9			JIS G3454 STPG370-E	BITE TYPE JOINT	FORGED STEEL					
U-MANOMETER PIPES (PART NO.22)		3	-	φ10	1.5	JIS H3300 C1220T-1/2H	-	BITE TYPE JOINT	COPPER ALLOY		
OIL MIST DETECTOR PIPES (PART NO.23)	Specs VISION III	-	-	-	-	-	-	-	-		
	SCHALLER VN215/93	-	-	-	-	-	-	-	-		
	SCHALLER VN215	-	-	25A	3.4	JIS G3454 STPG370-E	-	JIS B2220 FL.JIS 5K	JIS G3101 SS400		
				8A	2.2	JIS G3454 STPG370-S		BITE TYPE JOINT	FORGED STEEL		
	GRAVINER MARK 5	-	-	40A	3.7	JIS G3454 STPG370-E	-	JIS B2220 FL.JIS 5K	JIS G3101 SS400		
				φ20	2.0	JIS H3300 C1220T-1/2H		BITE TYPE JOINT	COPPER ALLOY		
GRAVINER MARK 6	-	-	-	-	-	-	-	-			
NOTE #1;ABS GRADE 2 BV GRADE 360 DNV NVR 1-1 GL GRADE R-360W KR RST 138 LR GRADE 360 NK KST PG370 R.L.NA RI/1-A #2;ABS GRADE 5 BV GRADE 410 DNV NVR 1-3 GL GRADE R-410W KR RST 342 LR GRADE 410 NK KST PT410 R.L.NA RI/1-A #3;ABS APPROVED BV APPROVED DNV APPROVED GL APPROVED KR APPROVED LR APPROVED NK APPROVED R.L.NA APPROVED PART NUMBER : 01											
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
				*							5
				*							4
				*							3
110425	OYS	KJY	LGH	*	MAT'L ST2R-->S19R, S20C-N-->SF440A						2
060825	KYI	YSB	PBS	*	MAT'L ST52.4-->S12R, HF44Q-->S20C-N						1
031217	HAH	KYI	ISDC	*	Replacement for Ident.no.:						0
Licensor Ident.no.:		Type:		S90ME-C							
Info.no.:		Description:		Spec.for piping system						Ident.no.:	
Page.no.:				03 OF 04						A14-243825-2	

TABLE OF THERMOMETER WITH ENGINE				SYMBOL	TI
NO	ITEM	TYPE	Q'TY	REMARKS	
1	EXHAUST GAS EACH CYL.OUTLET	PF3/4 x 650°C x 250	1xCYL.NO	DIAL TYPE	
2	EXHAUST GAS T/C INLET	PF3/4 x 650°C x 250	1xT/C NO	DIAL TYPE	
3	EXHAUST GAS T/C OUTLET	PF3/4 x 650°C x 250	1xT/C NO	DIAL TYPE	
4					
5	SCAVENGING AIR MANIFOLD	PF3/4 X 160°C X 250	1	DIAL TYPE	
6	SCAVENGING AIR INLET OF A/C	PF3/4 X 320°C X 200	1xA/C NO	DIAL TYPE	
7	SCAVENGING AIR OUTLET OF A/C	PF3/4 X 160°C X 250	1xA/C NO	DIAL TYPE	
8					
9	MAIN L.O.INLET	PF3/4 X 120°C X 120	1	DIAL TYPE	
10	PISTON COOLING OIL OUTLET	PF3/4 x 120°C x 120L	1xCYL.NO	DIAL TYPE	
11	FUEL OIL INLET	PF3/4 x 200°C x 100	1	DIAL TYPE	
12	COOLING WATER INLET FOR A/C	PF3/4 X 120°C X 120	1	DIAL TYPE	
13	COOLING WATER OUTLET FOR A/C	PF3/4 X 120°C X 120	1xA/C NO	DIAL TYPE	
14					
15					
16	COOLING FRESH WATER INLET	PF3/4 X 120°C X 120	1	DIAL TYPE	
17	COOLING F.W.EACH CYL.OUTLET	PF3/4 X 160°C X 100	1xCYL.NO	DIAL TYPE	
18	COOLING F.W.EXHAUST V/V OUTLET	PF3/4 X 160°C X 100	1xCYL.NO	DIAL TYPE	
19					
20	TURBO-CHARGER LUB.OIL INLET	PF3/4 x 120°C x 100	1	DIAL TYPE	
21	TURBO-CHARGER LUB.OIL OUTLET	PF3/4 x 160°C x 100	1XT/C NO	DIAL TYPE	
22					
23	THRUST PAD	SENSOR PF1/2 DIAL TYPE	1	DIAL TYPE (REMOTE)	
24					
25					
26					
27					
28					
29					
30					

PART NUMBER : 02

Date	Des.	Chk.	Appd.	A.C	Replace by Ident.no.:	R
				*		5
				*		4
				*		3
				*		2
				*		1
				*		0

060826/KYI/YSB/PBS * NO.18 REVISED(Q'TY 1-->1xCYL.)

031217/HAH/KYI/SDC * Replace for Ident.no.:

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

Licensor Ident.no.:	Type: S90ME-C(TPL,MET)	Ident.no.:
info.no.:	Description:	
370012	Table of thermometer-engine	A14-243826-4
Page.no.:		
01 OF 01		

TABLE OF PRESSURE GAUGE WITH ENGINE					SYMBOL PI	
NO	ITEM	TYPE	Q'TY	REMARKS		
1	LUB. & COOLING OIL INLET	BVS 1/2 x 100 x 4 bar	1			
3	FUEL OIL INLET	BVS 1/2 x 100 x 15 bar	1			
4	STARTING AIR	BVS 1/2 x 100 x 50 bar	1			
5						
6	CLEANING AIR INLET FOR T/C	BVS 1/2 x 100 x 15 bar	1			
7	SCAV.-EXH.GAS MANIFOLD	BVS 1/2 x 100 x 6 bar	1	Tier2		
8	CONTROL AIR	BVS 3/8 x 100 x 15 bar	1			
9						
10	LUB.OIL INLET FOR T/C	BVS 1/2 x 100 x 4 bar	1/T/C			
11	AIR COOLER COOLING WATER INLET	BVS 1/2 x 100 x 8 bar	1			
12	JACKET COOLING WATER INLET	BVS 1/2 x 100 x 8 bar	1			
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

PART NUMBER : 03

Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R
				*		5
				*		4
				*		3
				*		2
110219	HHS	OYS	LGH	*	CORRECTED FOR TIER2	1
090410	HAI	OYS	LGH	*	CORRECTED	0
070427	HAI	YSB	SDC	*	Replacement for Ident.no.:	

Licensor Ident.no.:	Type:	L/S/K-ME	
0000000-0.0			
Info.no.:	Description:	Ident.no.:	
370013	Table of press.gauge with engine	A14-300555-5	
Page.no.:			
01 OF 01			

NO.	SYMBOL	SYMBOL DESIGNATION	NO.	SYMBOL	SYMBOL DESIGNATION
1. GENERAL CONVENTIONAL SYMBOLS					
1.1		PIPE	1.4		APPLIANCES
1.2		PIPE WITH INDICATION OF DIRECTION OF FLOW	1.5		INDICATING AND MEASURING INSTRUMENTS
1.3		VALVES, GATE VALVES, COCKS AND FLAPS			
2. PIPES AND PIPE JOINT					
2.1		CROSSING PIPES, NOT CONNECTED	2.13		BLANK FLANGE
2.2		CROSSING PIPES, CONNECTED	2.14		SPECTACLE FLANGE
2.3		TEE PIPE	2.15		BULKHEAD FITTING WATER TIGHT, FLANGED
2.4		FLEXIBLE PIPE	2.16		BULKHEAD CROSSING, NON-WATERTIGHT
2.5		EXPANSION PIPE (CORRUGATED) GENERAL	2.17		TEST PIECE WITH PLUG
2.6		JOINT, SCREWED	2.18		ORIFICE
2.7		JOINT, FLANGED	2.19		REDUCER
2.8		JOINT, SLEEVE	2.20		OPEN DRAIN & AIR VENT
2.9		JOINT, HOSE COUPLING			
2.10		EXPANSION JOINT WITH GLAND			
2.11		EXPANSION PIPE			
2.12		CAP NUT			
3. VALVES, GATE VALVES, COCKS AND FLAPS					
3.1		VALVE, STRAIGHT THROUGH	3.6		NON-RETURN VALVE (FLAP) ANGLE
3.2		VALVE, ANGLE	3.7		NON-RETURN VALVE (FLAP) STRAIGHT, SCREW DOWN
3.3		STOP VALVE (SCREW ENDED)	3.8		NON-RETURN VALVE (FLAP) ANGLE, SCREW DOWN
3.4		VALVE, THREE-WAY	3.9		FLAP, STRAIGHT THROUGH
3.5		NON-RETURN VALVE (FLAP) STRAIGHT	3.10		FLAP, ANGLE
					PART NUMBER : 04
Date	Des.	Chk.	Appd.	A.C	Replace by Ident.no.:
				*	
				*	
				*	
				*	
				*	
				*	
031217	HAH	KYI	SDC	*	Replace for Ident.no.:
Licensor Ident.no.:		Type:		ALL ENGINES	
0000000-0.0					
Info.no.:		Description:		Ident.no.:	
000000		Basic symbols for piping		A14-243828-8	
Page.no.:					
01 OF 03					

NO.	SYMBOL	SYMBOL DESIGNATION	NO.	SYMBOL	SYMBOL DESIGNATION
3.11		REDUCING VALVE	3.26		DOUBLE-SEATED CHANGEOVER VALVE, ANGLE
3.12		SAFETY VALVE	3.27		COCK, STRAIGHT THROUGH
3.13		ANGLE SAFETY VALVE	3.28		COCK, ANGLE
3.14		SELF-CLOSING VALVE	3.29		COCK, THREE-WAY, L-PORT IN PLUG
3.15		QUICK-OPENING VALVE	3.30		COCK, THREE-WAY, T-PORT IN PLUG
3.16		QUICK-CLOSING VALVE	3.31		COCK, FOUR-WAY, STRAIGHT THROUGH IN PLUG
3.17		REGULATING VALVE	3.32		COCK, WITH BOTTOM CONNECTION
3.18		ANGLE VALVE	3.33		COCK, STRAIGHT THROUGH WITH BOTTOM CONNECTION
3.19		BALL VALVE (-COCK)	3.34		COCK, ANGLE, WITH BOTTOM CONNECTION
3.20		BUTTERFLY VALVE	3.35		COCK, THREE-WAY, WITH BOTTOM CONNECTION
3.21		GATE VALVE	3.37		SOLENOID VALVE
3.22		DOUBLE-SEATED CHANGEOVER VALVE	3.38		3-WAY TEST VALVE
3.23		SUCTION VALVE CHEST			
3.24		SUCTION VALVE CHEST WITH NON RETURN VALVES			
3.25		DOUBLE-SEATED CHANGEOVER VALVE, STRAIGHT			

4. CONTROL AND REGULATION PART

4.1		HAND-OPERATED	4.8		ELECTRO-MAGNETIC
4.2		REMOTE CONTROL	4.9		FLAME TRAP
4.3		SPRING	4.10		ELECTRIC MOTOR DRIVEN
4.4		MASS	4.11		AIR MOTOR DRIVEN
4.5		FLOAT			
4.6		PISTON			
4.7		MEMBRANE			

PART NUMBER : 04

Date	Des.	Chk.	Appd.	A.C	Replace by Ident.no.:	
				*		R
				*		5
				*		4
				*		3
				*		2
				*		1
				*		0
031217	HAH KYI	SDC		*	Replace for Ident.no.:	
Licensor Ident.no.: 0000000-0.0		Type: ALL ENGINES			Ident.no.: A14-243828-8	
Info.no.: 000000		Description: Basic symbols for piping				
Page.no.: 02 OF 03						

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

NO.	SYMBOL	SYMBOL DESIGNATION	NO.	SYMBOL	SYMBOL DESIGNATION
5. APPLIANCES					
5.1		MUDBOX	5.9		HAND PUMP (BUCKET)
5.2		SIMPLEX STRAINER	5.10		EJECTOR
5.3		DUPLEX STRAINER	5.11		VARIOUS ACCESSORIES (TEXT TO BE ADDED)
5.4		MAGNETIC FILTER	5.12		PISTON PUMP
5.5		SEPARATOR			
5.6		STEAM TRAP			
5.7		CENTRIFUGAL PUMP			
5.8		GEAR-OR SCREW PUMP			
6. FITTINGS					
6.1		FUNNEL	6.9		DECK FITTINGS FOR SOUND'G OR FILLING PIPE
6.2		BELL-MOUTHED PIPE END	6.10		SHORT SOUNDING PIPE WITH SELF-CLOSING COCK
6.3		AIR PIPE	6.11		STOP FOR SOUNDING ROD
6.4		AIR PIPE WITH NET	6.12		OIL TRAY COAMING
6.5		AIR PIPE WITH COVER			
6.6		AIR PIPE WITH COVER AND NET			
6.7		AIR PIPE WITH PRESSURE- VACUUM VALVE			
6.8		AIR PIPE WITH PRESSURE- VACUUM VALVE			
7. READING INSTRUMENTS WITH ORDINARY SYMBOL DESIGNATIONS					
7.1		SIGHT FLOW INDICATOR	7.5		COUNTER (INDICATE FUNCTION)
7.2		OBSERVATION GLASS	7.6		RECORDER
7.3		LEVEL INDICATOR			
7.4		DISTANCE LEVEL INDICATOR			
					PART NUMBER : 05
Date	Des.	Chk.	Appd.	A.C	Replace by Ident.no.:
				*	
				*	
				*	
				*	
				*	
				*	
031217	HAH	PST	SDC	*	Replace for Ident.no.:
Licensor Ident.no.: 0000000-0.0		Type: ALL ENGINES		Ident.no.:	
Info.no.: 000000		Description: Basic symbols for piping		Ident.no.: A14-243828-8	
Page.no.: 03 OF 03					

Codes for identification of instruments and signal-related functions

PT

8108

AH

First letter

Ident.No.

Secondary letter(s)

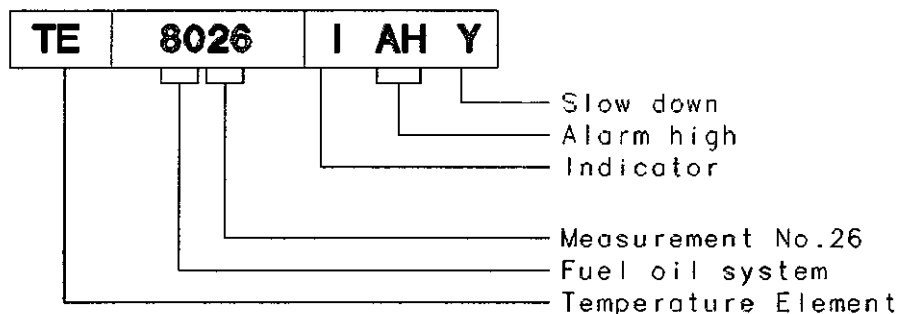
Measured or indicating variable (First letter(s))	Ident.number The first two digits indicate the point of measurement, the next two are serial numbers.	Function (Secondary letter(s))
DS: Density switch	11.Manoeuvring system	A: Alarm
DT: Density transmitter	12.Hydraulic power supply	C: Control
GT: Gauging transmitter (load/index transmitter)	14.Combustion pressure supervision	H: High
FT: Flow transmitter	20.ECS to/from safety system	I: Indication (remote)
FS: Flow switch	21.ECS to/from remote control system	L: Low
LS: Level switch	22.ECS to/from alarm system	R: Recording
LI: Level indication(local)	30.ECS Miscellaneous input/output values	S: Switching
LT: Level transmitter	40.Tacho/crankshaft pos.system	Y: Slow-down
PDI: Pressure difference indication(local)	41.Engine cylinder components	X: Unclassified function
PDS: Pressure difference switch	50.VOC:supply system	Z: Shut down
PDT: Pressure difference transmitter	51.VOC:sealing oil system	
PI: Pressure indication (local)	52.VOC:control oil system	
PS: Pressure switch	53.Other VOC related systems	
PT: Pressure transmitter	54.VOC engine related components	
ST: Speed transmitter	80.Fuel oil system	
TC: Thermo couple(NiCr-Ni)	81.Lubrication oil system	
TE: Temperature element (Pt-100)	82.Cylinder lub.oil system	
TI: Temperature indication (local)	83.Stuffing box drain system	
TS: Temperature switch	84.Cooling water system e.g.central cooling water e.g.sea cooling water e.g.jacket cooling water	
WS: Vibration switch	85.Compressed air supply system e.g.control air e.g.starting air	
WT: Vibration transmitter	86.Scavenge air	
VS: Viscosity switch	87.Exhaust gas system	
VT: Viscosity transmitter	88.Miscellaneous functions e.g.axial vibration	
ZV: Position valve (solenoid valve)	90.Project specific	
ZS: Position switch(limit switch)		
ZT: Position transmitter (e.g.proximity sensor)		
XC: Unclassified control	Note:	
XS: Unclassified switch	ECS:Engine control system	
XT: Unclassified transmitter	VOC:Volatile Organic Compound	

PART NUMBER : 05

Date	Des.	Chk.	Appd.	A.C	Replace by Ident.no.:	R
				*		5
				*		4
				*		3
				*		2
				*		1
031217	HAH	KYI	SDC	*	Replace for Ident.no.:	0
Licensor Ident.no.:		Type:				
Info.no.:		Description:				
Page.no.:		Identification codes				
3730071		ALL ENGINES				Ident.no.:
01 OF 02						A14-243829-0

The first link (first letter) indicates what is measured or the indicating variable. The second link is the Ident.No., in which the first two digits indicate the point of measurement or the indicating variable, followed by a serial number. The third link (secondary letter(s)) indicates the function of the measured value.

Example

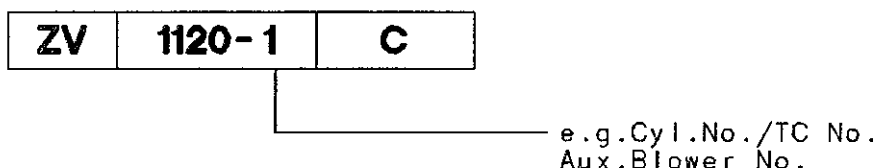


Repeated signals:

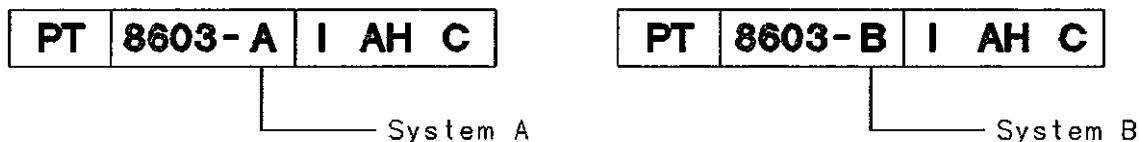
Signals which are repeated, such as per cylinder measurement or per turbocharger measurement, etc., are provided with a suffix number. The suffix number is identical with the place of measurement, such as 1 for cylinder 1, etc. Where signals are redundant, suffix A or B may be used.

Examples

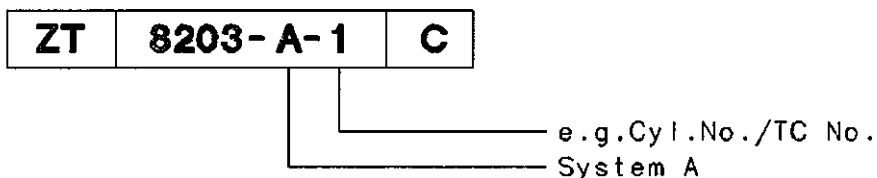
Cylinder or Turbocharger-Related Signals



Redundant Signals

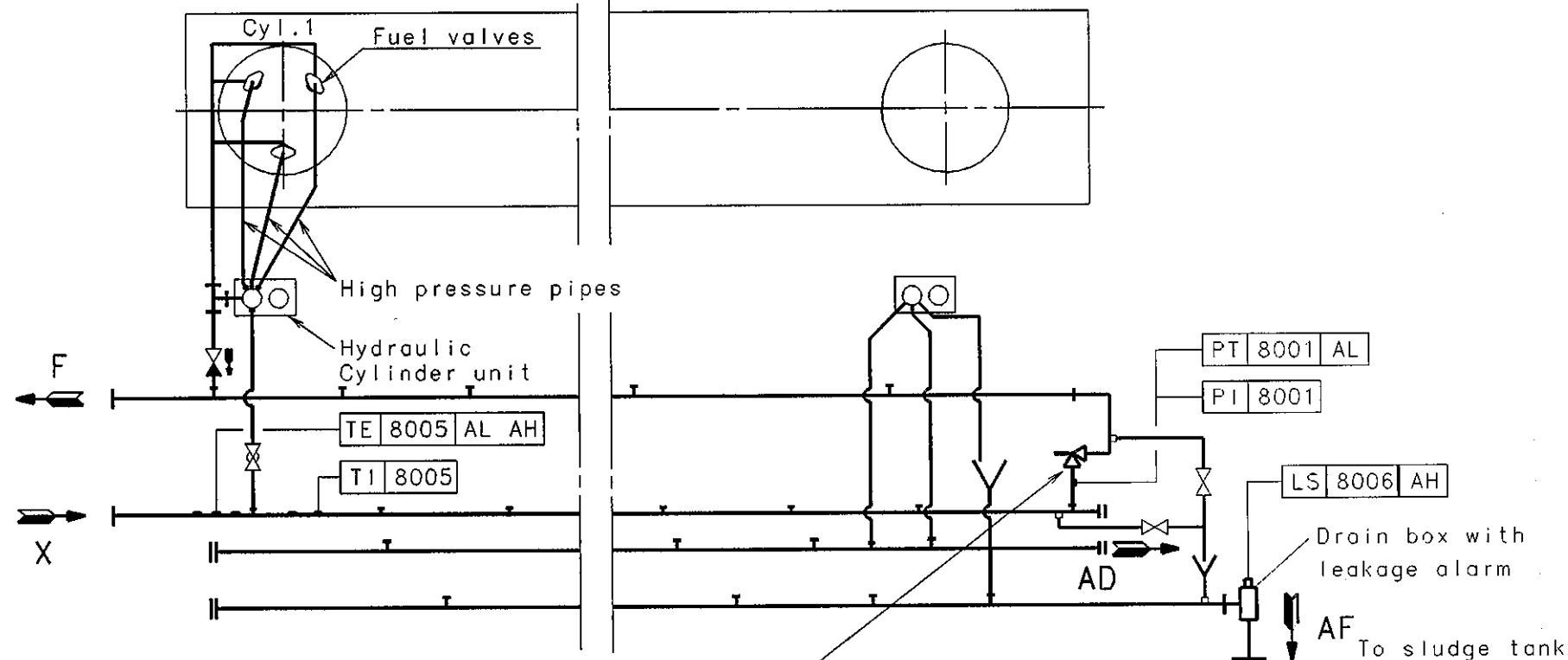


Cylinder-Related Redundant Signals



Graphical presentation in Pi-diagrams according to ISO 1219 1-11

						PART NUMBER : 05	
Date	Des.	Chk.	Appd.	A.C	Replace by Ident.no.:	R	
						5	
						4	
						3	
						2	
						1	
						0	
031217 IAH IKY I SDG * Replace for Ident.no.:						0	
Licence Ident.no.:				Type: ALL ENGINES			
Info.no.: 3730071				Description: Identification codes			
Page.no.: 02 OF 02				Ident.no.: A14-243829-0			



PART NUMBER : 06

NOTE

- THE COUNTER PRESSURE VALVE(BY-PASS V/V) IS TO BE ADJUSTED TO 7~8Kg/cm² AT 100% ENGINE LOAD.
- EVEN IF THE INLET PRESSURE IS OVER 8Kg/cm² AT A STOPPED ENGINE THE COUNTER PRESSURE VALVE SHOULD BE KEPT AT INITIAL SETTING.(I.G: DO NOT READJUST)

The letters refer to "Engine pipe connections"

Supplement Drawing no.:		Projection:	Mass (kg):	Material / Blank:		
		1264091-7.3	P82			
Licensor's Ident. no.:		Disl.:	Licensor's Material / Blank:			
060825KYIYSPBBS						
Date	Des.	Chk.	Appd.	A.C.E	Change / Replacement	C.No
				*	Replaced by Ident. No.:	9
				*		8
				*		7
				*		6
				*		5
				*		4
				*		3
				*		2
				*		1
				*		0
Similar Drawing No.: A13-243830-9.2					Replacement of Ident. No.:	
Scale:	Size:	Type:	Page No.:	HYUNDAI HEAVY INDUSTRIES CO., LTD.		
1:1	A3	S90ME-C	01 (01)			
Info. No.:		Description:		Ident. No.:		
372125		Fuel oil pipes and drains		A13-290821-8		

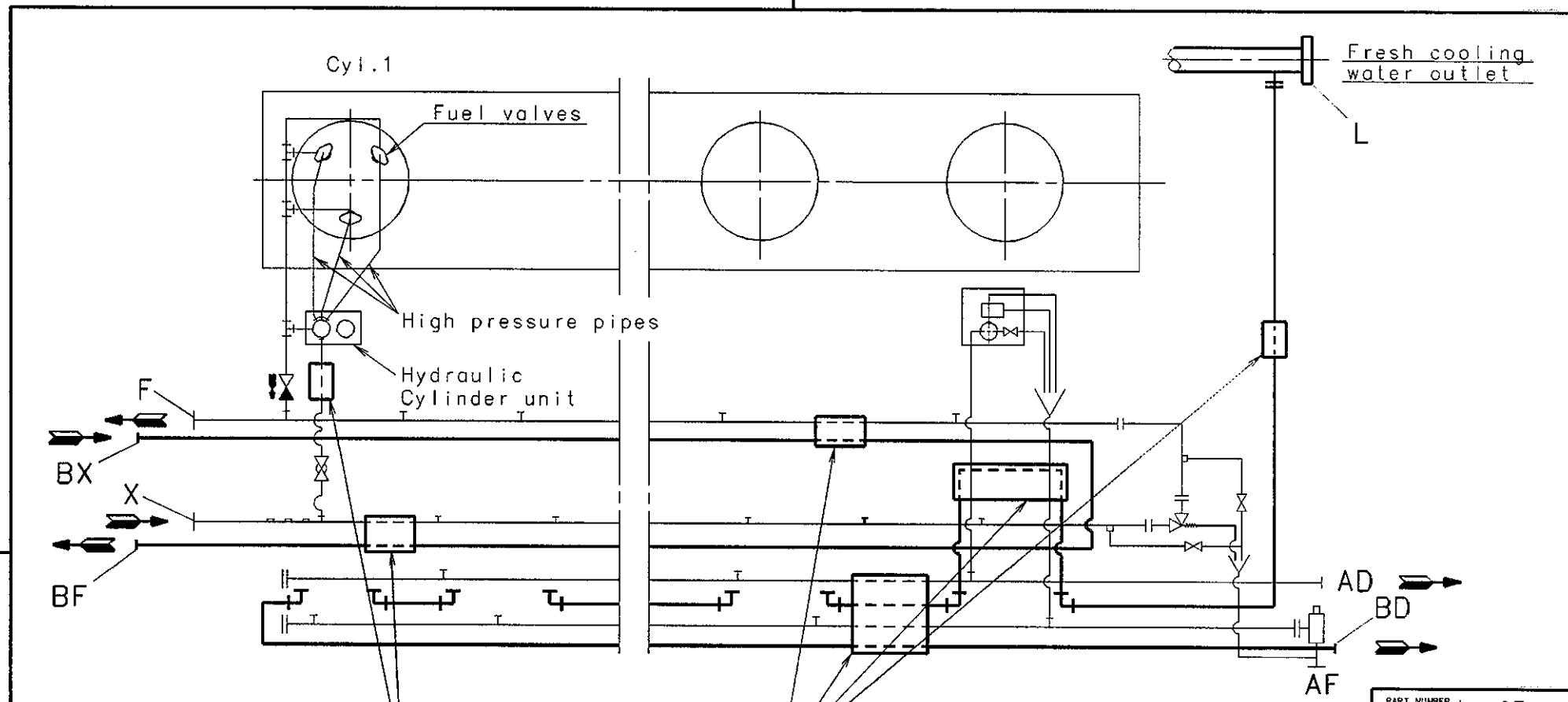
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Standard for surface roughness												
The basic symbols and class numbers are in accordance with ISO 15002-1978.												
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
R _a max. value μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50

Tolerances for dimensions without tolerance indication(ISO 2768-1989)					
This standard states the permissible deviations for dimensions without direct tolerance indications on metallic components manufactured by machines.					
Dim. measurement	0.5	over 0.5	over 30	over 120	over 315
Permissible deviations	±0.1	±0.2	±0.3	±0.5	±0.8

F



See drawing
"Fuel oil pipes insulation"

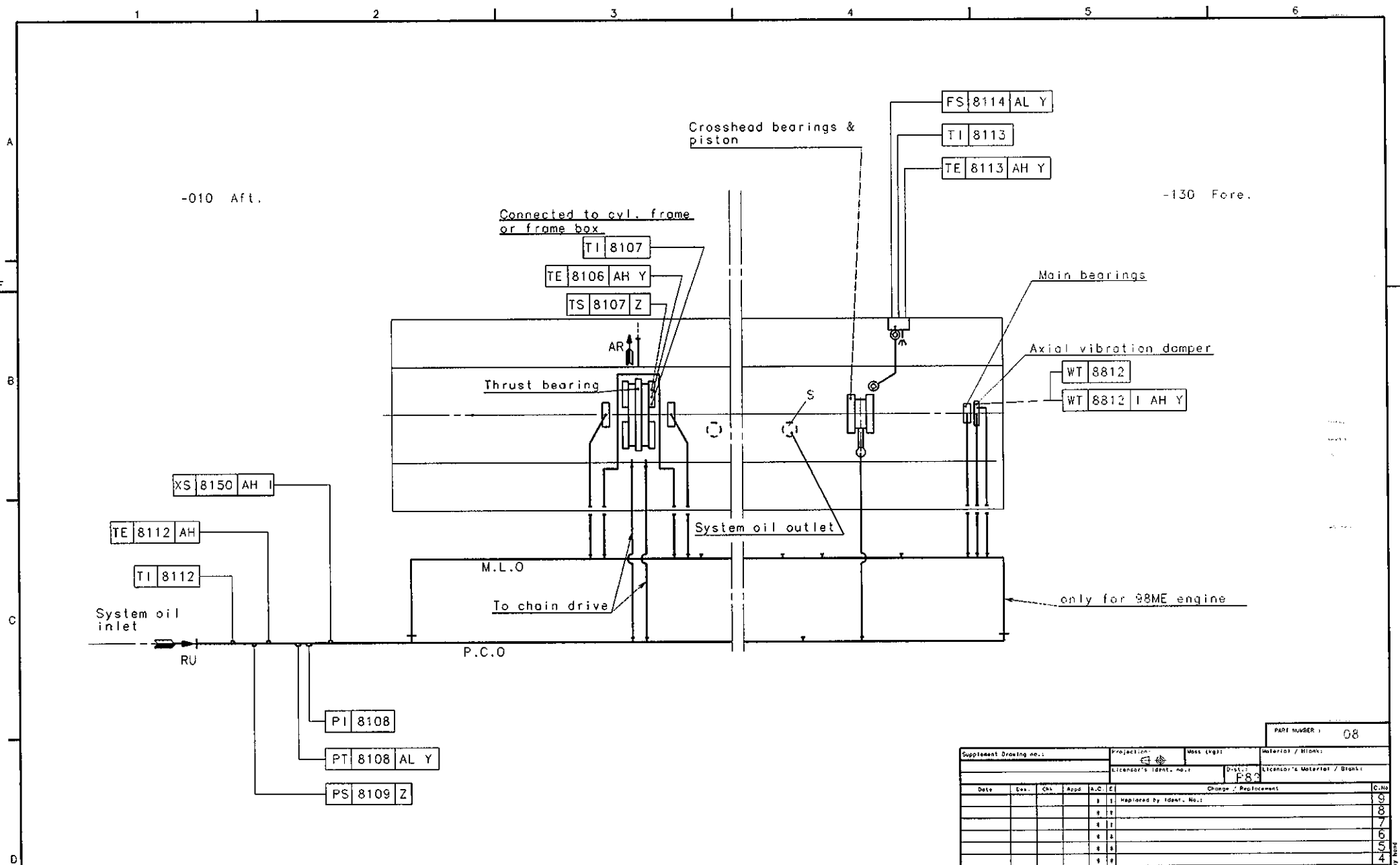
The letters refer to "Engine pipe connections"

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Standard for surface roughness													Tolerances for dimensions without tolerance indication (ISO 2768-1989)					
The basic symbols and class numbers are in accordance with ISO 1502-1978.													This standard states the permissible deviations for dimensions without direct tolerance indications on metallic components manufactured by machining.					
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	Permissible deviations	0.5	over 0.5	over 30	over 120	over 315
R _a max. value μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50	Medium series	±0.1	±0.2	±0.3	±0.5	±0.8

Supplement Drawing no.:		Projection:	Mass (kg):	Material / Blank:
		1211523-1.1	P82	Licensor's Material / Blank:
Date	Des.	Chk.	Appd.	A.C. E
				* * Replaced by Ident. No.:
				* * 9
				* * 8
				* * 7
				* * 6
				* * 5
				* * 4
				* * 3
				* * 2
				* * 1
				* * 0
0910160YSSMSLGH		* * MOD.		
060825KYIYSBPBS		* * MOD.		
Similar Drawing No.:		A13-243831-0.1		Replacement of Ident. No.:
Scale:	1:1	Size:	A3	Type:
Info. No.:	399176	Description:	S90ME-C	
		Page No.:		01 (01)
		Ident. No.:		A13-290822-0

CAD Drawing - do not correct by hand

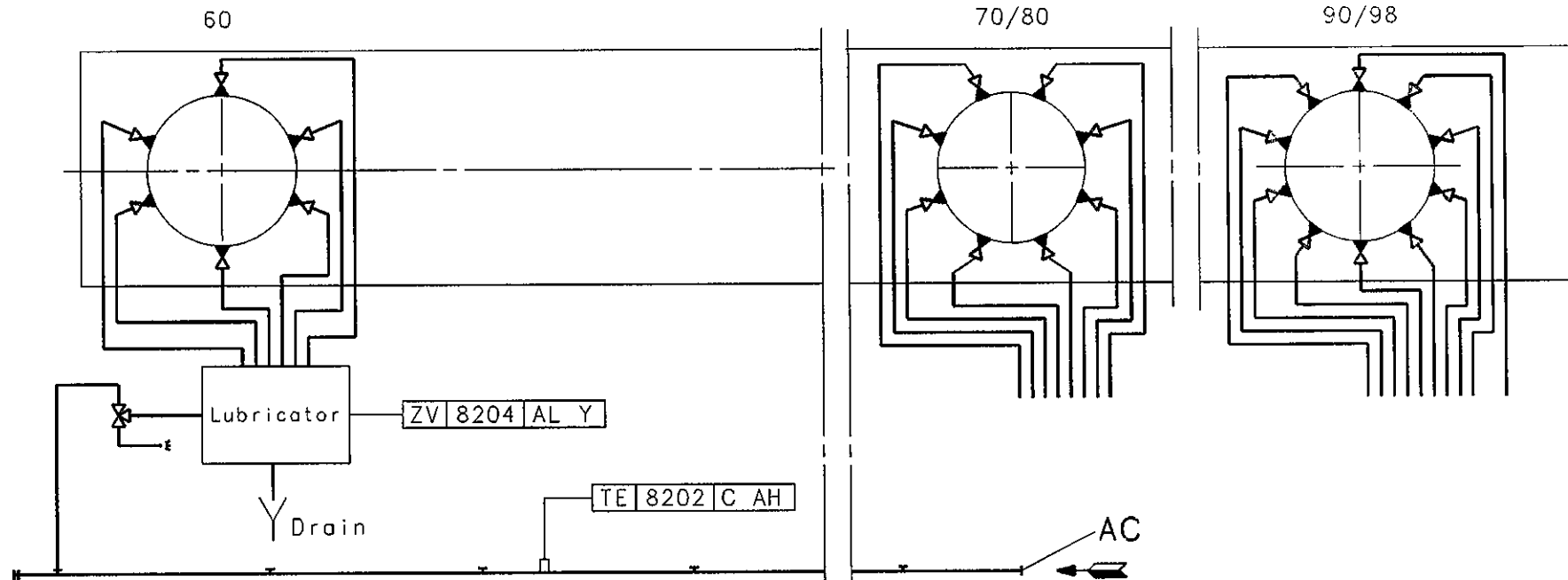


The letters refer to "Engine pipe connections"

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Standard for surface finishness												
Class No.	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12
Surface finishness	0,025	0,05	0,1	0,2	0,4	0,8	1,6	3,2	6,3	12,5	25	50
Mean series												

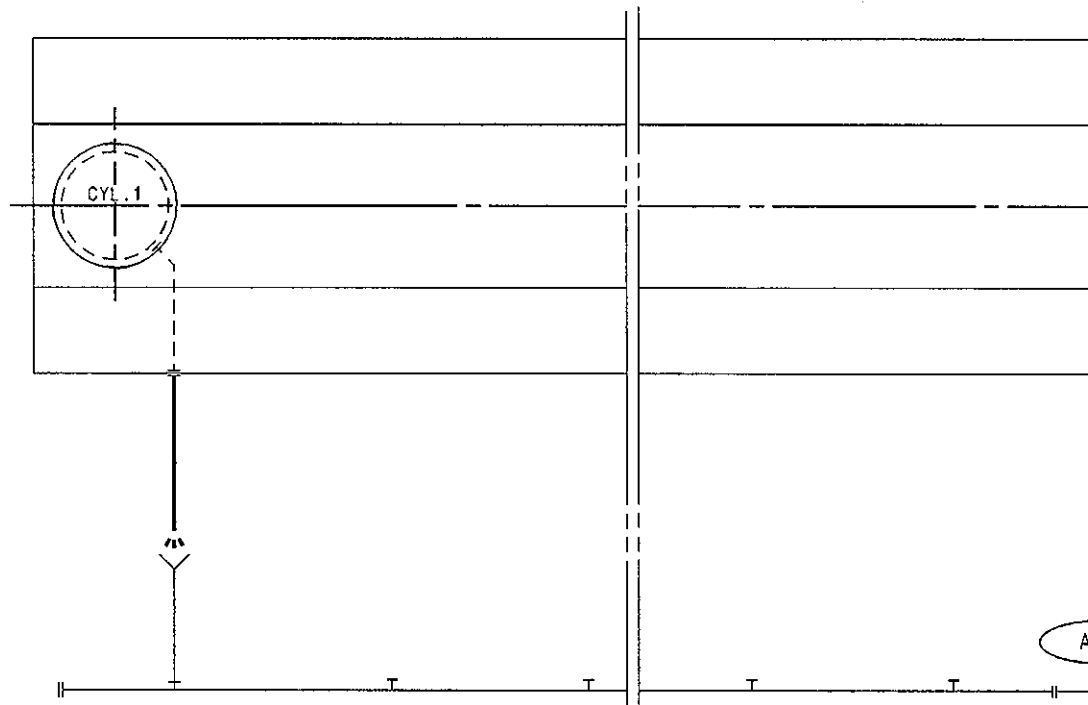
Supplement Drawing no.:		Projection:		Mass (kg):		Material / Blank:	
Licensor's Ident. No.:		Dist.:		Licensor's Material / Blank:		PART NUMBER: 08	
Date:		Ex.	Ch.	App.	A.C.	E	C.No.
Replicated by Ident. No.:							9
							8
							7
							6
							5
							4
							3
							2
							1
							0
101021 LHYOYSLGH							
Similar Drawing No.: A12-331118-2.0				Replacement of Ident. No.:			
Scale:	Size:	Type:	Page No.:		Ident. No.:		
1:1	A2	ME	01 (01)		A12-389344-3		
Info No.:				Description:			
373080				Lub. & cooling oil pipe			



PART NUMBER : 10

The letters refer to "Engine pipe connections"

Supplement Drawing no.:		Projection:	Mass (kg):	Material / Blank:
		1215090-1.0	P82	Licenser's Material / Blank:
Date	Des.	Chk.	Appd.	A.C. E
				* * Replaced by Ident. No.:
				* * 9
				* * 8
				* * 7
				* * 6
				* * 5
				* * 4
				* * 3
				* * 2
				* * 1
				* * 0
041006HAIYSBSCD		* * CORRECTED		
040701YSBSCDCLWS		* * Acc.to B&W mod.		
031216HAHKYISDC		* *		
Similar Drawing No.:		Replacement of Ident. No.:		
Scale:	Size:	Type:	Page No.:	HYUNDAI HEAVY INDUSTRIES CO., LTD.
1:1	A3		01 (01)	
Info. No.:		Description:		Ident. No.:
373270		Cyl.lub.oil pipes		A13-243834-6



AEG

STUFFING BOX DRAIN + BEDPLATE DRAIN

PART NUMBER : 11

Supplement Drawing no.:						Projection:		Mass (kg):		Material / Blank:		
						Licensor's Ident. no.:		Dist.:		Licensor's Material / Blank:		
Date	Des.	Chk.	Appd.	A.C.	E	Change / Replacement					C.No	
					*	Replaced by Ident. No.:					9	
					*						8	
					*						7	
					*						6	
					*						5	
					*						4	
					*						3	
					*						2	
					*						1	
					*						0	
110426HHSOYS LGH						*	CORRECTED					
071004HAIYSBPBS						*	CORRECTED					
060112HAIYSBPBS						*						
Similar Drawing No.:						Replacement of Ident. No.:						
Scale:		Size:		Type:		Page No.:		HYUNDAI				
1:1		A3		L/S/K-MC/E		01 (01)		HEAVY INDUSTRIES CO., LTD.				
Info. No.:		Description:		Ident. No.:								
000000		STUFFING BOX DRAIN PIPES		A13-281997-2								

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Standard for surface roughness

The basic symbols and class numbers are in accordance with ISO 1302-1978.

Tolerances for dimensions without tolerance indication (ISO 2768-1989)

This standard states the permissible deviations for dimensions without direct tolerance indications on metallic components manufactured by machining.

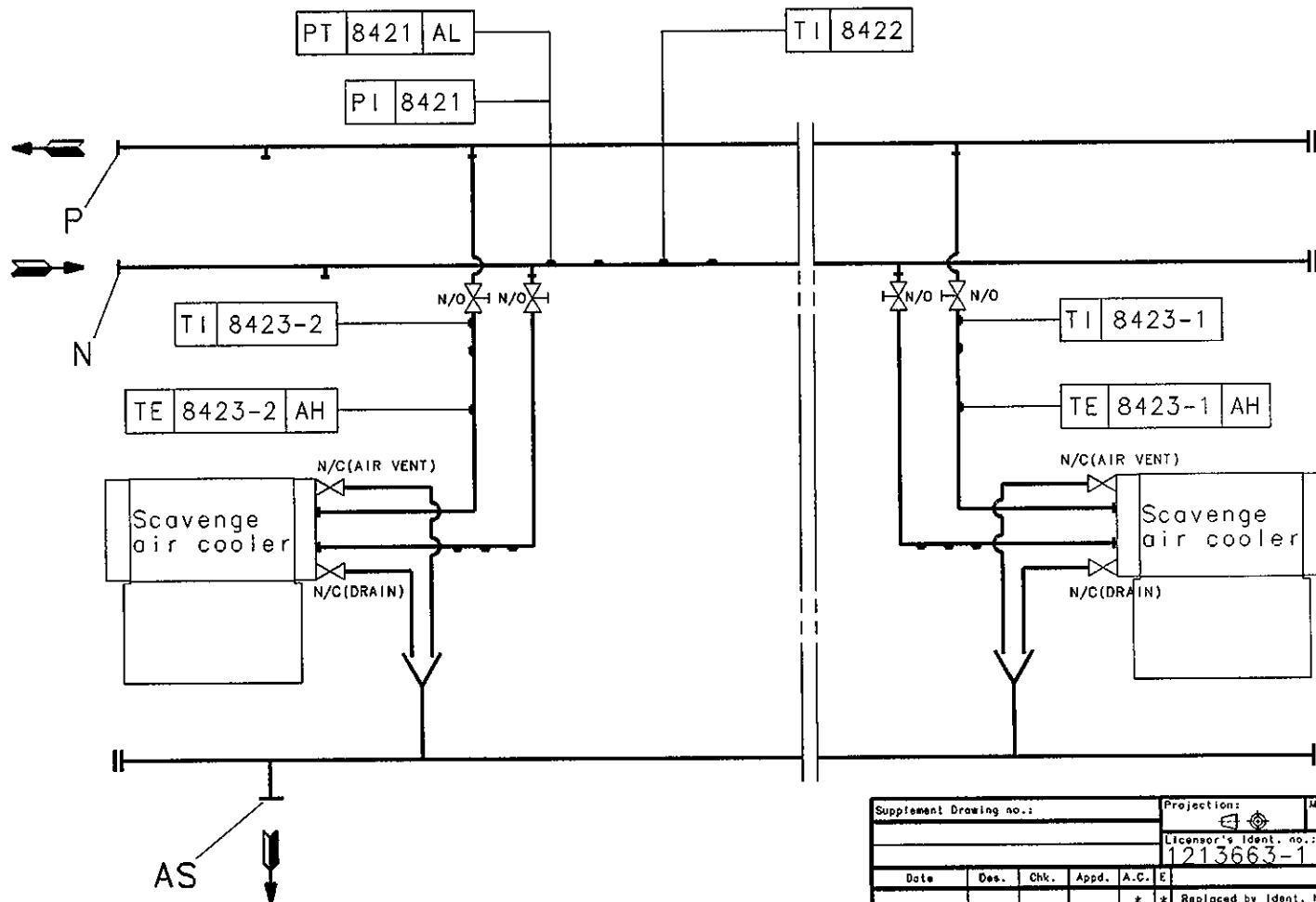
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	Permissible deviations
R _a max. value μm	0,025	0,05	0,1	0,2	0,4	0,8	1,6	3,2	6,3	12,5	25	50	Medium series

HSEF-k210-012(R1)

현대중공업 (주) 엔진사업본부

A3 (420mmx297mm) 1:1

CAU Drawing - do not correct by hand



The letters refer to "Engine pipe connections"

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Standard for surface roughness
The basic symbols and class numbers are in accordance with ISO 1302-1978.

Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
R_a max. value μm	0,025	0,05	0,1	0,2	0,4	0,8	1,6	3,2	6,3	12,5	25	50

Tolerances for dimensions without tolerance indication(ISO 2768-1989)
This standard states the permissible deviations for dimensions without direct tolerance indications on metallic components manufactured by machining.

Dim. measurement	0,5	over 0,5	over 30	over 120	over 315	over 1000
Permissible deviations	up to 6	up to 30	up to 120	up to 315	up to 1000	up to 2000
Medium series	$\pm 0,1$	$\pm 0,2$	$\pm 0,3$	$\pm 0,5$	$\pm 0,8$	$\pm 1,2$

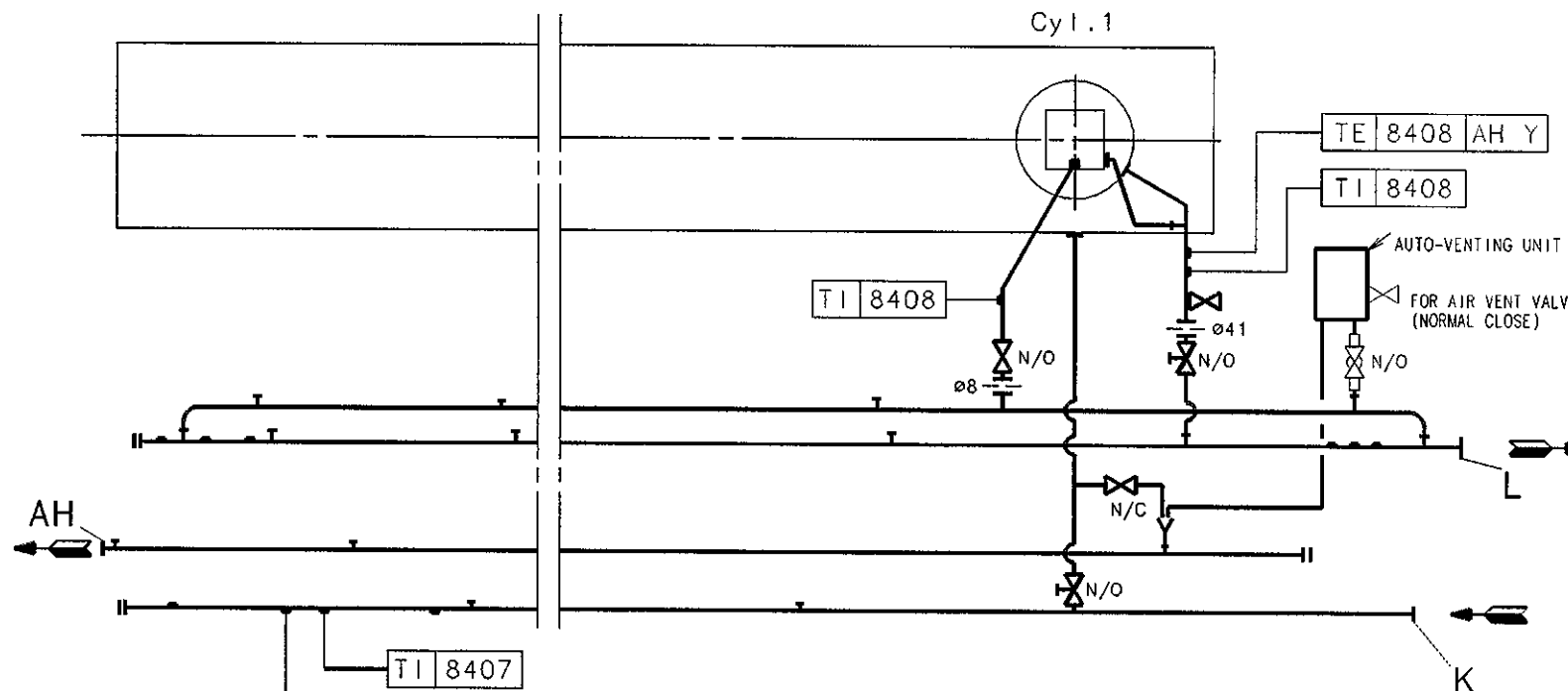
Supplement Drawing no.:						Projection:		Mass (kg):		Material / Blank:	
						Licensor's Ident. no.:		Dist.:		Licensor's Material / Blank:	
						1213663-1.0		P82			
Date	Des.	Chk.	Appd.	A.C.	E	Change / Replacement					
				*	*	Replaced by Ident. No.:					
				*	*						
				*	*						
				*	*						
				*	*						
				*	*						
				*	*						
				*	*						
				*	*						
1104250YSKJYLGH						* * ADD.NOTE					
0912110YSSMSLGH						* * MOV.BUTTERFLY V/V					
031216HAHKYISDC						* *					
Similar Drawing No.:						Replacement of Ident. No.:					
Scale:						Size:		Type:		Page No.:	
1:1						A3		ME/ME-C		01 (01)	
Info. No.:						Description:					
375440						Cool.w.pipe-air cooler					
						Ident. No.:					
						A13-243836-0					

HSEF-k210-012(R1)

현대중공업(주) 엔진사업본부

A3(420mmx297mm) 1:1

CAD Drawing - do not correct by hand



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Standard for surface roughness

The basic symbols and class numbers are in accordance with ISO 1302-1978.

Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
R _a max. value in μ m	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50

Tolerances for dimensions without tolerance indication (ISO 2768-1989)

This standard states the permissible deviations for dimensions without direct tolerance indications on metallic components manufactured by machining.

Permissible deviations	0.3	over 0.3	over 30	over 120	over 315	over 1000	over 2000
Medium series	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±1.6

Supplement Drawing no.: 110329OYSKJYLGH						Projection:		Mass (kg):		Material / Blank:	
Licensor's Ident. no.: 1213668-0.0						Dist.: P82		Licensor's Material / Blank:			
Date	Des.	Chk.	Appd.	A.C.	E	Change / Replacement					C.No
				*	*	Replaced by Ident. No.:					9
				*	*						8
				*	*						7
				*	*						6
				*	*						5
				*	*						4
				*	*						3
				*	*						2
				*	*						1
				*	*						0
Similar Drawing No.: A13-359131-5.1						Replacement of Ident. No.:					
Scale: 1:1		Size: A3		Type: S90ME-C		Page No.: 01 (01)					
Info. No.: 375063		Description: FW cooling pipes WITH AUTO VENT'G V/V		Ident. No.: A13-408673-8							

HSEF-k210-012(R1)

현대중공업 (주) 엔진사업본부

A3(420mmx297mm) 2/2

do not correct by hand

A3(420mm×297mm)포맷상지[illegible]

MAN B&W turbocharger

Scavenge
air cooler

PT 8601-B C

PT 8601 I

PT 8601-A C

TI 8605

TI 8605

Auxiliary blower

TE 8609 AH

TI 8608

TI 8609

TI 8608

Scavenge air receiver

Cyl. 1

SOOT BLOWER SEAL INR AIR
25A

(ES)

PART NUMBER : 15

Supplement Drawing no.:						Projection:		Mass (kg):		Material / Blank:		
						Licensor's Ident. no.:		Dist.:		Licensor's Material / Blank:		
						1211525-5.2		P82				
Date	Des.	Chk.	Appd.	A.C.	E	Change / Replacement					C.No	
					*	Replaced by Ident. No.:					9	
					*						8	
					*						7	
					*						6	
					*						5	
					*						4	
					*						3	
					*						2	
					*						1	
					*	ADD.CONN.POINT "ES"					0	
0910220YSSMSLGH												
0904230YSSMSLGH												
Similar Drawing No.:						A13-243840-4.0						Replacement of Ident. No.:
Scale:						Size:						Page No.:
1:1						A3						01 (01)
Info. No.:						Description:						Ident. No.:
356025						Scavenge air pipes						A13-359132-7

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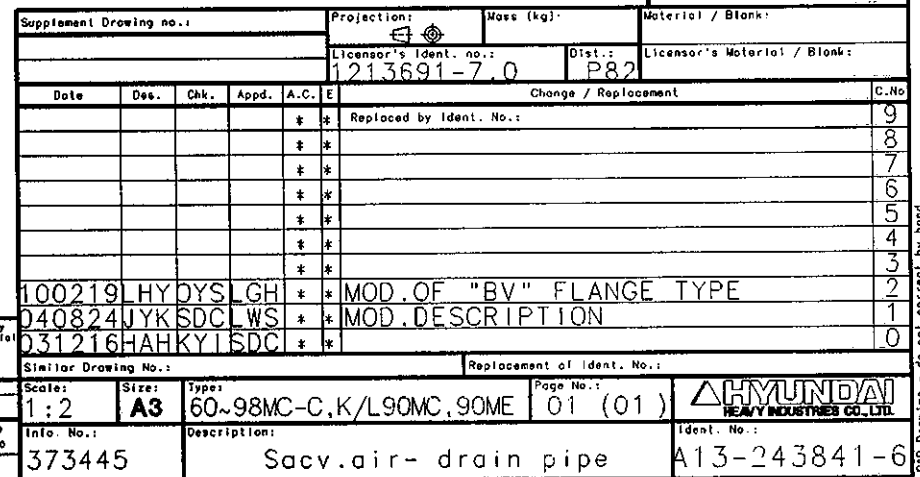
Standard for surface roughness

The basic symbols and class numbers are in accordance with ISO 1302-1978.

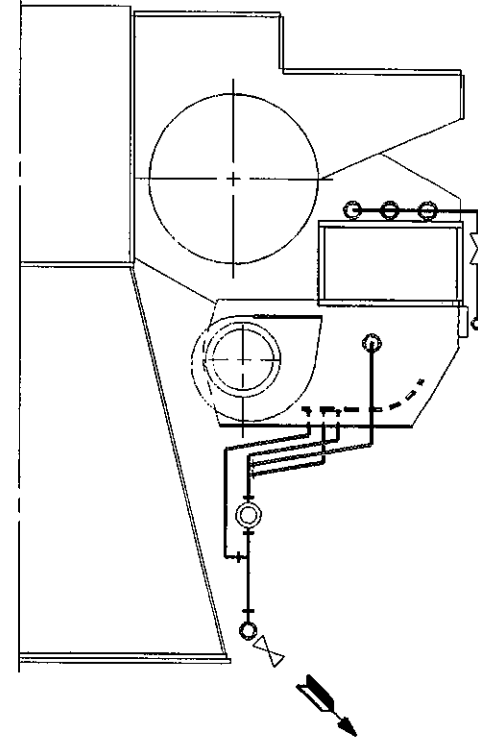
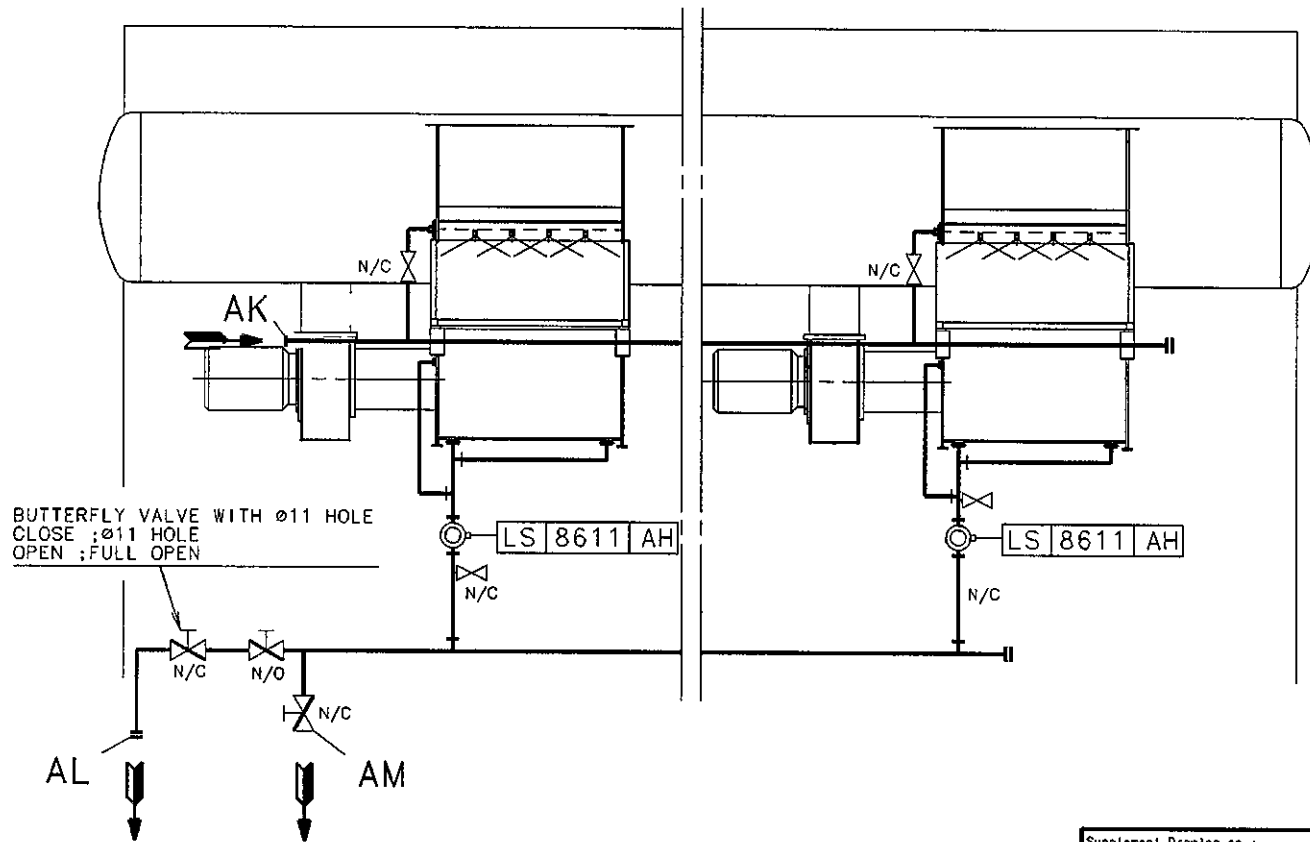
Tolerances for dimensions without tolerance indication (ISO 2768-1989)

This standard states the permissible deviations for dimensions without direct tolerance indications on metallic components manufactured by machining.

Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	Permissible deviations	0.5	over 6	over 30	over 120	over 315	over 1000
R _a max. value μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50	Medium series	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2



HSEF-k210-012(R1) 현대중공업(주) 엔진사업본부 A3(420mm×297mm) 3점식



PART NUMBER : 17

The letters refer to "Engine pipe connections"

Supplement Drawing no.:						Projection:		Mass (kg):		Material / Blank:		
						Licensor's Ident. no.:		Dist.:		Licensor's Material / Blank:		
						1213724-3.0		P82				
Date	Des.	Chk.	Appd.	A.C.	E	Change / Replacement					C.No	
					*	Replaced by ident. No.:					9	
					*						8	
					*						7	
					*						6	
					*						5	
					*						4	
					*						3	
					*						2	
					*						1	
					*						0	
1108300YSKJYLGH						ORIFICE SIZE						
060825KYIYSBPBS												
Similar Drawing No.:						Replacement of Ident. No.:						
A13-264336-6.0												
Scale:		Size:		Type:		Page No.:		HYUNDAI		REAR INDUSTRIES CO., LTD.		
1:1		A3		S90ME-C		01 (01)						
Info. No.:		Description:		Ident. No.:								
375313		Air-cool. clean. pipes		A13-290825-5								

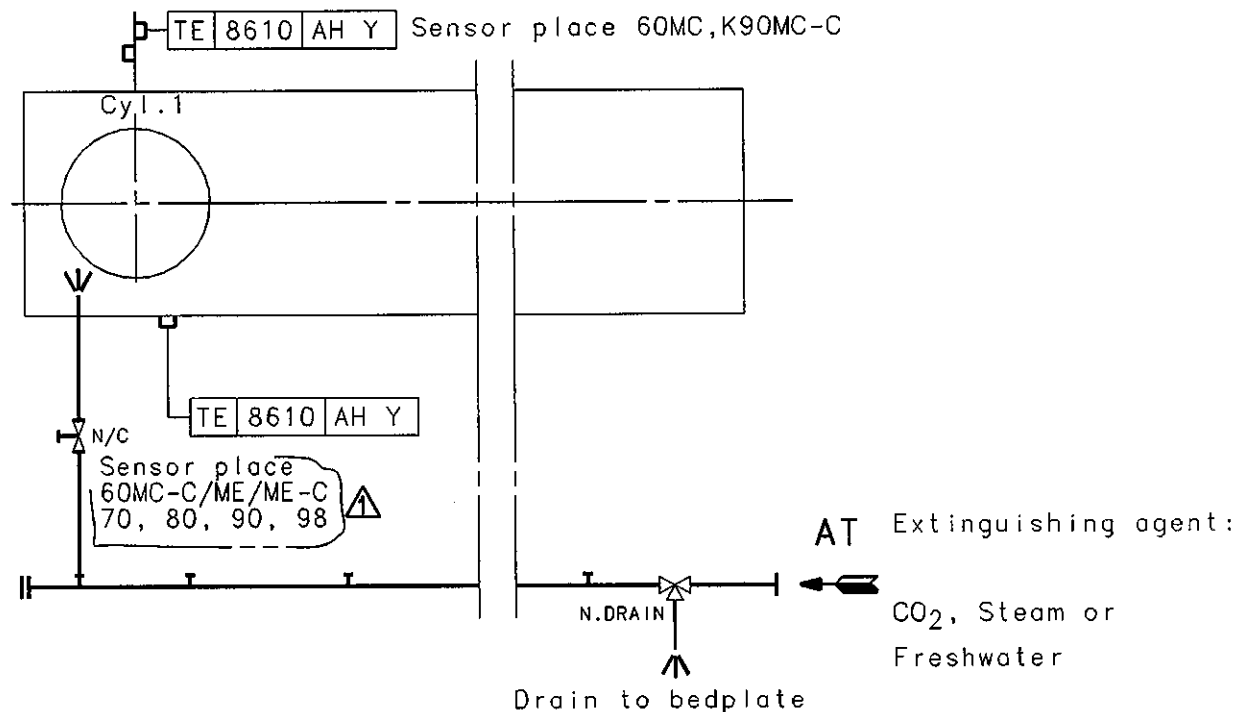
HSEF-k210-012(R1)

현대중공업(주) 엔진사업본부

A3(420mm×297mm)표준형

do not correct by hand

F



PART NUMBER : 18

Supplement Drawing no.:						Projection:		Mass (kg):		Material / Blank:		
						Licensor's Ident. no.:		Dist.:		Licensor's Material / Blank:		
						1264081-0.3		P82				
Date	Des.	Chk.	Appd.	A.C.	E	Change / Replacement					C.No	
					*	Replaced by Ident. No.:					9	
					*						8	
					*						7	
					*						6	
					*						5	
					*						4	
					*						3	
					*						2	
					*						1	
					*						0	
1108180YSKJYLGH						MOD.ENG.TYPE						
031216HAHKY1SDC												
Similar Drawing No.:						Replacement of Ident. No.:						
Scale:		Size:		Type:		Page No.:		HYUNDAI				
1:1		A3				01 (01)		HEAVY INDUSTRIES CO., LTD.				
Info. No.:		Description:		Ident. No.:								
399006		Fire exting. in scov. box		A13-243843-0								

The letters refer to "Engine pipe connections"

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Standard for surface roughness												
The basic symbols and class numbers are in accordance with ISO 1302-1978.												
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
R _a max. value μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50

Tolerances for dimensions without tolerance indication (ISO 2768-1989)						
This standard states the permissible deviations for dimensions without direct tolerance indications on metallic components manufactured by machining.						
Permissible deviations	0.5	over 0.5	over 30	over 120	over 315	over 1000
Medium series	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2

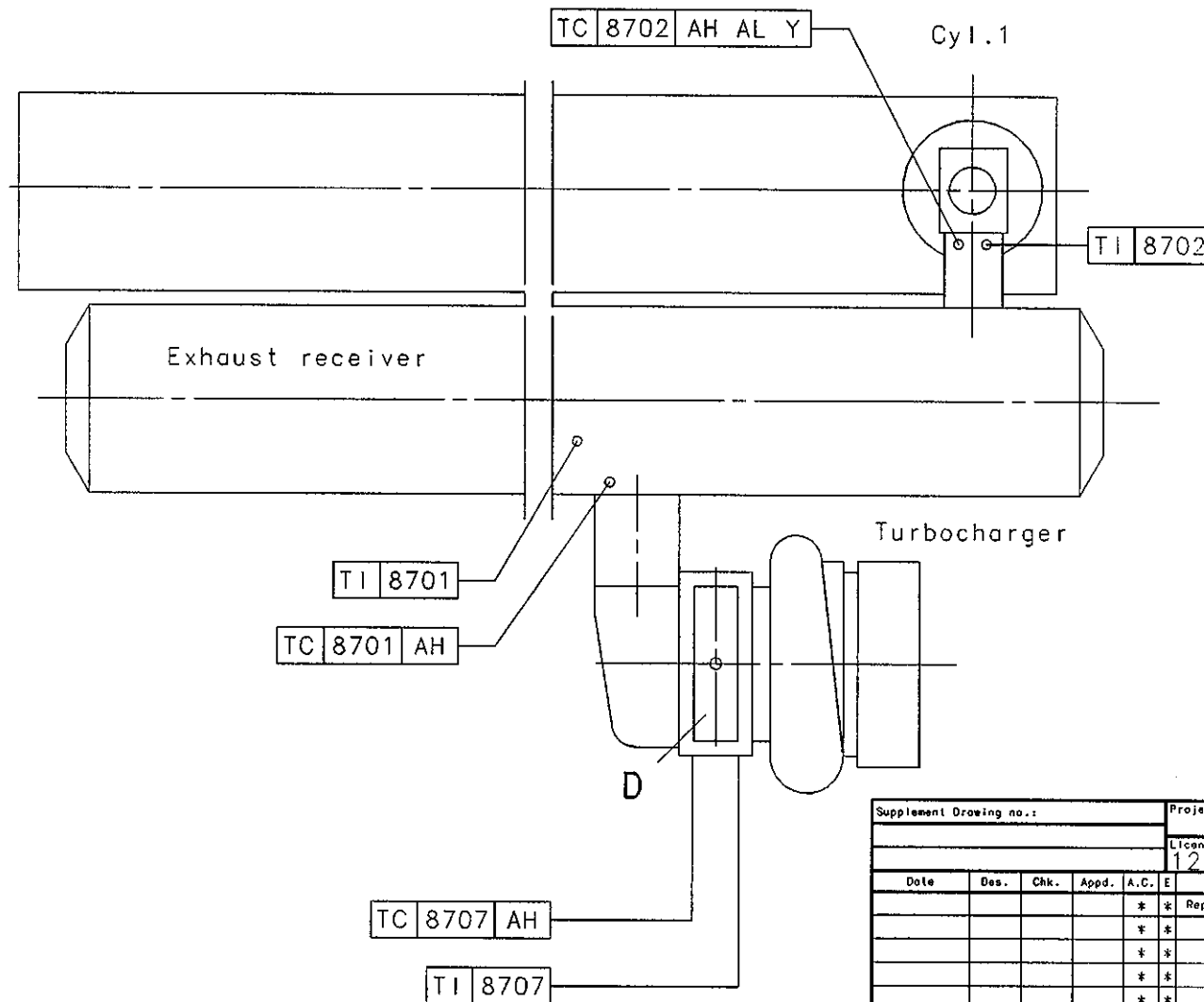
HSEF-k210-012(R1)

현대중공업(주) 엔진사업본부

A3(420mm×297mm) 3/32

CAD Drawing - do not correct by hand

F



The letters refer to "Engine pipe connections"

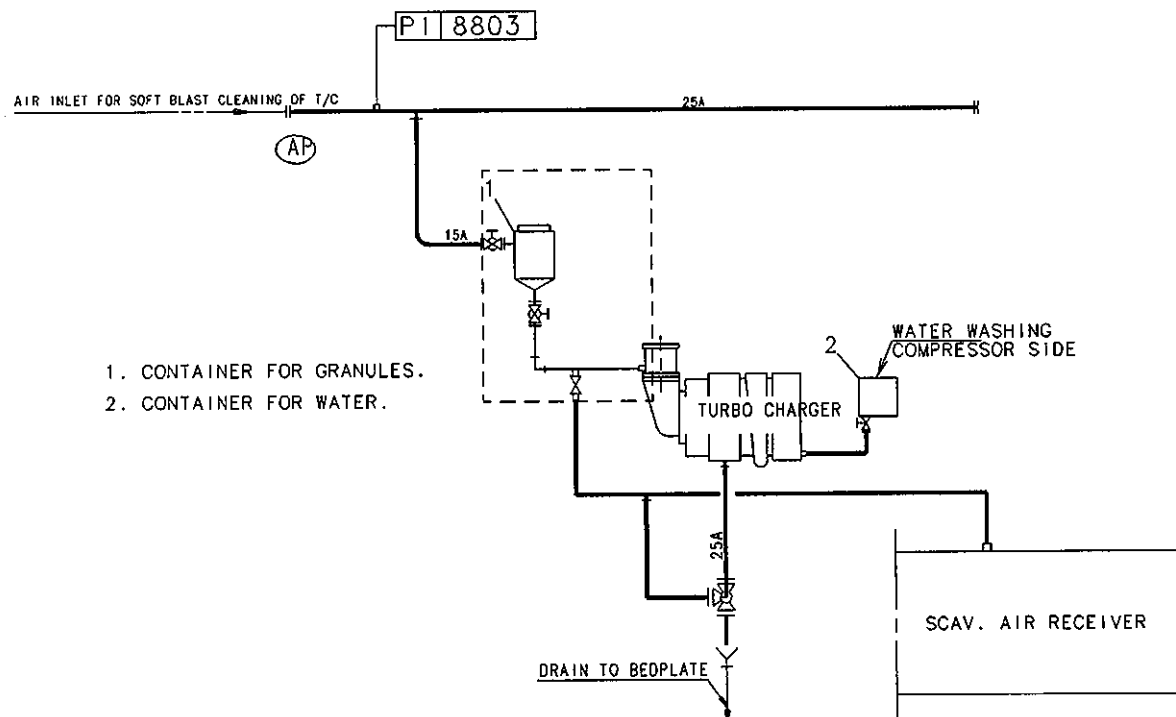
Supplement Drawing no.:						Projection:		Mass (kg):		Material / Blank:		
						Licensor's Ident. no.:		Dist.:		Licensor's Material / Blank:		
						1211527-9.1		P82				
Date	Des.	Chk.	Appd.	A.C.	E	Change / Replacement					C.No	
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					*						7	
					*						6	
					*						5	
					*						4	
					*						3	
					*						2	
					*						1	
					*						0	
031216HAHKYISDC												
Similar Drawing No.:						Replacement of Ident. No.:						
Scale:						Size:		Type:		Page No.:		
1:1						A3				01 (01)		
Info. No.:						Description:						Ident. No.:
357144						Exhaust gas pipes						A13-243844-1

HSEF-k210-012(R1)

현대중공업 (주) 엔진사업본부

A3(420mmx297mm) 80g

F



PART NUMBER : 20

Supplement Drawing no.:					Projection:		Mass (kg):	Material / Blank:	
					Licensor's Ident. no.:		Dist.:	Licensor's Material / Blank:	
					P82				
Date	Des.	Chk.	Appd.	A.C.	E	Change / Replacement			C.No
				*	*	Replaced by Ident. No.:			9
				*	*				8
				*	*				7
				*	*				6
				*	*				5
				*	*				4
				*	*				3
				*	*				2
				*	*				1
				*	*				0

100917JYKJYKLGH

Similar Drawing No.: A13-284064-0 Replacement of Ident. No.:

Scale: 1:1 Size: A3 Type: MET T/C Page No.: 01 (01)

Info. No.: 375325 Description: TC CLEANING PIPES(DRY)

Ident. No.: A13-388825-3

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Standard for surface roughness

The basic symbols and class numbers are in accordance with ISO 1302-1976.

Tolerances for dimensions without tolerance indication (ISO 2768-1989)

This standard states the permissible deviations for dimensions without direct tolerance indications on metallic components manufactured by machining.

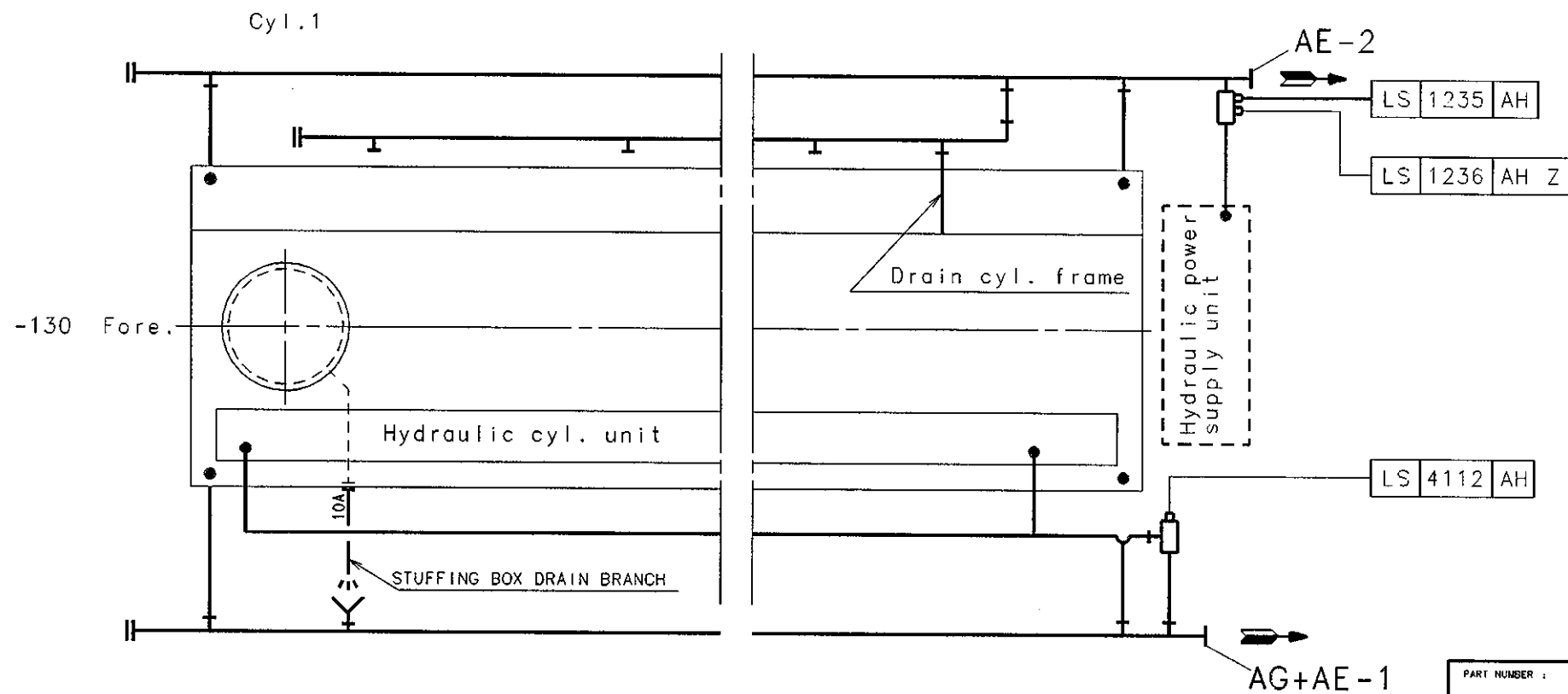
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
R _a max. value μm	0,025	0,05	0,1	0,2	0,4	0,8	1,6	3,2	6,3	12,5	25	50
Permissible deviations	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Medium series	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±1,6	±2,5	±4	±6,3	±10	±16

HSEF-k210-012(R1)

본(대)공(주) 원(전)사(업)본(부)

A3(420mm×297mm) 1/4

30 Drawing - do not correct by hand



The letters refer to "Engine pipe connections"

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Standard for surface roughness

The basic symbols and class numbers are in accordance with ISO 1302-1978.

Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
R _a max. value μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50

Tolerances for dimensions without tolerance indication (ISO 2768-1989)

This standard states the permissible deviations for dimensions without direct tolerance indications on metallic components manufactured by machining.

Non-measurement	0.6	over 0.6	over 30	over 120	over 315	over 1000
Permissible deviation	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2

Supplement Drawing no. 1		Projection: 1:1		Mass (kg): 0.1		Material / Blank: 1211535-1.2	
Licensor's Ident. no.: 1211535-1.2		Dist.: P82		Licensor's Material / Blank:			
Date	Des.	Chk.	Appd.	A.C.	E	Change / Replacement	C.No.
				*	*	Replaced by Ident. No.:	9
				*	*		8
				*	*		7
				*	*		6
				*	*		5
				*	*		4
				*	*		3
				*	*		2
				*	*		1
				*	*		0
Similar Drawing No.: A13-289677-7.1						Replacement of Ident. No.:	
Scale: 1:1		Size: A3		Type:		Page No.: 01 (01)	
Info. No.: 373280		Description: Bedplate drain pipes		Ident. No.: A13-304810-2			

Pressure drop, exhaust receiver
& Scavenging manifold

PI 8706

ø10 SUS PIPE

EXHAUST RECEIVER

SCAVENGING MANIFOLD

CYL. I

Pressure drop
air cooler (W.C)

TURBO-CHARGER

U

Pressure drop intake
air silencer (W.C)

AIR COOLER

PD I 8606

PART NUMBER : 22

Supplement Drawing no.:						Projection:	Mass (kg):	Material / Blank:
						Licensor's Ident. no.:	Dist.:	Licensor's Material / Blank:
						P82		
Date	Des.	Chk.	Appd.	A.C.	E	Change / Replacement		C.No
				*	*	Replaced by Ident. No.:		9
				*	*			8
				*	*			7
				*	*			6
				*	*			5
				*	*			4
				*	*			3
				*	*			2
				*	*			1
				*	*			0
110309OYSJYKLGH						MOD.		
050119JYKPSIPI						ADDED V/V		
031216HAHKYISDC								
Similar Drawing No.:						Replacement of Ident. No.:		
A13-106689-1.2								

Scale:	Size:	Type:	Page No.:	Ident. No.:
1:1	A3	ME	01 (01)	
Info. No.:	Description:			
356025	U-Tube manometer pipes	A13-243847-7		

HSEF-k210-012(R1) HEMUNDAI HEAVY INDUSTRIES CO., LTD. A3(420mmx297mm) 3/24

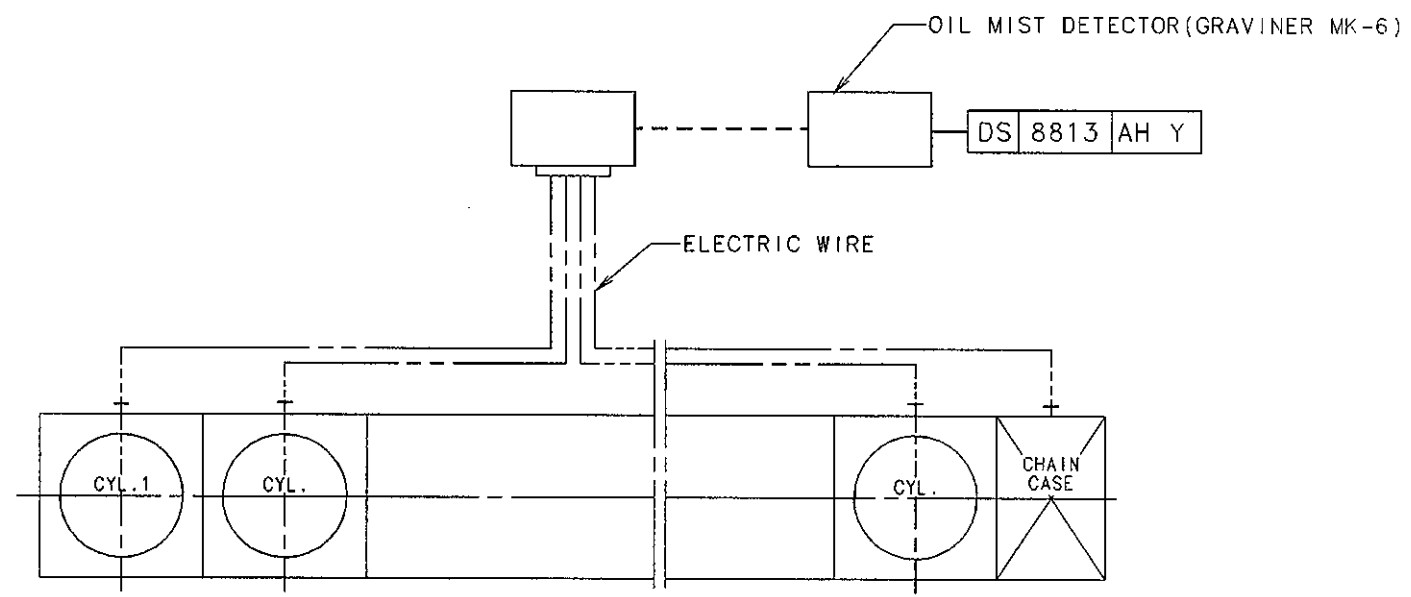
Standard for surface roughness												Tolerances for dimensions without tolerance indication (ISO 2768-1989)					
The basic symbols and class numbers are in accordance with ISO 1302-1978.												This standard states the permissible deviations for dimensions without direct tolerance indications on metallic components manufactured by machining.					
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	Permissible deviations	0.5	0.8	1.2	2.0
R _a max. value μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50	Medium series	±0.1	±0.2	±0.3	±0.5

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COP Drawing - do not correct by hand

F



PART NUMBER : 27

Supplement Drawing no.:					Projection:		Mass (kg):		Material / Blank:			
					Licensor's Ident. no.:		Dist.:		Licensor's Material / Blank:			
					P82							
Date	Des.	Chk.	Appd.	A.C.	E	Change / Replacement					C.No	
						*	*	Replaced by Ident. No.:			9	
						*	*				8	
						*	*				7	
						*	*				6	
						*	*				5	
						*	*				4	
						*	*				3	
						*	*				2	
						*	*				1	
110130LHYLGHKBY					*	*	GRAVINER MARK-6			0		
Similar Drawing No.:					Replacement of Ident. No.:							
Scale: 1:1					Size: A3		Type: L/S/K-MC/E		Page No.: 01 (01)			
Info. No.: 335303					Description: OIL MIST DETECTOR PIPES					Ident. No.: A13-396420-1		

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Standard for surface roughness												
The basic symbols and class numbers are in accordance with ISO 1302-1978.												
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
R _a max. value μ m	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50

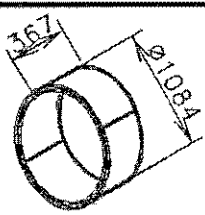
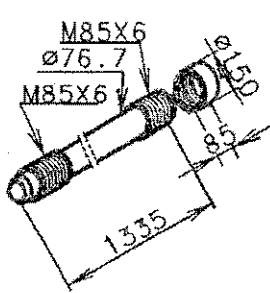
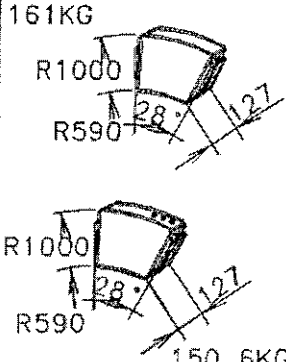
Tolerances for dimensions without tolerance indication (ISO 2768-1989)												
This standard states the permissible deviations for dimensions without direct tolerance indications on metallic components manufactured by machining.												
Permissible deviations	0.5		over 8		over 30		over 120		over 315		over 1000	
	up to 6		up to 50		up to 120		up to 315		up to 1000		up to 2000	
Medium series	±0.1		±0.2		±0.3		±0.5		±0.8		±1.2	

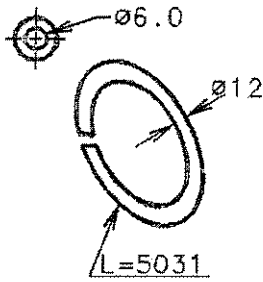
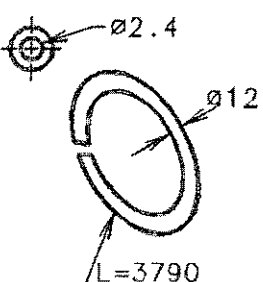
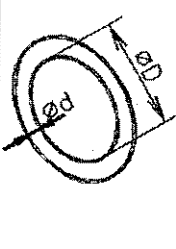
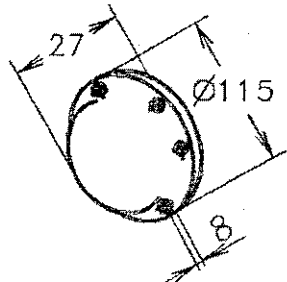
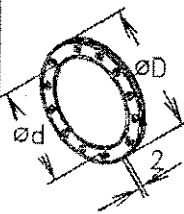
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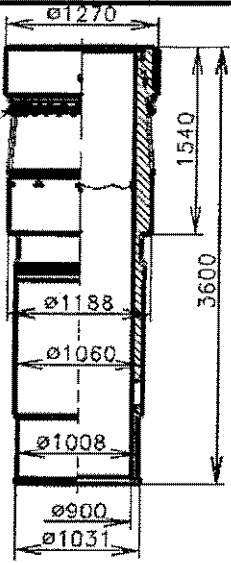
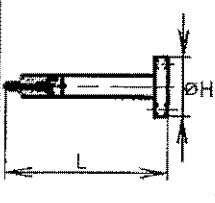
CAB Drawing - do not correct by hand

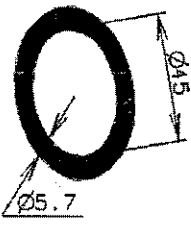
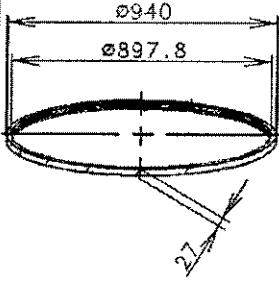
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R	
				*		5	
				*		4	
120110	LMH	SDC	SDC	*	CORRECTE (FOR FINAL)	3	
111206	LMH	SDC	SDC	*	CORRECTED	2	
111017	LMH	SDC	SDC	*	CORRECTED (FOR WORKING)	1	
110228	LMH	SDC	SDC	*	Replacement for Ident.no.:	0	
					FOR FINAL		
Licensor Ident.no.:				Type:	6S90ME-C8.2		
Info.no.:				Description:			Ident.no.:
Page.no.:				OF	LIST OF SPARE PARTS FOR MAIN ENGINE		A14-414249-2

Similar no.:					Ship no.: 2585/86/87/8/89					Scale:		Mass.(kg):	
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:							R	
				*								5	
				*								4	
120110	LMH	SDC	SDC	*	CORRECTED							3	
111206	LMH	SDC	SDC	*	CORRECTED							2	
111017	LMH	SDC	SDC	*	CORRECTED							1	
110228	LMH	SDC	SDC	*	Replacement for Ident.no.:							0	
SPARES				Type:		6S90ME-C8.2							
Info. no.				Description:					Ident.no.:				
				INDEX OF SPARE LIST					A14-414250-1				

ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP				PLATE/ DRAWING		REMARKS	BOX NO.	
				WORKING	SPARE			NO.	PART NO.			
					STAND- -ARD	ADDI- -TION	TOTAL					
A-1-1	MAIN BEARING SHELL IN 2/2 (UPPER+LOWER)	 182KG	Mild steel + White metal	8	1		1			086A10-417177-1	S	
A-1-2	STUD AND NUT FOR MAIN BEARING	 58.0KG	Cr-Mo steel	32	4		4	91210 -0180		Stud 025 A13-354587-3		
			Carbon steel	32	4		4			Nut 013 A13-241733-2		
A-2-1	SEGMENT FOR AHEAD	 150.6KG	Cast iron + White metal	7	7		7			Without sensor hole provision 217 A11-317695-1	S	
				1	1		1	90505 -0148		With sensor hole provision 099 A11-317695-0		
Similar no.:				Ship no.:				Scale:		Mass. (kg):		
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R	
				*							5	
				*							4	
				*							3	
				*							2	
110930	LKS	KPJ	KBY	*	CORRECTED						1	
110929	LKS	KPJ	KBY	*	Replacement for Ident.no.:						0	
SPARES				Type:				6S90ME-C8.2				
Info. no.				Description:				Ident.no.:				
000000				MAIN BEARING AND THRUST BEARING				A14-430958-9				

ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP				PLATE/ DRAWING		REMARKS	BOX NO.
				WORKING	STAND- ARD	ADDITION	TOTAL	NO.	PART NO.		
A-3-1	O-RING FOR FRAME BOX DOOR		SYN. RUBBER	7	3		3	91205 -0187	435	A14-142251-9	
A-3-2	O-RING FOR FRAME BOX DOOR		SYN. RUBBER	1	1		1	91205 -0187	100	A14-003777-4	
A-3-3	O-RING FOR RELIEF VALVE	 øD=715 ød=20 øD=627 ød=18 øD=551 ød=14	SYN. RUBBER	6	1		1	91102 -0035	041	(HCSG735N) A19-004532-8 (HCSG645N) A19-006287-8 (HCSG565N) A14-345303-4	
A-3-4	SIGHT GLASS		ACRYLIC PLASTIC	6	1		1	91207 -0089	137	A13-002679-0	
A-3-5	GASKET FOR RELIEF VALVE	 øD=900 ød=720 øD=800 ød=630 øD=710 ød=550	NON ASBESTOS	6	2		2	91102 -0035	030	(HCSG735N) A14-015452-0 (HCSG645N) A14-009358-9 (HCSG565N) A14-020749-6	
Similar no.:		Ship no.:		Scale: NONE		Mass. (kg):					
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						
				*					R		
				*					5		
				*					4		
				*					3		
				*					2		
111205	LKS	KPJ	KBY	*	dwg.no a19-273713-7->a14-345303-4				1		
110929	LKS	KPJ	KBY	*	Replacement for Ident.no.:				0		
SPARES		Type:		6S90ME-C8.2							
Info. no.		Confidential:		Description:				Ident. no.:			
000000		B		FRAME BOX				A14-430959-0			

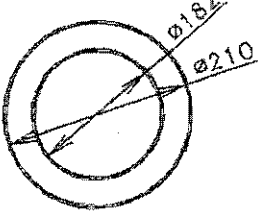
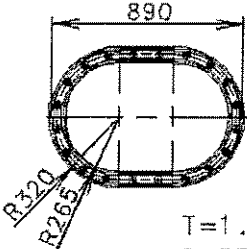
ITEM NO.	NAME	SKETCH (WEIGHT) KG	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.	
				CYL. NO.	WORKING	STAND- ARD	SPARE	ADDITION	TOTAL	NO.			PART NO.
A-4-1	CYL. LINER WITH PIPE & DOWEL PIN	 8807 Kg	Terkall-C	6	6								
				7	7								
				8	8								
				9	9	1		1	P90302-0200	095	A19-314287-9 (A10-387473-5)	S	
				10	10								
				11	11						(Include pipe and dowel pin)		
				12	12								
A-4-2	NON RETURN VALVE FOR CYL. LINER	 L=161.5 H=70 0.846Kg CARBON STEEL L=175 H=70 0.871Kg SPRING STEEL		6	6		6	P90304-0027	060	A19-169759-7			
				7	7								
				8	8								
				9	9								
				10	10								
				11	11								
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				145	145								
				146	146								
				147	147								
				148									

ITEM NO.	NAME	SKETCH (WEIGHT) KG	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.	
				CYL. NO.	WORKING	STAND- ARD	ADDITION	TOTAL	NO.	PART NO.			
A-4-5	O-RING FOR COOLING W. CONN. BETTEN COOLING JACKET AND CYL. FRAME	 0.003Kg	Viton	6	48								
				7	56								
				8	64	12		12	P90302-0200	178	3557L060045		
				9	72								
				10	80								
				11	88								
				12	96								
A-4-6	PISTON CLEANING RING	 10.88Kg	Cr-Mo Steel	6	6								
				7	7								
				8	8								
				9	9	1		1	P90302-0200	083	A11-361033-8		
				10	10								
				11	11								
				12	12								
Similar no.: A14-415627-0.1 Ship no.: Scale: Mass. (kg):													
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:								R
				*									5
				*									4
				*									3
				*									2
				*									1
111014	KMOJGS	KPJ	*	Replacement for Ident.no.: TIER 1 & 2								0	
SPARES				Type: 6~12S90MC-C8.2/ME-C8.2									
Info. no. 005000				Description: CYL. LINER & COOLING JACKET					Ident. no.: A14-415710-6				

ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.	
				CYL. NO.	WORKING	STAND- ARD	ADDI- TION	TOTAL	NO.	PART NO.			
A-5-1	STUD AND NUT FOR CYL. COVER		Cr-Ni-Mo steel	6	48								
				7	56								
				8	64								
				9	72	4		4	P90301 -0179	172	NUT	A13-310221-0	S
				10	80								
				11	88					196	STUD	A11-310220-9	
				12	96								
A-5-2	O-RING FOR CYL. COVER STUD		Viton	6	48								
				7	56								
				8	64								
				9	72	4		4	P90301 -0179	206			
				10	80								
				11	88								
				12	96							355.7L.060090	
A-5-3	O-RING FOR CLEANING COVER		1A	6	6								
				7	7								
				8	8								
				9	9	2		2	P90301 -0179	434			
				10	10								
				11	11								
				12	12							3518A572700	
A-5-5	O-RING FOR PROTECTIVE TUBE		Viton	5	12								
				7	14								
				8	16								
				9	18	3		3	P90301 -0179	052			
				10	20								
				11	22								
				12	24							3557L030140	

Similar no.:		Ship no.:		Scale:		Woss. (kg):	
Date	Dep.	Chk.	Appd.	A.C	Replaced by Ident.no.:		
				*			
				*			
				*			
120105	KMO	JGS	PNG	*	PLATE NO. MOD.: 90301-→P90301		
110617	KMO	JGS	KPJ	*	ENG. TYPE MOD. CYL. NO ADDED		
090210	SJM	JGS	YSC	*	Replacement for Ident.no.:		
SPARES				Type:	6~12S90ME-C		
Info. no.				Confidential:	Description:		
000000				B	CYLINDER FRAME		
					Ident. no.:		
					A14-356683-8		

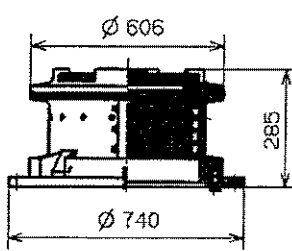
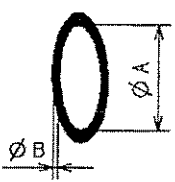
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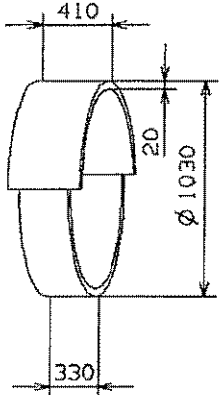
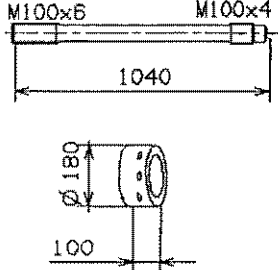
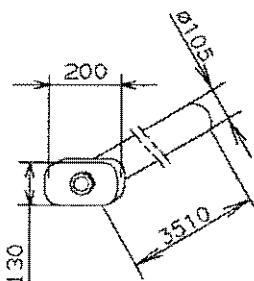
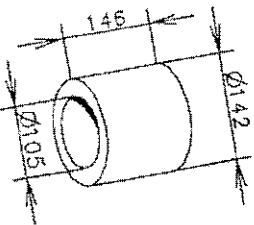
ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.											
				CYL.NO	WORKING	STAND- ARD	SPARE	ADDITION	TOTAL	NO.			PART NO.										
A-6-1	PACKING RING FOR PROTECTIVE TUBE	T=1.5  0.03KG	TBAAF 2100	6	6	7	7	8	8	9	9	10	10	11	11	12	12	2	2	P90301 -0179	040	A19-169471-C	
A-6-2	PACKING RING FOR INSPECTION COVER	 T=1.5 0.35KG	KLGS 4400	6	6	7	7	8	8	9	9	10	10	11	11	12	12	2	2	P90301 -0179	591	A12-177818-3	

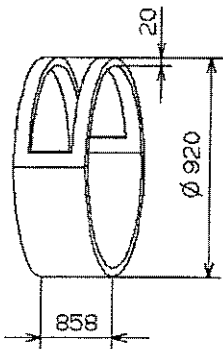
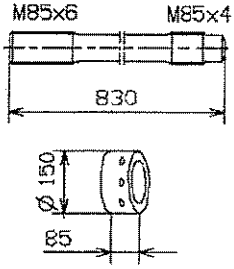
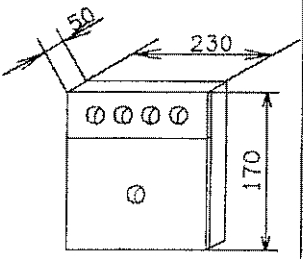
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Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.: A14-415728-6.0										
120105	KMO	JGS	PNG	*	PLATE NO. MOD.: 90301->P90301										
110817	KMO	JGS	KPJ	*	ENG. TYPE MOD. CYL. NO ADDED.										
090925	JGS	SLK	KYJ	*	ITEM NO. A-6-1 --> A-6-2 CORR.										
050912	JGS	SLK	KYJ	*	ITEM NO. A-6-1 CORRECTED: DIM. 2170->2182, 2207->2210 PART NO.: 052-->040										
050518	JGS	KJM	KYJ	*	PLATE NO. MOD.										
040727	PDJ	SLK	KYJ	*	Replacement for Ident.no.:										
SPARES				Type:				6~12S90ME-C							
Info. no.		Confidential:		Description:				Ident. no.:							
000000		B		CYLINDER FRAME				A14-186159-4							

ITEM NO.	NAME	SKETCH (WEIGHT)Kg	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.
				CYL NO	WORKING	STAND- -APD	SPARE	ADJL- -TION	TOTAL	NO.		
C-1-1	PISTON COMPLETE WITH PISTON CROWN PISTON SKIRT PISTON ROD COOLING INSERT PCO PIPE	 4731KG	CR-MO STEEL CAST IRON MILD STEEL CARBON STEEL	6	6					90201 -0225	A11-289877-6 PISTON RING TO BE SUPPLIED SEPARATELY (REFER TO C-1-2)	S
C-1-2	PISTON RING	 11.7KGX1 8.9KGX3	CAST IRON	6	6	2			2	035	1 SET FOR PISTON COMPLETE RIGHT CUT A19-261532-7 (A12-302722-0)	
				6	6	2			2	059	1 SET FOR PISTON COMPLETE RIGHT CUT A19-234519-1 (A12-294767-0)	
				6	6	2			2	047	1 SET FOR PISTON COMPLETE LEFT CUT A19-254854-3 (A12-294766-9)	
				6	6	2			2	060	1 SET FOR PISTON COMPLETE LEFT CUT A19-261533-9 (A12-302723-1)	
C-1-3	D - RING FOR PISTON ROD AND PISTON SKIRT	 D=745 d=8.4	VITON	6	6	2			2	155	A19-121606-0 (A13-153446-8) (024)	
				9	9	3			3			
				6	6	2			2	131	A19-121600-9 (A13-153446-8) (018)	
				9	9	3			3			
	D - RING FOR STUD	 D=30 d=3	RUBBER	6	72	18			18	238	35576030030	
				9	108	27			27			
C-1-5	STUD & HYDR.NUT & WASHER & FOR PISTON ROD	 3.3KG	CR-MO STEEL CARBON STEEL	6	24					90401 -0167	A19-261616-8 (A12-186326-1)	
					4				4	571	A13-194721-6	
				9	36					331	(26303236000)	

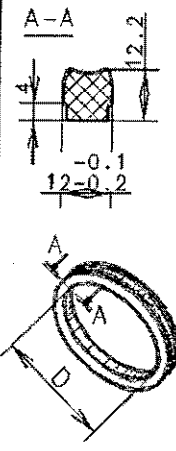
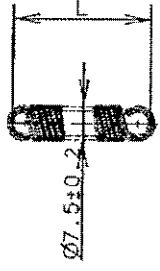
Similar no.:					Ship no.:					Scale: NONE					Mass. (kg):				
Date	Des.	CHK.	Appd.	A.C	Replace by Ident.no.:					Replace by Ident.no.:					R				
20111114	SJS	PNG	YGS		ITEM NO.C-1-5 STUD MAT'L MODIFIED										I				
20110616	SJS	PNG	YGS		ENGING TYPE(DOT2) ADDED										O				
SPARES		Confidential Type:		6590MC-C/ME-C															
In'to. no.		Description:										Ident.no.:							
010000		PISTON AND PISTON ROD										A14-397169-0							

ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP				PLATE/ DRAWING		REMARKS	BOX NO.	
				WORKING	STAND- ARD	ADDITION	TOTAL	NO.	PART NO.			
C-2-1	STUFFING BOX COMPLETE WITH TIGHTENING RING & SCRAPER RING	 188.4KG	CAST IRON CARBON STEEL MILD STEEL RUBBER	6				90205 -0116		A19-205569-4 (A12-404419-2)	S	
				1		1						
		TOP SCRAPER RING		(1)		(1)	A12-136905-2					
		SEGMENT COVER		(2)		(2)	A13-136910-9					
		SEGMENT PACK		(3)		(3)	A13-136908-8					
		BASE RING(LAMELLA 조립)		(1)		(1)	A12-224734-0					
		BASE RING(LAMELLA 조립)		(3)		(3)	A12-136912-2					
		TENSION SPRING		(6)		(6)	A13-136906-4					
		TENSION SPRING		(4)		(4)	A13-136914-6					
		CYLINDRICAL PIN(Ø16×60)		(1)		(1)	297.CR.1A6060					
		LOCKING WIRE(Ø1.5×2500)		(1)		(1)	160.N8.152500					
		HEX SCREW(M16×110)		(6)		(6)	228.DP.216110					
		D-RING		(2)		(2)	A14-136915-8					
HEX.FILT BOLT & NUT(M12×80)		(4)		(4)	226.DP.112080							
C-2-2	O - RING FOR STUFFING BOX	 A=580 B=8.4	RUBBER	12	12		(12)			108 A14-136915-8		
				18	18		18					
Similar no.:				Ship no.:				Scale:		Mass. (kg):		
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.: A14-428906-4						R	
110617	SJS	PNG	YGS	*	ENGING TYPE(DOT2) ADDED, ASS'Y DWG. NO. MODIFIED						5	
090922	PNG	YGS	SJR	*	ITEM NO.C-2-1: PACKING LIST MOD. (LOCKING WIRE APPLIED)						4	
071002	SJS	PNG	KBY	*	ITEM NO.C-2-1: NORD-LOCK WASHER APPLIED						3	
070119	USP	PNG	KBY	*	ITEM NO.C-2-1: PACKING LIST DRAWING ADDED						2	
060720	PNG	KBY	LWS	*	ITEM NO.C-2-1: PART LIST ADDED						1	
060512	KHT	PNG	KBY	*	Replacement for Ident.no.: A14-186375-7						0	
SPARES				Type:				S90MC-C/ME-C8.1/2				
Info. no.				Description:				Ident.no.:				
010000				PISTON ROD STUFFING BOX				A14-283986-2				

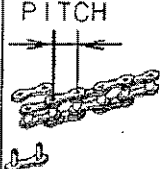
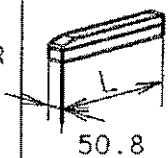
ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.			
				CYL NO	WORKING	STAND- ARD	SPARE	ADJ- TION	TOTAL	NO.			PART NO.		
C-3-1	CRANKPIN BEARING SHELL	 175KG	CARBON STEEL + WHITE METAL	6	6		1		1	90401-0167	247	A19-239776-6 (A10-164987-0)	S		
C-3-2	STUD & HYDR. NUT FOR CRANKPIN BEARING	 69KG	CR-MO STEEL CARBON STEEL	6	12		2		2			A19-261615-6 509 (A12-186324-8) 487 (A13-192941-9)	C		
C-4-1	TELESCOPE PIPE FOR PISTON COOLING	 93KG	NI-CR MO STEEL CARBON STEEL	6	6		1		1		019	A19-205561-0 (A13-186336-7)			
C-4-2	BUSH FOR TELESCOPE PIPE	 9.4KG	LBC3	6	6		1		1		032	A14-186334-3			
Similar no.:				Ship no.:				Scale: NONE		Mass. (kg):					
Date	Des.	CHK.	Appr.	A.C.	Replace by Ident.no.:				Replace by Ident.no.: A14-442785-0 R						
20111114	SJS	PNG	YGS		ITEM NO. C-3-2 STUD MAT'L MODIFIED										
20110928	SJS	PNG	YGS		ITEM NO. C-3-2, C-4-1 DWG. NO. CORRECTED										
20110616	SJS	PNG	YGS		ENGINE TYPE (DOT2) ADDED										
20071002	SJS	PNG	KBY	*	ITEM NO. C-3-2 & C-4-1 : DWG. NO. CORRECTED										
20070119	USP	PNG	KBY	*	ITEM NO. C-3-1 PART NO. ADDED										
20040917	PNG	YGS	KBY	*											
SPARES		Confidential Types		B		S90MC-C/ME-C8.1/2									
Info. no.		Description:				008000				CONNECTING ROD AND CROSSHEAD				Ident. no.: A14-255121-3	

ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP						PLATE/ DRAWING		REMARKS	BOX NO.		
				CYL NO	WORKING	STAND	SPARE	ADDITION	TOTAL	NO.	PART NO.				
C-5-1	CROSSHEAD BEARING SHELL	 308KG	CARBON STEEL + WHITE METAL	6	6							90401 -0167	235	A10-412368-9	S
C-5-2	STUD & HYDR. NUT FOR CROSSHEAD BEARING	 38.17KG	CR-MO STEEL CARBON STEEL	6	24							451		A19-261614-4 (A12-186323-6)	S
C-5-3	THRUST PIECE	 10.2KG	SS400 + AL-BRONZE	6	12							188		A12-203854-6	

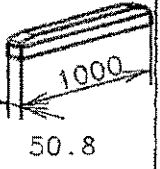
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Date	Des.	Chk.	Appd.	A.C.	Replace by Ident.no.:										Replace by Ident.no.:				
2011114	SJS	PNG	YGS		ITEM NO.C-5-2 STUD MAT'L MODIFIED														
20110616	SJS	PNG	YGS																
SPARES					Confidential: B					Type: 6590MC-C/ME-C8.2									
Info. no. 008000					Description: CONNECTING ROD AND CROSSHEAD					Ident.no.: A14-428907-6									

ITEM NO.	NAME	SKETCH (WEIGHT) KG	MAT'L	SUPPLY PER SHIP				PLATE/ DRAWING		REMARKS	BOX NO.
				WORKING	STAND- ARD	SPARE	ADDITION	TOTAL	NO.		
C-7-1	OIL SEAL FOR AXIAL VIBRATION DAMPER	 D= $\varnothing 1360 \pm 1$ 1.250 KG D= $\varnothing 1044 \pm 1$ 0.980 KG	TEFLON	1	1		1	91211 -66	139	A13-187575-0	
		2		1		1	140		A13-187572-4		
C-7-2	TENSION SPRING FOR AXIAL VIBRATION DAMPER	 L= 2534 0.355 KG L= 2154 0.289 KG	SFJB	1	1		1		019	A13-187573-6	
		2		1		1	020		A13-187574-8		

Similar no.:					Ship no.:					Scale: NS					Mass. (kg):				
Date	Des.	Chk.	Appd.	A.C.	Replaced by Ident.no.:										R				
				*											S				
				*											4				
				*											3				
				*											2				
				*											1				
050224 JDY KBY LWS					* Replacement for Ident.no.:										0				
SPARES					Type: S90ME-C														
Info. no. 000000					Description: AXIAL VIBRATION DAMPER										Ident. no.: A14-256174-0				

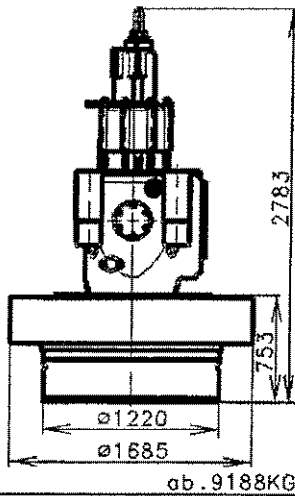
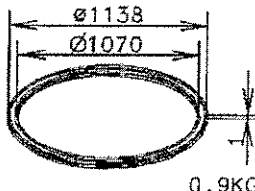
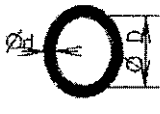
ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP				PLATE/ DRAWING		REMARKS	BOX NO.
				WORKING	STAND- ARD	ADDITION	TOTAL	NO.	PART NO.		
C-6-1	CHAIN FOR CHAIN DRIVE (OUTER LINK: 6PITCH INNER LINK: 6PITCH)	 PITCH 4.5 INCH 81.6kg	STEEL	276 (70x3 +86)	12		12	90632 -0023E	052 064	A19- 236185-1	
C-6-2	GUIDE BAR FOR CHAIN DRIVE	 L=730 15kg	RUBBER STEEL	6	1		1	90632 -0023E	206	A19- 321777-8 (A13- 410325-4)	
		L=400 9.3kg	RUBBER STEEL	6	1		1	90632 -0023E	302	A19- 231796-8 (A11- 253464-7)	

Similar no.:					Ship no.:					Scale: NONE					Mass.(kg):				
Date	Des.	Chk.	Appd.	A.G.	Replaced by Ident.no.:										R				
				*											5				
				*											4				
				*											3				
				*											2				
				*											1				
110929 CRS YGS KBY					* Replacement for Ident.no.:										0				
SPARES					Type: 6S90ME-C8.2														
Info. no. 032903					Description: CHAIN DRIVE LOWER PART										Ident.no.: A14-424646-8				

ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP				PLATE/ DRAWING		REMARKS	BOX NO.	
				WORKING	STAND- ARD	SPARE	TOTAL	NO.	PART NO.			
C-7-1	GUIDE BAR FOR MOMENT COMPENSATOR	 1000 50.8	22 KG	RUBBER STEEL	3	1		1	P90625 -0057	113	A19- 004446-6 (A11- 130213-0)	

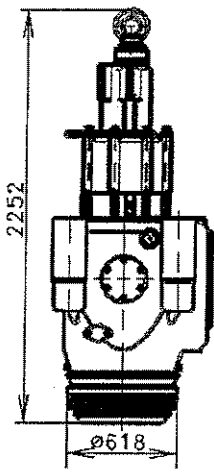
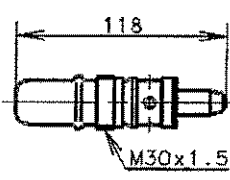
Similar no.:					Ship no.:					Scale: NONE					Mosa. (kg):				
Date	Des.	Chk.	Appd.	A.C.	Replace by Ident. no.:										R				
				*											5				
				*											4				
				*											3				
				*											2				
050418	KPJ	KBY	LWS	*	DWG. NO. ADDED.										1				
050114	KPJ	KBY	LWS	*	Replace for Ident. no.:										0				

SPARES		Type:	6S90MC-C/ME-C			
Info. no.		Description:		Ident. no.:		
055900		MOMENT COMPENSATOR (FORE)		A14-253489-7		

ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.
				CYL NO.	WORKING STAND- ARD	SPARE	ADDI- TION	TOTAL	NO.	PART NO.		
D-01-01	CYL. COVER COMPLETE WITH VALVES (EXHAUST VALVE, FUEL VALVES, STARTING VALVE) AND THEIR FITTINGS (WITHOUT COOLING JACKET)		Cr-MO STEEL CARBON STEEL STAIN- LESS STEEL MILD STEEL SPRING STEEL VITON	5	5				P90101 -0181		EXCLUDING 079,080,102,126 CYL. COVER	
				6	6							
				7	7				P908XX -XXXX		EXH. VALVE	
				8	8	1		1	P90704 -XXXX		STARTING V/V	
				9	9				P90910 -XXXX		FUEL VALVE	
				10	10							
				11	11							
				12	12							
D-01-05	GASKET BETWEEN CYLINDER COVER AND CYLINDER LINER		Mild steel	5	5	5		5	P90101 -0181	126	A13-355789 -0	
				6	6	6		6				
				7	7	7		7				
				8	8	8		8				
				9	9	9		9				
				10	10	10		10				
				11	11	11		11				
				12	12	12		12				
D-01-06	O-RING FOR CYLINDER COVER		VITON	5	10			3	079	A14-284761 -7		
				6	12			3				
				7	14			4				
				8	16			4				
				9	18			5				
				10	20			5				
				11	22			6				
				12	24			6				

Similar no.:					Ship no.:					Scale: NS					Mass.(kg):				
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:										R				
				*											5				
				*											4				
				*											3				
				*											2				
				*											1				
120103 KHT QJS KSI					Replacement for Ident.no.:										0				
SPARES					Type: S90ME-C (LOW FORCE)										HYUNDAI HEAVY INDUSTRIES CO., LTD.				
Info. no.		Confidential:		Description:										Ident.no.:					
006000		B		CYLINDER COVER (HTL)										A14-446813-8					

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ITEM NO.	NAME	SKETCH (WEIGHT) KG	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.
				CYL No.	WORK ING	STAND -ARD	SPARE		NO.	PART NO.		
							ADDI -TION	TOTAL				
D-04-01	EXHAUST VALVE COMPLETE	 2252 ø618 ab. 2500 KG	CAST IRON STEEL	6	6							A19-324860 -5 S
				7	7							
				8	8							
				9	9	2		2	P908XX -XXX			
				10	10							
				11	11							
				12	12							
D-04-02	SAFETY VALVE FOR EXHAUST VALVE	 118 M30x1.5 0.2 KG	STEEL	6	6							A14-347442 -6
				7	7							
				8	8							
				9	9	2		2	P90804 -0018	045		
				10	10							
				11	11							
				12	12							

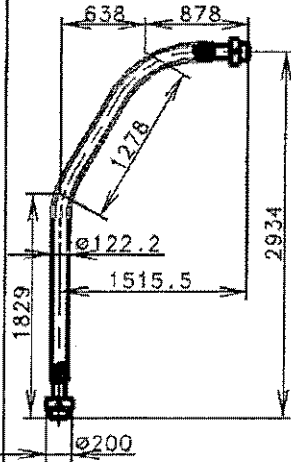
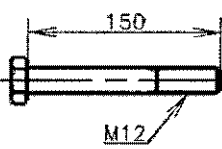
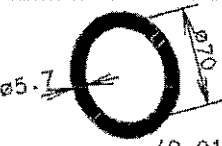
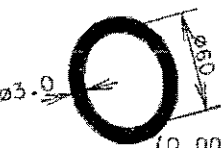
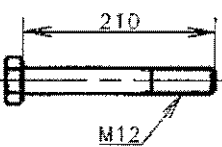
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Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:										R				
				*											3				
				*											4				
				*											3				
				*											2				
120103	KHT	OJS	KSL	*	ITEM NO. D-04-02 PLATE NO. MODIFIED.										1				
110930	KHT	OJS	KSL	*	Replacement for Ident.no.:										0				
SPARES				Type:	6~12S90ME-C (LOW FORCE)														
Info. no.	Confidential:	Description:										Ident. no.:							
012900	B	EXHAUST VALVE										A14-439662-2							

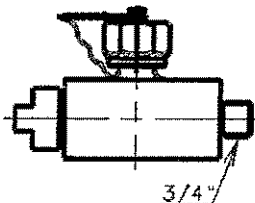
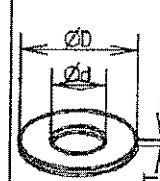
ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.	
				CYL No.	WORKING STAND	SPARE	ADDI- TION	TOTAL	NO.	PART NO.			
D-04-05	SEALING RING FOR EXHAUST VALVE SPINDLE		MAKER	6	6				2	P90801 -0226	182	A14-035183 -0	
D-04-06	SEALING RING FOR EXHAUST VALVE AIR PISTON		TEFLON VITON	6	6				2	P90803 -0071	408	A14-395230 -4	
D-04-07	GUIDE RING FOR EXHAUST VALVE AIR PISTON		TEFLON VITON	6	6				2		398	A14-381141 -0	
D-04-08	PISTON RING FOR EXHAUST VALVE AND DRIVING GEAR		CAST IRON	6	12						099	A14-120170 -0	
D-04-09	SPINDLE GUIDE FOR EXHAUST VALVE		CAST IRON	6	6					P90801 -0226	216	A12-395228 -3	
				6	6								
				7	7								
				8	8								
				9	9								
				10	10								
				11	11								
				12	12								

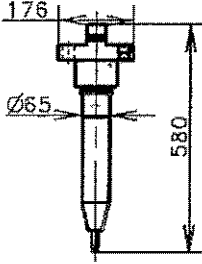
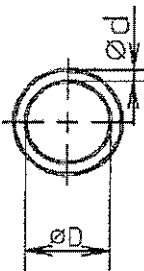
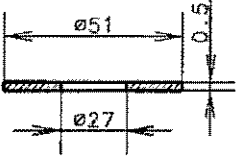
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Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:										R				
				*											5				
				*											4				
				*											3				
				*											2				
120103 KHT OJS KSL					* PLATE NO. AND PART NO. MODIFIED.										1				
110930 KHT OJS KSL					* Replacement for Ident.no.:										0				
SPARES					Type: 6~12S90ME-C (LOW FORCE)														
Info. no.		Confidential:		Description:										Ident. no.:					
012900		B		EXHAUST VALVE										A14-439663-4					

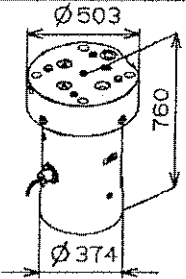
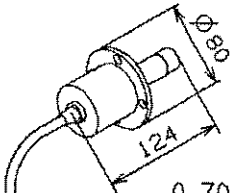
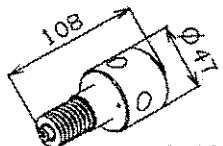
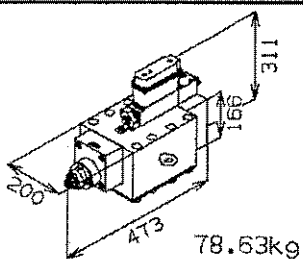
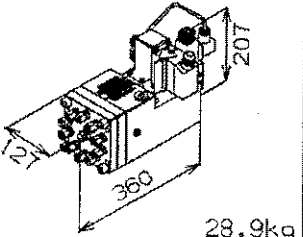
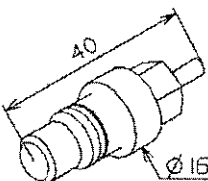
ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.	
				CYL NO.	WORKING STAND	SPARE	ADDI- TION	TOTAL	NO.	PART NO.			
D-04-10	O-RING FOR EXHAUST VALVE		D x d 195x6 0.132KG VITON	6	18	5		5	P90801 -0226	228	3557L060195		
				7	21			6					
				8	24	6		6					
				9	27			7					
				10	30	7		7					
				11	33			9					
			605x7 0.170KG VITON	6	6			2	2	P90801 -0226	133		A14-035173 -5
				7	7	2		2					
				8	8			1					
				9	9			3					
				10	10	3		3					
				11	11			3					
574x7 0.160KG VITON	6	6			2	2	P90803 -0071	145	A14-030492 -0				
	7	7	2		2								
	8	8			1								
	9	9			3								
	10	10	3		3								
	11	11			3								
300x6 0.132KG NBR	6	6			2	2	P90803 -0071	421	35576060300				
	7	7	2		2								
	8	8			1								
	9	9			3								
	10	10	3		3								
	11	11			3								
23.4x2.4 0.010KG VITON	6	6			2	2	P90804 -0011	033	A14-003646 -1				
	7	7	2		2								
	8	8			1								
	9	9			3								
	10	10	3		3								
	11	11			3								
110x6 0.012KG VITON	6	6			2	2	P90803 -0071	374	3557L060110				
	7	7	2		2								
	8	8			1								
	9	9			3								
	10	10	3		3								
	11	11			3								
2.5x3 0.001KG VITON	6	6			2	2	P90803 -0071	014	3557L030025				
	7	7	2		2								
	8	8			1								
	9	9			3								
	10	10	3		3								
	11	11			3								

Similar no.:				Ship no.:				Scale:				Mass. (kg):			
Date	Des.	Chk.	Appd.	A.C.	Replaced by Ident. no.:										
				*					R						
				*					S						
				*					4						
				*					3						
				*					2						
120103	KHT	OJS	KSL	*	PLATE NO. AND PART NO. MODIFIED.				1						
110930	KHT	OJS	KSL	*	Replacement for Ident. no.:				0						
SPARES				Type: 6~12S90ME-C (LOW FORCE)											
Info. no.		Confidential:		Description:				Ident. no.:							
012900		B		EXHAUST VALVE				A14-439664-6							

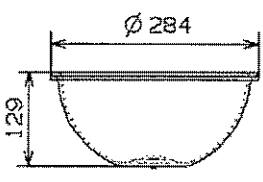
ITEM NO	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP				PLATE/ DRAWING		REMARKS	BOX NO.
				WORKING	STAND- -ARD	SPARE		NO.	PART NO.		
						ADDITION	TOTAL				
D-05-01	HYDRAULIC PIPE COMPLETE FOR EXHAUST VALVE DRIVING	 (99.745)	STEEL PIPE CARBON STEEL	6	1		1	90806 -0127	010A19-320822-2	S	
D-05-02	BOLT FOR HYDRAULIC PIPE CONNECTION	 (0.48)	Cr-MO STEEL	36	6		6		058 221R6112150		
D-05-03	O-RING FOR HYDRAULIC PIPE CONNECTION	 (0.023)	VITON	12	3		3		129 3557L060110		
D-05-04	O-RING FOR HYDRAULIC PIPE CONNECTION	 (0.014)	VITON	12	3		3		154 3557L060070		
D-05-05	O-RING FOR HYDRAULIC PIPE CONNECTION	 (0.003)	VITON	12	3		3		213 3557L030060		
D-05-06	BOLT FOR HYDRAULIC PIPE CONNECTION	 (0.60)	Cr-MO STEEL	36	6		6		058 221R6112210		
Similar no.:				Ship no.:				Scale:		Mass. (kg):	
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
				*							S
				*							4
				*							3
				*							2
111115	OYS	LGH	KBY	*	J0025, 2585~						1
110613	OYS	LGH	KBY	*	Replaced by Ident.no.:						0
SPARES				Type:				HYUNDAI HEAVY INDUSTRIES CO., LTD.			
				6S90ME-C8							
Info. no.		Confidential:		Description:				Ident.no.:			
012901		B		HYDRAULIC PIPE FOR EXH.V/V LOW F				A14-422474-4			

ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.																																																																																																																								
				NO. OF CYL.	WORKING	STAND- ARD	SPARE	ADDITION	TOTAL	NO.			PART NO.																																																																																																																							
D-06-01	INDICATOR COCK DETAIL		MAKER	6	6																																																																																																																															
				7	7		<1>																																																																																																																													
				8	8		+																																																																																																																													
				9	9																																																																																																																															
				10	10																																																																																																																															
										ME/ME-C: P90103 -0008(E)	ME/ME-C: 164 ME-B: 161	<1>set shall be included in cyl. cover spare complete.																																																																																																																								
										ME-B: 2272-1000- 0001.0(E)		A12-367238 -8																																																																																																																								
D-06-02	PACKING FOR INDICATOR VALVE		MILD STEEL	6	12	3			3		MC-C: 044		A14-059187 -8																																																																																																																							
				7	14	4			4		ME-B: 100																																																																																																																									
				8	16																																																																																																																															
				9	18	5			5																																																																																																																											
				10	20																																																																																																																															
				6	6						MC-C: 139		A14-330751 -5																																																																																																																							
				7	7	2			2																																																																																																																											
				8	8																																																																																																																															
				9	9	3			3		ME-B: 112																																																																																																																									
				10	10																																																																																																																															
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Similar no.:					Ship no.:					Scale:		Mass.(kg):																																																																																																																								
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:									R																																																																																																																						
				*										5																																																																																																																						
120103	KHT	QJS	KSL	*	ENGINE TYPE MODIFIED.									4																																																																																																																						
111210	KHT	QJS	KSL	*	ENGINE TYPE ADDED.									3																																																																																																																						
110516	KHT	QJS	KSL	*	PLATE NO. REVISED									2																																																																																																																						
101107	KHT	QJS	KPJ	*	D-06-01 DWG. NO. CHANGED									1																																																																																																																						
091229	KHT	QJS	YGS	*	Replacement for Ident.no.:									0																																																																																																																						
SPARES					Type:					ME/ME-C/ME-B																																																																																																																										
Info. no.		Confidential:		Description:		Ident.no.:																																																																																																																														
054000		B		INDICATOR DRIVE					A14-367247-1																																																																																																																											

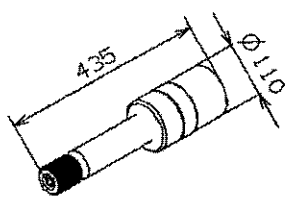
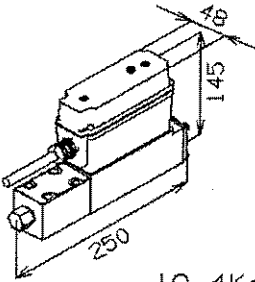
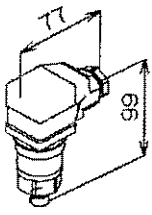
ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.
				NO. OF CYL.	WORKING	STAND- ARD	SPARE	TOTAL	NO.	PART NO.		
D-14-01	FUEL INJECTION VALVE COMPLETE		Ni-Cr Steel Cr-Mo Steel Spring Steel Carbon Steel	6	18	18		(18)	90910 -0137		<3>Sets for cyl. cover spare are not included in this page. A19-295655 -0	S
				7	21	21		21				
				8	24	24		24				
				9	27	27		27				
				10	30	30		30				
				11	33	33		33				
				12	36	36		36				
				6	18	18		(18)				
				7	21	21		21				
				8	24	24		24				
				9	27	27		27				
				10	30	30		30				
D-14-02	O-RING FOR FUEL INJECTION VALVE		VITON VITON VITON	6	18	18		(18)		124	A14-138314 -6 (1420304 -4)	
				7	21	21		21				
				8	24	24		24				
				9	27	27		27				
				10	30	30		30				
				11	33	33		33				
				12	36	36		36				
				6	18	18		(18)				
				7	21	21		21				
				8	24	24		24				
				9	27	27		27				
				10	30	30		30				
11	33	33		33								
D-14-03	DISC		STEEL	6		39		(39)	950		A14-184269 -7 (3155224 -0)	
				7		45		45				
				8		51		51				
				9		57		57				
				10		63		63				
				11		69		69				
				12		75		75				
				6		39		(39)				
				7		45		45				
				8		51		51				
				9		57		57				
				10		63		63				
11		69		69								
Similar no.:				Ship no.:				Scale:		Mass. (kg):		
Date	Des.	Chk.	Appd.	A.G.	Replaced by Ident.no.:							
				*								
				*								
				*								
				*								
				*								
110930/KHT/OJS/KSL				*	Replacement for Ident.no.:							
SPARES		Type:				S90ME-C8.2						
Info. no.		Description:				FUEL VALVE				Ident.no.:		
017000										A14-439665-8		

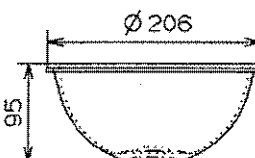
ITEM NO.	NAME	SKETCH (WEIGHT) Kg	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.
				CYL NO	WORKING	STAND	SPARE	ADDITION	TOTAL	NO.	PART NO.	
H-2-1	FUEL OIL PRESSURE BOOSTER	 634.691Kg	ALLOY STEEL	6	6							
				7	7							
				8	8							
				9	9	1			1	P90917-0008	-	A19-321166-3
				10	10							
				11	11							
				12	12							
H-2-2	POSITION (INDUCTIVE) SENSOR	 0.70kg	MAKER	6	6							
				7	7							
				8	8							
				9	9	1			1	P90917-0008	408	A19-288779-1
				10	10							
				11	11							
				12	12							
H-2-3	SUCTION VALVE	 0.63kg	MAKER	6	6							
				7	7							
				8	8							
				9	9	1			1	P90917-0008	014	A19-267579-3
				10	10							
				11	11							
				12	12							
H-2-4	FIVA VALVE	 78.63kg	MAKER	6	6							
				7	7							
				8	8							
				9	9	1			1	P90636-0065	747	A19-267583-8
				10	10							
				11	11							
				12	12							
H-2-5	ALPHA LUBRICATOR	 28.9kg	MAKER	6	6							
				7	7							
				8	8							
				9	9	1			1	P90307-0053	-	A19-321170-8
				10	10							
				11	11							
				12	12							
H-2-6	INDUCTIVE SENSOR	 0.04kg	MAKER	6	6							
				7	7							
				8	8							
				9	9	1			1	P90307-0053	391	A19-236465-4
				10	10							
				11	11							
				12	12							

Similar no.:					Ship no.:					Scale: SPARES					Mass. (kg):						
Date	Des.	Chk.	Appd.	A/C	Replace for (Ident.no.):										Replace by Ident.no.:					R	
20111229	AJY	KSL	KBY		PLATE NO. UPDATED															I	
20110504	AJY	KSL	KBY																	O	
SPARES				Confidential Type: B				S90ME-C 8.2													
Info. no.				1014000				Description:										Ident. no.:			
								HYDRAULIC CYLINDER UNIT (300BAR)										A14-417066-0			

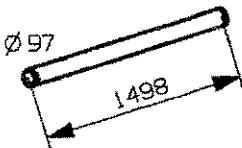
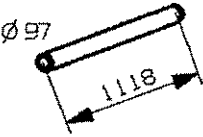
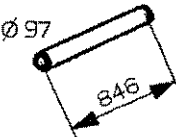
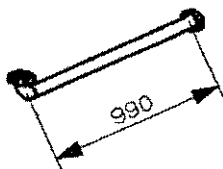
ITEM NO.	NAME	SKETCH (WEIGHT) Kg	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.	
				CYL NO	WORKING	SPARE			NO.	PART NO.			
						STAND - APT	ADD - TION	TOTAL					
H-2-7	MEMBRANE REPAIR KIT FOR ACCUMULATOR	 0.5Kg	MAKER	6	12								
				7	14								
				8	16								
				9	18	2		2	P90636 -0065	113	A13-301616-3 (1905674-4) "MEMBRANE ONLY"		
				10	20								
				11	22								
				12	24								

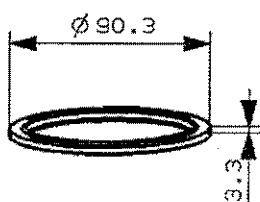
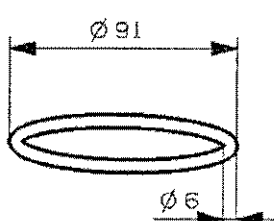
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Date	Des.	CHK.	Appd.	A.C.	Replace for Ident.no.:					Replace by Ident.no.:		R	
20111229	AJY	KSL	KEY		PLATE NO. UPDATED							I	
20110504	AJY	KSL	KEY									O	
SPARES		Confidential: B	Type:		S90ME-C 8.2								
Info. no.		Description:		Ident.no.:									
014000		HYDRAULIC CYLINDER UNIT (300BAR)		A14-417067-1									

ITEM NO.	NAME	SKETCH (WEIGHT)Kg	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.																																
				CYL NO	WORKING	STAND- ARD	ADDITION	TOTAL	NO.	PART NO.																																		
H-3-1	DRIVE SHAFT	 16.463Kg	MAKER	6	3					P90638-0026	199	A19-310516-8																																
				7	3	1		1																																				
				8	3																																							
H-3-2	PROPORTIONAL VALVE	 10.4Kg		6	3					P90636-0092	025	A12-426054-0 (5237088-1)																																
				7	3	1		1																																				
				8	3																																							
H-3-3	PRESSURE TRANSDUCER SYSTEM (0-400)	 0.2Kg		6	3					P90641-0058	171	A14-300936-4 (3171922-4)																																
				7	3	1		1																																				
				8	3																																							
Similar no.: Ship no.: Scale: Mass. (kg): <table border="1"> <thead> <tr> <th>Date</th> <th>Des.</th> <th>CHK.</th> <th>Appd.</th> <th>A.C</th> <th>Replace for Ident.no.:</th> <th>Replace by Ident.no.:</th> <th>R</th> </tr> </thead> <tbody> <tr> <td>2011229</td> <td>AJY</td> <td>KSL</td> <td>KBY</td> <td></td> <td>PLATE NO. UPDATED</td> <td></td> <td>2</td> </tr> <tr> <td>2011017</td> <td>AJY</td> <td>KSL</td> <td>KBY</td> <td></td> <td>DWG.NO. CORRECTED</td> <td></td> <td>1</td> </tr> <tr> <td>20110504</td> <td>AJY</td> <td>KSL</td> <td>KBY</td> <td></td> <td></td> <td></td> <td>0</td> </tr> </tbody> </table> SPARES Confidential Type: B S90ME-C 8.2  Info. no. 031000 Description: HYDRAULIC POWER SUPPLY (300BAR) Ident.no.: A14-417068-3													Date	Des.	CHK.	Appd.	A.C	Replace for Ident.no.:	Replace by Ident.no.:	R	2011229	AJY	KSL	KBY		PLATE NO. UPDATED		2	2011017	AJY	KSL	KBY		DWG.NO. CORRECTED		1	20110504	AJY	KSL	KBY				0
Date	Des.	CHK.	Appd.	A.C	Replace for Ident.no.:	Replace by Ident.no.:	R																																					
2011229	AJY	KSL	KBY		PLATE NO. UPDATED		2																																					
2011017	AJY	KSL	KBY		DWG.NO. CORRECTED		1																																					
20110504	AJY	KSL	KBY				0																																					

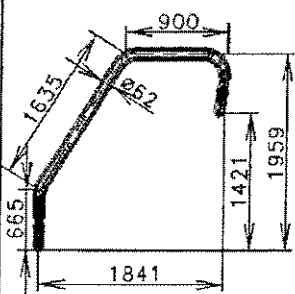
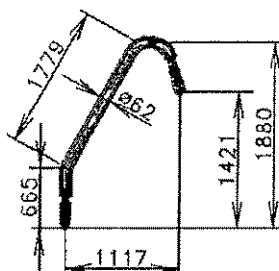
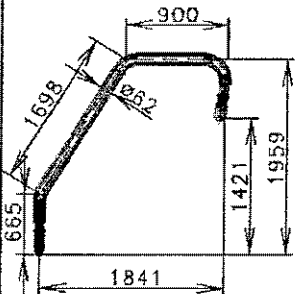
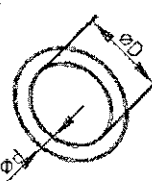
ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.					
				CYL NO	WORKING	STAND -ARD	ADDI- TION	TOTAL	NO.	PART NO.							
H-4-1	MEMBRANE REPAIR KIT FOR ACCUMULATOR	 0.2Kg	MAKER	6	3	7	3	8	3	9	3	1	1	P90638 -0026	092	A13-301620-8 (1905672-0) "MEMBRANE ONLY"	
				10	3	11	3	12	3								

Similar no.:					Ship no.:					Scale: SPARES		Mass. (kg):	
Date	Des.	Drk.	Appd.	A.C	Replace by Ident.no.:					Replace by Ident.no.:		R	
2011/017	AJY	KSL	KEY		CORRECTED								
2011/0504	AJY	KSL	KEY									O	
SPARES		Security: Type:		S90ME-C									
Info. no.		Description:		034000 ACCUMULATOR BLOCK COMPLETE					Ident.no.:		A14-417069-5		

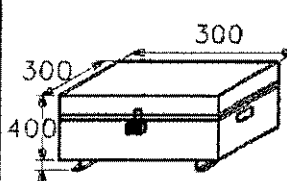
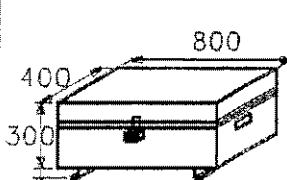
ITEM NO.	NAME	SKETCH (WEIGHT)Kg	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.	
				CYL NO	WORKING	STAND- ARD	SPARE	ADDITION	TOTAL	NO.			PART N.
H-2-10	HIGH PRESSURE PIPE		STS480	6	4								
				7	5								
				8	5								
				9	7	1		1	P90635-0050	167	A13-402369-8		
				10	8								
				11	10								
				12	11								
H-2-11	HIGH PRESSURE PIPE		STS480	6	1								
				7	1								
				8	1								
				9	1	1		1	P90635-0050	417	A13-402368-6		
				10	1								
				11	1								
				12	1								
H-2-12	HIGH PRESSURE PIPE		STS480	6	1								
				7	1								
				8	1								
				9	1	1		1	P90635-0050	395	A13-402357-4		
				10	1								
				11	1								
				12	1								
H-2-13	HOSE STEEL WITH 2 FLANGE		MAKER	6	6								
				7	7								
				8	8								
				9	9	2		2	P90635-0050	131	A13-402355-2		
				10	10								
				11	11								
				12	12								
Similar no.: Ship no.: Scale: Mass. (kg):													
Date	Des.	CHK.	Appd.	A.C	Replace for Ident.no.:					Replace by Ident.no.:		R	
20111229	AJY	KSL	KBY		PLATE NO. UPDATED							I	
20110511	AJY	KSL	KBY									O	
SPARES		Confidential	Type:	S90ME-C 8.2									
Info. no.		Description:					Ident.no.:						
014000		HYDRAULIC CYLINDER UNIT (300BAR)					A14-408930-4						

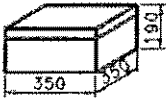
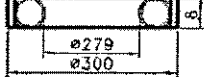
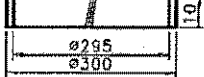
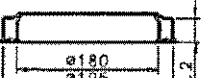
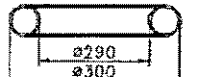
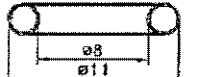
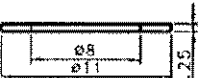
ITEM NO.	NAME	SKETCH (WEIGHT)Kg	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.
				CYL NO	WORKING	SPARE			NO.	PART NO.		
						STAND- ARD	ADJL- TION	TOTAL				
H-2-14	SOCKET HEAD BOLT	 M24x80	8.8	6	48	4		4	P90635-0050	180	230.DP.124080	
				7	55							
				8	64							
				9	72							
				10	80							
				11	88							
				12	96							
H-2-15	SOCKET HEAD BOLT	 M14x45	8.8	6	24	4		4	P90635-0050	096	230.DP.114045	
				7	28							
				8	32							
				9	36							
				10	40							
				11	44							
				12	48							
H-2-16	SOCKET HEAD BOLT	 M24x70	8.8	6	4	4		4	P90635-0050	072	230.DP.124070	
				7	4							
				8	4							
				9	4							
				10	4							
				11	4							
				12	4							
H-2-17	BONDED SEAL		MAKER	6	13	4		4	P90635-0050	060	A14-344505-5	
				7	15							
				8	17							
				9	19							
				10	21							
				11	23							
				12	25							
H-2-18	RETAINING RING		MAKER	6	12	4		4	P90635-0050	084	A14-344505-3	
				7	14							
				8	16							
				9	18							
				10	20							
				11	22							
				12	24							

Similar no.:					Ship no.:					Scale: N/S					Mass. (kg):					
Date	Des.	Chk.	Appd.	A.C.	Replace for Ident.no.:										Replace by Ident.no.:					R
20111229	AJY	KSL	KBY		PLATE NO. UPDATED															I
20110511	AJY	KSL	KBY																	O
SPARES		Confidential Type:		S90ME-C 8.2																
Info. no.				Description:												Ident.no.:				
014000				HYDRAULIC CYLINDER UNIT (300BAR)												A14-408931-6				

ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP				PLATE/ DRAWING		REMARKS	BOX NO.	
				WORKING	STAND- -ARD	ADDI- -TION	TOTAL	NO.	PART NO.			
E-1-1	HIGH PRESSURE PIPE WITH CONNECTION PIECE FOR FUEL PUMP (A19-309891-6) (101.385)	 FORE (35.905)	CARBON STEEL Cr-STEEL HIGH PRESS. PIPE VITON	6	1		1		227	A19-309892-8	S	
E-1-2		 Center (29.126)		6	1		1		203	A19-313951-0		
E-1-3		 AFTER (36.355)		6	1		1		181	A19-309896-5		
E-1-4	"O"-RING or SEARING RING FOR FUEL OIL HIGH PRESSURE PIPE MS037000		VITON	18	5		5		168	A14-063587-7		
		36		9		9		119	A14-054843-2			
		36		9		9		120	A14-264321-1			
Similar no.:		Ship no.:		Scale:		Mass. (kg):						
Date	Des.	Chk.	Appd.	A.C.	Replaced by Ident.no.:							R
				*								5
				*								4
				*								3
				*								2
				*								1
110613JOYSILGHKBY				*	Replacement for Ident.no.:							0
SPARES		Type:		6S90ME-C8(300bar)								
Info. no.		Description:		PIPING SYSTEM(DOUBLE WALL)				Ident.no.:				
037000								A14-422473-2				

ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP				PLATE/ DRAWING		REMARKS	BOX NO.																																										
				NO. OF CYL.	WORKING	STAND- -ARD	SPARE	NO.	PART NO.																																												
E-2-1	BURSTING DISC FOR BURSTING CAP MS099912	 (0.01)	COPPER	6 9 12	6 9 12	2	-	2	91104E -83	174	A14- 003570-2																																										
E-2-3	SPRING FOR BACK PRESSURE VALVE MS099912	 (0.15)	SPRING STEEL	1	1	-	1	90915 -0060	145	A13- 141524-8																																											
E-2-4	"O"-RING FOR BACK PRESSURE VALVE MS099912	 D= 35 D= 3 (0.001) D= 45 D= 3 (0.013)	NBR	2	1	-	1	90915 -0060	049	355.8L. 030035																																											
				2	1	-	1		121	355.8L. 030045																																											
Similar no.: Ship no.: Scale: Mass. (kg): <table border="1"> <thead> <tr> <th>Date</th> <th>Des.</th> <th>Chk.</th> <th>Appd.</th> <th>A.C</th> <th>Replaced by Ident.no.:</th> <th></th> </tr> </thead> <tbody> <tr> <td>110929</td> <td>OYS</td> <td>KJY</td> <td>LGH</td> <td>*</td> <td>355.7K. --> 355.8L.</td> <td>R</td> </tr> <tr> <td>110516</td> <td>OYS</td> <td>KJY</td> <td>LGH</td> <td>*</td> <td>ADD. 9, 12 CYL.</td> <td>S</td> </tr> <tr> <td>080619</td> <td>OYS</td> <td>LGH</td> <td>SDC</td> <td>*</td> <td>E-2-3(101.6-->116.6)</td> <td>4</td> </tr> <tr> <td>050331</td> <td>KYI</td> <td>YSB</td> <td>PBS</td> <td>*</td> <td>PLATE NO. ADDED</td> <td>3</td> </tr> <tr> <td>050107</td> <td>KYI</td> <td>YSB</td> <td>PBS</td> <td>*</td> <td>Replacement for Ident.no.:</td> <td>2</td> </tr> </tbody> </table> SPARES Type: 6/9/12S90ME-C HYUNDAI HEAVY INDUSTRIES CO., LTD. Info. no. Description: PIPING SYSTEM Ident. no.: A14-264327-2 000000												Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:		110929	OYS	KJY	LGH	*	355.7K. --> 355.8L.	R	110516	OYS	KJY	LGH	*	ADD. 9, 12 CYL.	S	080619	OYS	LGH	SDC	*	E-2-3(101.6-->116.6)	4	050331	KYI	YSB	PBS	*	PLATE NO. ADDED	3	050107	KYI	YSB	PBS	*	Replacement for Ident.no.:	2
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:																																																
110929	OYS	KJY	LGH	*	355.7K. --> 355.8L.	R																																															
110516	OYS	KJY	LGH	*	ADD. 9, 12 CYL.	S																																															
080619	OYS	LGH	SDC	*	E-2-3(101.6-->116.6)	4																																															
050331	KYI	YSB	PBS	*	PLATE NO. ADDED	3																																															
050107	KYI	YSB	PBS	*	Replacement for Ident.no.:	2																																															

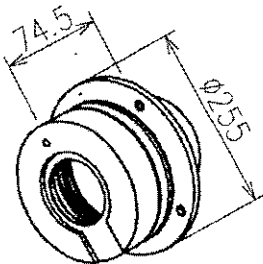
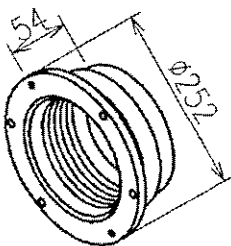
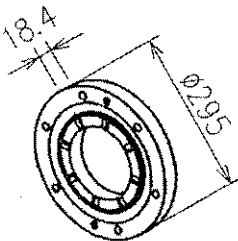
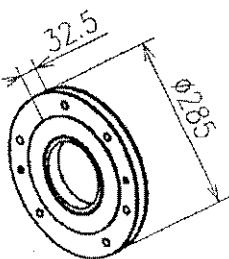
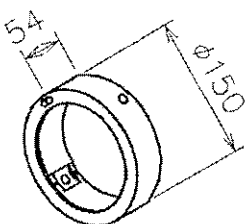
ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP				PLATE/ DRAWING		REMARKS	BOX NO.
				WORKING	STAND- ARD	SPARE	ADDITION	TOTAL	NO.		
D-90-1	BOLT OF EACH SIZE		M10X30	MILD STEEL	EACH 20	EACH 20				221R6110030	
			M12X40							221R6112040	
			M16X50							221R6116050	
			M20X60							221R6120060	
			M24X75							220R6124075	
			M30X90							220R6130090	
			D-90-2							NUT OF EACH SIZE	
M12	250R1212000										
M16	250R1216000										
M20	250R1220000										
M24	250R1224000										
M30	250R1230000										
D-90-10	STEEL BOX FOR SPARE PARTS	 		STEEL	2	2		A19-264696-2	ONLY FOR HYUNDAI-MIPO SHIPYARD		
			7							7	
				10	10			ONLY FOR HYUNDAI, HANJIN, DAEWOO, OTHER SHIPYARD			
				11	11			ONLY FOR SAMHO SHIPYARD			
Similar no.:		Ship no.:		Scale: NONE		Woss. (kg):					
Date	Des.	Chk.	Appd.	A.G.	Replaced by Ident.no.:						R
				*							5
				*							4
				*							3
				*							2
				*							1
080418/KML/LGS/LK1				*	Replacement for Ident.no.:						0
SPARES		Type:		L/K/S90MC/-C							
Info. no.		Description:		OTHERS						Ident.no.:	
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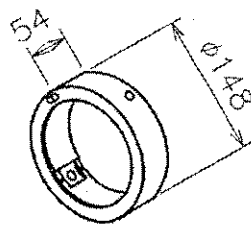
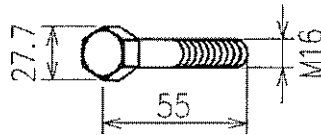
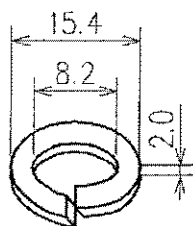
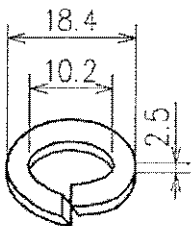
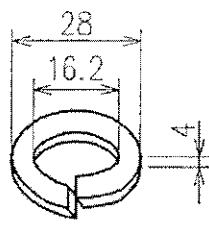
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			CODE NO.	REMARK (WEIGHT) KG	BOX NO.
					STAND-ARD	ADDI-TION	TOTAL			
1		SPARE BOX		STEEL	1	-	1		11.2 kg	
1-1		GLYD RING		Busak Luyken	2	-	2	TB-GC-0039	0.15 kg	
1-2		WEAR RING		Busak Luyken	4	-	4	TB-GC-0038	0.1 kg	
1-3		WEAR RING		Busak Luyken	4	-	4	TB-GC-0040	0.05 kg	
1-4		STEP SEAL		Busak Luyken	2	-	2	TB-GC-0041	0.1 kg	
1-5		DUST SEAL		UREATHAN	1	-	1	TB-GC-0043	0.01 kg	
1-6		O - RING		NBR	1	-	1	TB-GC-0042	0.01 kg	
1-7		O - RING		NBR	1	-	1	TB-GC-0044-0049	0.001 kg	
1-8		BACK UP RING		TEFLON	1	-	1	TB-GC-0045-0050	0.001 kg	

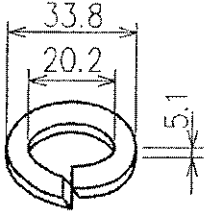
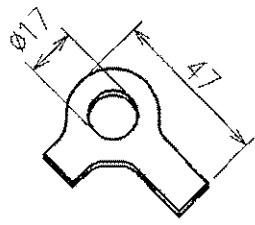
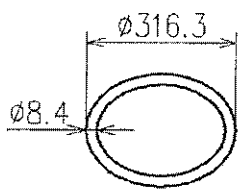
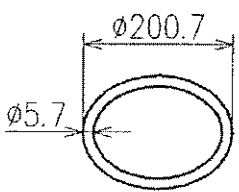
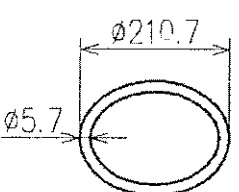
 Green & Clean Technology Co., Ltd.

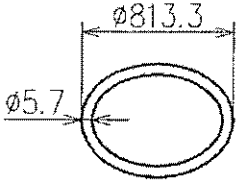
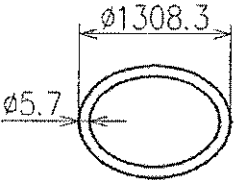
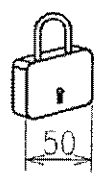
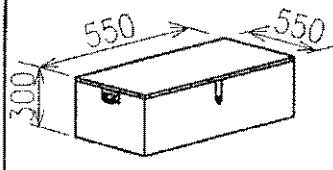
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Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:		
				*			
				*			
				*			
070712	KJJ	PBS	PBS	*	MOD.CODE NO. ADD.WEIGHT		
051222	KJJ	PBS	PBS	*	ADD.CODE NO.		
040721	HAA	JYC	PBS	*	Replacement for Ident.no.:		
SPARES		Type:				AIR-OIL CUSHION 300	
Info. no.		Description:				Ident.no.:	
981000		HYDRAULIC TOP BRACING				A14-257313-8	

 **HYUNDAI**
HEAVY INDUSTRIES CO., LTD.

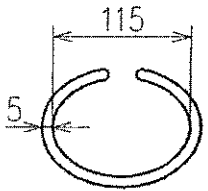
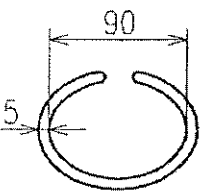
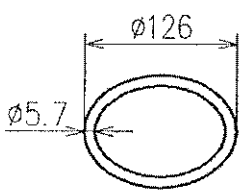
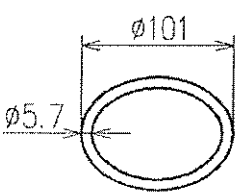
SPARES				PAGE		S34		
For MET71MBx 2Sets				()		SHIP NO.		
						BOX NO.		
NO.	NAME	SKETCH	MATERIAL	SUPPLY PER SHIP		DRAWING		REMARKS (Kg)
				WORK-ING	SPARE	NO.	PART NO.	
1	Oil Labyrinth (Turbine Side) 油ラビリンス (タービン側)		Bronze Casting (CAC402)	2	1	N36-848-1040-1	35	8.8
2	Oil Labyrinth (Blower Side) 油ラビリンス (ブロウ側)		Bronze Casting (CAC402)	2	1	N36-848-1049-1	37	4.5
3	Thrust Bearing (Turbine Side) スラスト軸受 (タービン側)		Carbon Steel & White metal (S25C, WJ2)	2	1	N36-J18-4087-A	71	6.67
4	Thrust Bearing (Blower Side) スラスト軸受 (ブロウ側)		Carbon Steel & Leaded Tin Bronze Casting (S25C/CAC603)	2	1	N36-J18-4097-A	73	10.0
5	Journal Bearing (Turbine Side) 平軸受 (タービン側)		Carbon Steel & Aluminium (S45C, A40)	2	1	N36-J08-4065-A	75	3.18
MFR'S NAME & ADDRESS		NAGASAKI SHIPYARD & MACHINERY WORKS. MITSUBISHI HEAVY INDUSTRIES, LTD						

SPARES				PAGE		S35				
For MET71MBx 2Sets ()				SHIP NO.						
				BOX NO.						
NO.	NAME	SKETCH	MATERIAL	SUPPLY PER SHIP		DRAWING		REMARKS (Kg)		
				WORK-ING	SPARE	NO.	PART NO.			
6	Journal Bearing (Blower Side) 平 軸 受 (ブロー側)		Carbon Steel & Aluminium (S45C,A40)	2	1	N36-J08-4064-A	70	2.99		
7	Hex. Bolt 六角ボルト M16x45		Stainless Steel (SUS304)	16	8	100-516-045-4	225	0.111		
8	Spring Washer ばね座金 M8		Hard Steel Wire (SWRH62)	8	4	168-400-108-2	371	0.002		
9	Spring Washer ばね座金 M10		Hard Steel Wire (SWRH62)	8	4	168-400-110-2	351	0.003		
				12	32		6		16	714
				12	6					734
10	Spring Washer ばね座金 M16		Hard Steel Wire (SWRH62)	12	6	168-400-116-2	242	0.011		
				8	32		4		16	454
				12	6					474
MFR'S NAME & ADDRESS		NAGASAKI SHIPYARD & MACHINERY WORKS. MITSUBISHI HEAVY INDUSTRIES, LTD								

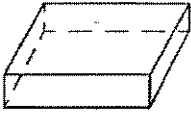
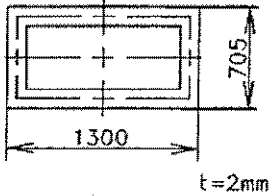
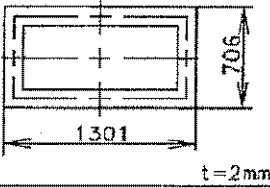
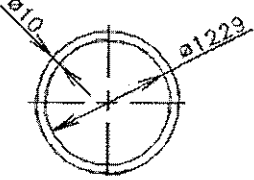
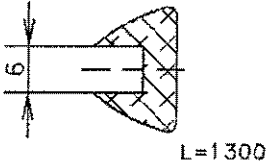
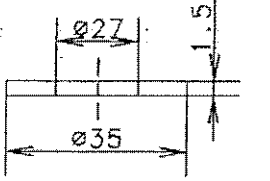
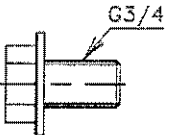
SPARES		PAGE		SHIP NO.		BOX NO.		REMARKS	
For MET71MBx 2Sets		()						(Kg)	
NO.	NAME	SKETCH	MATERIAL	SUPPLY PER SHIP		DRAWING		REMARKS	
				WORK-ING	SPARE	NO.	PART NO.		
11	Spring Washer ばね座金 M20		Hard Steel Wire (SWRH62)	12	6	168-400-120-2	364	0.019	
12	Tongued Washer 両舌付座金 M16		Stainless Steel (SUS304)	16	8	168-620-116-4	226	0.008	
13	O Ring Oリング		Rubber	2	1	360-084-300-6	362	0.050	
14	O Ring Oリング		Rubber	2	1	361-057-190-6	354	0.015	
15	O Ring Oリング		Rubber	2	1	361-057-200-6	373	0.015	
MFR'S NAME & ADDRESS		NAGASAKI SHIPYARD & MACHINERY WORKS. MITSUBISHI HEAVY INDUSTRIES, LTD							

SPARES				PAGE		S37		
For MET71MB x 2Sets ()				SHIP NO.				
				BOX NO.				
NO.	NAME	SKETCH	MATERIAL	SUPPLY PER SHIP		DRAWING		REMARKS (Kg)
				WORK-	SPARE	NO.	PART NO.	
16	O Ring O リング		Rubber	2	1	N36-361-0051-1	472	0.10
17	O Ring O リング		Rubber	2	1	N36-361-0069-4	449	0.10
18	Pad-Lock 南京錠		Brass (BS)		1	N36-940-0001-1		0.10
19	Spares Box 予備品箱		Rolled Steel (SS400)		1	N36-501-0003-2		20.0

MFR'S NAME & ADDRESS	NAGASAKI SHIPYARD & MACHINERY WORKS. MITSUBISHI HEAVY INDUSTRIES, LTD
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SPARES		PAGE		538				
For MET71MB x 2Sets () Spars Hydraulic Jack (油圧ジャッキ用スペア)				SHIP NO.				
				BOX NO.				
NO.	NAME	SKETCH	MATERIAL	SUPPLY PER SHIP		DRAWING		REMARKS (Kg)
				WORK-ING	SPARE	NO.	PART NO.	
20	Back-up Ring バックアップリング P115		Teflon	1	4	N36-Y00-0015-3	T-60-3	0.005
21	Back-up Ring バックアップリング P90		Teflon	1	4	N36-Y00-0015-6	T-60-6	0.003
22	O Ring O リング P115		Rubber	1	4	N36-Y00-0015-4	T-60-4	0.009
23	O Ring O リング P90		Rubber	1	4	N36-Y00-0015-5	T-60-5	0.007

MFR'S NAME & ADDRESS	NAGASAKI SHIPYARD & MACHINERY WORKS. MITSUBISHI HEAVY INDUSTRIES, LTD
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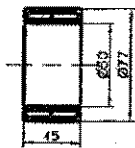
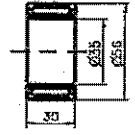
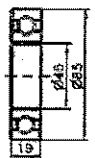
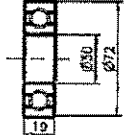
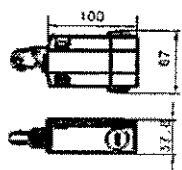
ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP				PLATE/ DRAWING		REMARKS	BOX NO.
				WORKING	STAND- ARD	SPARE	ADDITION	TOTAL	NO.		
AS-01	WOODEN BOX FOR GASKET		WOOD		1			1			
AS-02	CONNECT HEADER GASKET		NON- ASBESTOS		2			2			
AS-03	RETURN HEADER GASKET		NON- ASBESTOS		2			2			
AS-04	O-RING		VITON		4			4			
AS-05	"U" GASKET		NBR		6			6			
AS-06	GASKET		COPPER		8			8			
AS-07	PLUGS		HSn62-1		8			8			

GEA type : 199/36/19/4

Similar no.:					Ship no.:					Scale:					Mass.(kg):				
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:														
				*											5				
				*											4				
				*											3				
				*											2				
090219/AJYRSH/SJR					* DRAWING UPDATED.										1				
060426/AJYQGYIDY					* Replacement for Ident.no.:										0				
SPARES					Type: LKMx-Bx2sets														
Info. no. 093000					Description: AIR COOLER SPARE										Ident. no.: A14-270110-3				

[illegible]

MAIN ENGINE TURNING GEAR WITH MOTOR SPARE PARTS LIST FOR REDUCTION GEAR

NO.	NAME	SKETCH	METERIAL	SET SPARE		PART NO	SIZE	REMARKS
				QUANTITY				
1	NEEDLE BEARING		BEARING STEEL	4	1	151	TRI #507745	PURCHASE
2	NEEDLE BEARING		BEARING STEEL	3	1	101	TRI #355630	PURCHASE
3	BALL BEARING		BEARING STEEL	1	1	061	#6209	PURCHASE
4	BALL BEARING		BEARING STEEL	1	1	062	#6306	PURCHASE
5	OIL SEAL		SYNTHETIC RUBBER	1	1	042	D TYPE 26030020	PURCHASE
6	OIL SEAL		SYNTHETIC RUBBER	1	1	052	D TYPE 456812	PURCHASE
7	LIMIT SWITCH			1	1	54	3SE5162-0BE01	PURCHASE

NOTE

YRTG 96-140



YU RIM INDUSTRIAL CO., LTD.

6S-90ME-SPLST1

Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	
				*		3
				*		4
				*		3
				*		2
111213	CSW	JDY	YGS	*	Limit switch type changed.	1
071116	YDK	JDY	KBY	*	Replacement for Ident.no.:	0
Licensor Ident.no.:		Type:		S90ME-C		
Info.no.:		Description:		LIST OF SPARE PARTS FOR T/GEAR (REDUCTION)		
Page.no.:		Confidential:		01 OF 01 B		Ident.no.:
						A14-315763-7

		S. Page T01	T. Page T81
PLAN HISTORY	ENGINE TYPE	HYUNDAI-MAN B&W 6S90ME-C8	
* NOTE The item marked with "S" in this list are to be arranged at the hull side and the steel box for storing them are not supplied.	MESSER.		
	RULE	LR+UMS	
	SHIP NO.	2585/86/87/88/89	
	ENG.NO.	AA4624/25/26/27/28	

TITLE : LIST OF TOOLS FOR MAIN ENGINE

CONTENT

INDEX OF TOOL LIST ----- A14-413705-2.5(1/2)
A14-413705.2.5(2/2)

REVISED HISTORY 5 ----- 120110

* PAGE CORRECTED. : T02,T03,T29

REVISED HISTORY 4 ----- 111216

* PAGE CHANGED. : T10 (A14-274210-2.3 --> A14-441391-7.0)

REVISED HISTORY 3 ----- 111202

* PAGE CORRECTED. : T02,T03,T68

* PAGE DELETED. : T25

* PAGE CHANGED. : T13 (A14-263467-5.3 --> A14-442814-5.0)
T46 (A14-432037-2.0 --> A14-448970-7.0)

REVISED HISTORY 2 ----- 111102

* PAGE CORRECTED. : T02,T03

* PAGE DELETED. : T82

REVISED HISTORY 1 ----- 111014

* PAGE CORRECTED. : T02,T03,T04,T07,T08,T09,T10,T12,T13,T14,T44,T48,T75

* PAGE ADDED. : T41-1,T65-1

* PAGE DELETED. : T73,T77

* PAGE CHANGED. : T23 (A14-261553-0.2 --> A14-421846-6.1), T24 (A14-261554-1.3 --> A14-421847-8.1)
T27 (A14-261560-0.3 --> A14-439669-5.1), T28 (A14-261561-1.1 --> A14-439670-4.0)
T29 (A14-261562-3.2 --> A14-439677-7.0), T30 (A14-270239-5.3 --> A14-439672-8.0)
T41 (A14-246852-4.5 --> A14-180092-7.5), T46 (A14-261581-2.2 --> A14-432037-2.0)
T47 (A14-261582-4.2 --> A14-432038-4.0), T59 (A14-257314-0.2 --> A14-371958-1.1)
T65 (A14-357517-6.0 --> A14-270112-7.1), T72 (A14-215162-6.3 --> A14-261596-7.1)
T74 (A14-309284-9.1 --> A14-424645-8.0), T78 (A14-246834-7.5 --> A14-439660-9.0)
T79 (A14-246835-9.5 --> A14-439661-0.0)

(T81 SHEETS WITH COVER)

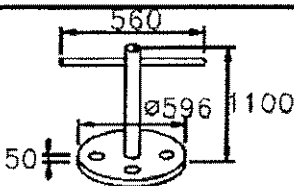
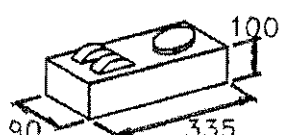
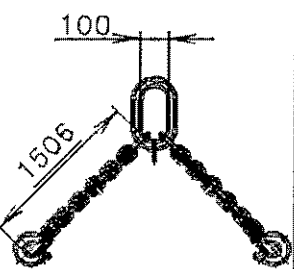
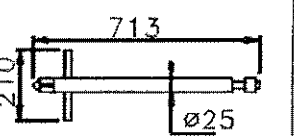
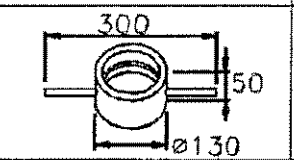
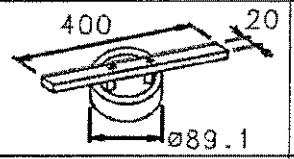
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R
120110	KML	SDC	SDC	*	CORRECTED.(FOR FINAL)	5
111216	KML	SDC	SDC	*	CORRECTED.	4
111202	KML	SDC	SDC	*	CORRECTED.	3
111102	KML	SDC	SDC	*	CORRECTED.	2
111014	KML	SDC	SDC	*	CORRECTED.(FOR WORKING)	1
110228	KML	SDC	SDC	*	Replacement for ident.no.:	0
				FOR APPROVAL		
Licencee Ident.no.:				Type:		
				6S90ME-C		
Info.no.:				Description:		
Page.no.:				LIST OF TOOLS FOR MAIN ENGINE		Ident.no.:
01 OF 01						A14-413704-0

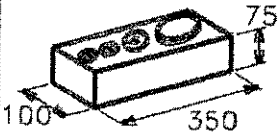
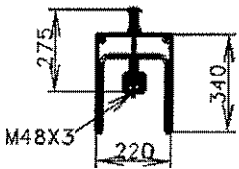
NO.	GROUP	DWG.NO	DESCRIPTION	PAGE	REV.NO
2		A14-413705-2.5	INDEX OF TOOL LIST(1/2)	T02	△△△△△
3		A14-413705-2.5	INDEX OF TOOL LIST(2/2)	T03	△△△△△
4	901	A14-268297-0.3	CYLINDER COVER, TOOLS	T04	△
5	901	A14-260830-3.0	CYLINDER COVER, TOOLS	T05	
6	901	A14-310787-7.1	CYLINDER COVER, TOOLS	T06	
7	902	A14-261588-5.3	PISTON AND STUFFING BOX	T07	△
8	902	A14-272694-4.1	PISTON AND STUFFING BOX	T08	△
9	902	A14-261545-8.4	PISTON AND STUFFING BOX	T09	△
10	902	A14-441391-7.0	CYLINDER LINER	T10	△△
11	902	A14-258105-0.1	TEST EQUIPMENT FOR ACCUMULATORS	T11	
12	904	A14-272693-2.1	CROSSHEAD AND CONNECTING ROD	T12	△
13	904	A14-442814-5.0	CROSSHEAD AND CONNECTING ROD	T13	△△
14	904	A14-193717-8.4	CROSSHEAD AND CONNECTING ROD	T14	△
15	905	A14-261546-0.1	MAIN BEARING TOOL	T15	
16	905	A14-261547-1.0	MAIN BEARING TOOL	T16	
17	905	A14-261551-6.2	MAIN BEARING TOOL	T17	
18	905	A14-268226-0.1	CRANKSHAFT AND MAIN/THRUST BRG.	T18	
19	905	A14-238284-1.4	FRAME BOX AND MAIN/THRUST BRG.	T19	
20	905	A14-188156-6.3	FRAME BOX AND MAIN/THRUST BRG.	T20	
21	906	A14-309283-7.0	MECHANICAL CONTROL GEAR, TOOLS	T21	
22	906	A14-259566-7.4	TOOL FOR MEMB. ACCUMULATOR	T22	
23	908	A14-421846-6.1	EXHAUST VALVE, TOOLS	T23	△
24	908	A14-421847-8.1	ME EXHAUST VALVE, TOOLS	T24	△
25	908	A14-268564-8.1	EXHAUST VALVE AND VALVE GEAR	T25	△
26	908	A14-354111-6.0	EXHAUST VALVE, TOOLS	T26	
27	909	A14-439669-5.1	HYDR. AND FUEL OIL SYSTEM, TOOLS	T27	△
28	909	A14-439670-4.0	HYDR. AND FUEL OIL SYSTEM, TOOLS	T28	△
29	909	A14-439677-7.1	HYDR. AND FUEL OIL SYSTEM, TOOLS	T29	△△
30	909	A14-439672-8.0	HYDR. AND FUEL OIL SYSTEM, TOOLS	T30	△
31	910	A14-388620-5.0	T/C SYSTEM	T31	
32	910	A14-291816-5.0	AIR COOLER	T32	
33	913	A14-297926-7.1	GENERAL TOOLS	T33	
34	913	A14-246844-2.3	GENERAL TOOLS	T34	
35	913	A14-263468-7.1	GENERAL TOOLS	T35	
36	913	A14-246847-8.1	GENERAL TOOLS	T36	
37	913	A14-246848-0.2	GENERAL TOOLS	T37	
38	913	A14-261576-6.1	GENERAL TOOLS	T38	
39	913	A14-261577-8.1	GENERAL TOOLS	T39	
40	913	A14-261578-0.1	GENERAL TOOLS	T40	
41	913	A14-180092-7.5	GENERAL TOOLS	T41	△
41-1	913	A14-268173-8.2	GENERAL TOOLS	T41-1	△
42	913	A14-246853-6.2	GENERAL TOOLS	T42	
43	913	A14-246854-8.3	GENERAL TOOLS	T43	
44	913	A14-246855-0.1	GENERAL TOOLS	T44	△

Similar no.:		Ship no.:		Scale:		Mass. (kg):	
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:		
120110	KML	SDC	SDC	*	CORRECTED.		
111216	KML	SDC	SDC	*	CORRECTED.		
111202	KML	SDC	SDC	*	CORRECTED.		
111102	KML	SDC	SDC	*	CORRECTED.		
111014	KML	SDC	SDC	*	CORRECTED.		
110228	KML	SDC	SDC	*	Replacement for Ident.no.:		
TOOLS		Type:		6S90ME-C			
Info. no.		Description:		INDEX OF TOOL LIST(1/2)		Ident.no.:	
						A14-413705-2	

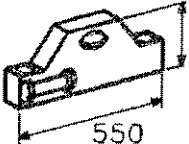
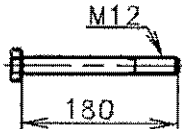
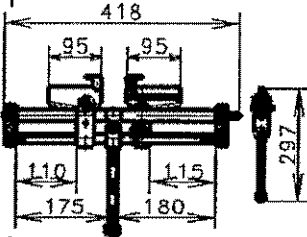
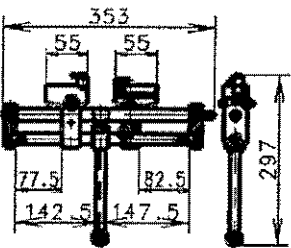
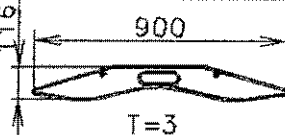
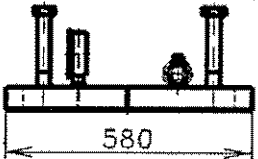
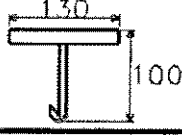
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Similar no.:					Ship no.:		Scale:		Mass. (kg):		
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
120110	KML	SDC	SDC	*	CORRECTED,						5
111216	KML	SDC	SDC	*	CORRECTED,						4
111202	KML	SDC	SDC	*	CORRECTED,						3
111102	KML	SDC	SDC	*	CORRECTED,						2
111014	KML	SDC	SDC	*	CORRECTED,						1
110228	KML	SDC	SDC	*	Replacement for Ident.no.:						0
TOOLS				Type:		6S90ME-C					
Info. no.				Description:				Ident.no.:			
				INDEX OF TOOL LIST(2/2)				A14-413705-2			

TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.	
					STAND- -ARD	ADDI- -TION	TOTAL				
046	P901	GRINDING TOOL FOR EXH. VALVE SEAT		CAST IRON STEEL	1		1	A19- 167387-4 (A12- 004292-7)	0984463-8		
									45.14 x 1		
060	P901	MILLING AND GRINDING TOOL FOR STARTING VALVE SEAT		TOOL STEEL CAST IRON WOOD	1		1	A19- 120561-5 (A13- 004090-4)	0955985-5		
									10.59x 1		
017	S	LIFTING CHAIN FOR CYLINDER COVER		STEEL	2		2	A19- 217989-3 (A13-260832-7)	3167240-9.		
									18.00x 2		
083	P901	HANDLE		STEEL	1		1	A19- 120565-2 (A13- 004096-5)	0955990-2		
									2.81 x 1		
095	P901	GRINDING RING FOR STARTING VALVE		CAST IRON	1		1	A19- 120566-4 (A14- 003804-5)	0955968-8		
									2.0 x 1		
105	P901	PIN WRENCH FOR STARTING VALVE SPINDLE		STEEL	1		1	A19- 120567-6 (A13- 004086-0)	0955971-1		
									0.501 x 1		
Similar no.:					Ship no.:			Scale:		Mass. (kg):	
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
				*							5
				*							4
111012	KHT	OJS	KSL	*	TOOL No. 046,060,017 CORRECTED.						3
070223	CRS	OJS	KBY	*	TOOL No. 117 DELETED.						2
050607	CRS	OJS	KBY	*	TOOL No. 117 CORRECTED : A19-234246-8-->A19-230436-8						1
050404	CRS	OJS	KBY	*	Replacement for Ident.no.: A14-184206-9.5-->A14-268297-0						0
TOOLS		Type:				K90MC/-C, S90MC-C/ME-C					
Info. no.		Description:				CYLINDER COVER, TOOLS				Ident.no.:	
901000										A14-268297-0	

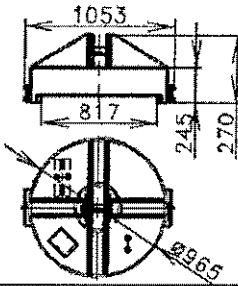
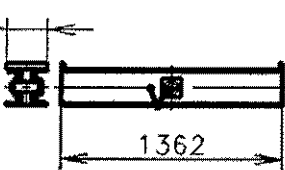
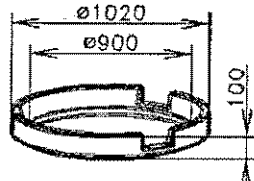
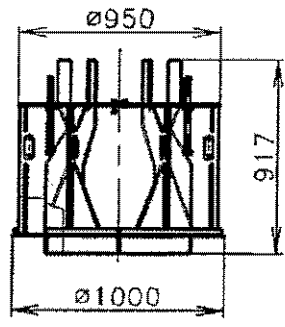
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.																																																								
					STANDARD	ADDITION	TOTAL																																																											
058	P901	MILLING AND GRINDING TOOL FOR FUEL VALVE SEAT		TOOL STEEL CAST IRON WOOD	1		1	A19-217945-4 (A13-225543-8)	3167298-5.1																																																									
									2.821 x 1																																																									
071	P901	DISMANTLING LEVER FOR FUEL VALVE		STEEL	1		1	A19-205810-4 (A13-205810-4)	3128926-5.0																																																									
									7.88 x 1																																																									
Similar no.: Ship no.: Scale: Mass. (kg): <table border="1"> <thead> <tr> <th>Date</th> <th>Des.</th> <th>Chk.</th> <th>Appd.</th> <th>A.C</th> <th>Replaced by Ident.no.:</th> <th></th> </tr> </thead> <tbody> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>R</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>S</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>4</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>3</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>2</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>1</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>0</td></tr> </tbody> </table> 050324 O.SIKBYI LWS Replacement for Ident.no.:											Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						*		R					*		S					*		4					*		3					*		2					*		1					*		0
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:																																																													
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TOOLS		Type: S90MC-C/ME-C																																																																
Info. no. 901000		Description: CYLINDER COVER, TOOLS				Ident.no.: A14-260830-3																																																												

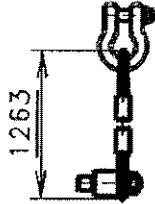
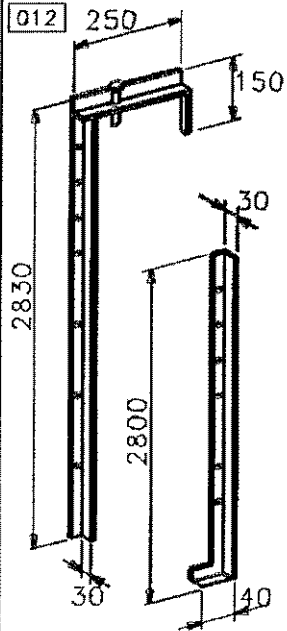
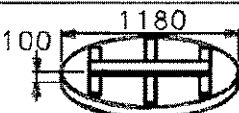
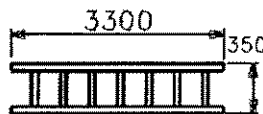
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TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.	
					STAND- -ARD	ADDI- -TION	TOTAL				
90251-0263 040	P902	LIFTING TOOL FOR PISTON ROD FOOT		STEEL	1		1	A19- 234373-4 (A13-D14001-0)	0984456-7.1 17.896 X 1		
90251-0263 171	P902	DISMANTLING SCREW FOR PISTON SKIRT		STEEL	2		2	A14- 116570-8	1733584-1.0 0.204 X 2		
90251-0263 134	P902	PISTON RING EXPANDER NOT CPR-RING		STEEL	1		1	A19- 234380-4 (A11-215153-2)	3167143-9.3 4.02 X 1		
90251-0263 135	P902	PISTON RING EXPANDER CPR-RING		STEEL	1		1	A19- 234381-6 (A11-215156-8)	3167145-2.2 3.89 X 1		
90251-0263 075	P902	TEMPLATE FOR PISTON TOP		STEEL	1		1	A12- 182969-1	1283682-8.0 [OROS] 1.54 X 1		
90251-0263 110	P902	PRESSURE TESTING TOOL FOR PISTON		STEEL	1		1	A19- 234310-6 (A12-210031-5)	3128941-9.0 32.39 X 1		
90251-0263 099	P902	COVER FOR STUFFING BOX HOLE		STEEL	1		1	A19- 234375-8 (A13-033999-6)	0992391-2.0 30.868 X 1		
90251-0263 109	P902	MOUNTING TOOL FOR STUFFING BOX SPRING		STEEL	2		2	A19- 169603-4 (A14-135065-0)	0993230-1.2 0.21 X 2		
Similar no.:		Ship no.:			Scale: NONE			Mass. (kg):			
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
				*							5
				*							4
111010	SJS	PNGIYGS	*		TOOL NO.134,135,075 DIM.MODIFIED						3
050531	PNGIYGS	KBY	*		PLATE NO.ADDED & TOOL NO.134/109 REMARK MOD.						2
041223	KMOIJGS	KYJ	*		TOOL NO.040,134,135,099,109 PART NO. REPLACED						1
041028	JGSIKJMIKYJ	*			Replacement for Ident.no.: PISTON CROWN DESIGN:OROS						0
TOOLS		Type:			S90MC-C/ME-C			HYUNDAI HEAVY INDUSTRIES CO., LTD.			
Info. no.		Description:			PISTON AND STUFFING BOX			Ident.no.:			
902-000								A14-261588-5			

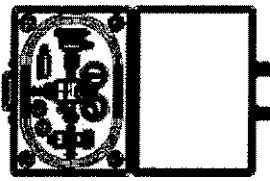
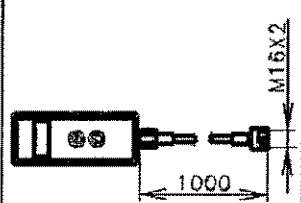


TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.																																																																																																																																																																																																
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90251-0263 087	P902	DISTANCE PIECE		STEEL	4		4	A13- 182970-0	1227202-1.1																																																																																																																																																																																																	
									6.27 X 4																																																																																																																																																																																																	
90251-0263 122	P902	WORK TABLE FOR STUFFING BOX		STEEL	1		1	A19- 234311-8 (A11-412412-5)	5243231-5.0																																																																																																																																																																																																	
									19.44 X 1																																																																																																																																																																																																	
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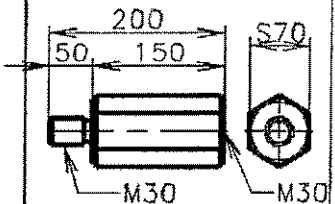
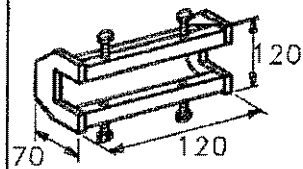
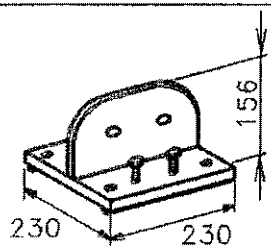
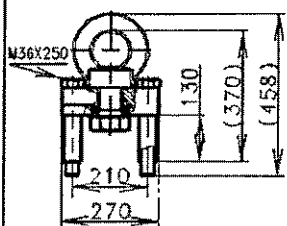
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.																																																	
					STANDARD	ADDITION	TOTAL																																																				
90266-0001 016	S	LIFTING TOOL FOR PISTON		STEEL	1		1	A19-234384-1 (A11-412416-2)	3127572-3.7																																																		
									378.92 X1																																																		
90366-0004 021	S	LIFTING CROSS BAR FOR PISTON CYL. LINER		STEEL	1		1	A19-234314-3 (A10-210033-9)	3128939-7.2																																																		
									99.22X1																																																		
90261-0102 019	S	GUIDE RING FOR PISTON		STEEL	1		1	A12-182988-0	1283680-4.4																																																		
									80.65 x 1																																																		
90265-0003 010	S	SUPPORT IRON FOR PISTON		STEEL	1		1	A19-234383-0 (A10-412415-0)	3100609-8.4																																																		
									189.24 X1																																																		
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Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R																																																					
111010	SJS	PNG	YGS	*	TOOL NO. 016, 010 DWG. NO. MODIFIED	5																																																					
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050525	SHC	PNG	YGS	*	TOOL NO. CHANGED	3																																																					
041223	KMO	JGS	KYJ	*	PART NO. REPL.: 020(A19-234313-1->A19-234384-1), 056(A19-234312-0->A19-234383-0.0)	2																																																					
041021	JGS	KJM	KYJ	*	Replacement for Ident.no.:	1																																																					
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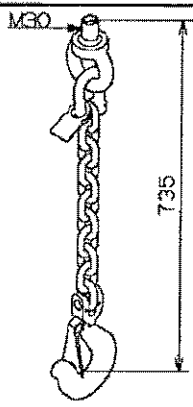
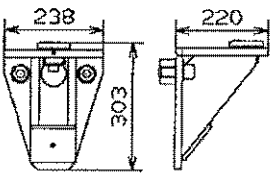
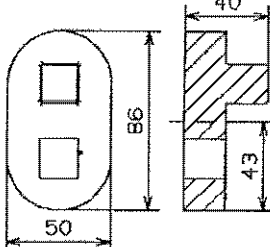
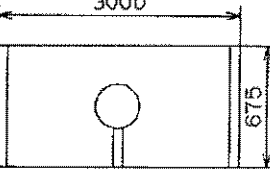
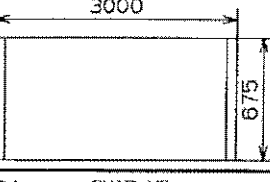
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STANDARD	ADDITION	TOTAL			
051	P902	LIFT TOOL FOR CYL. LINER		STEEL	2		2	A19-234315-5 (A13-210028-2)	3128936-1.0	
									9.63 X 2	
012	S	MEASURING ROD FOR CYL. LINER		STEEL	1		1	A19-348444-3 (A12-441617-8)	5281003-4	
024	S				1		1	A12-441618-0	5280928-0	
									4.3 X 1	
									3.76X 1	
0301	S	COVER FOR CYL. BORE		WOOD	2		2	A19-234390-0 (A13-126136-1)		
									9.5 X 2	
0302	S	LADDER		ALUMINUM	1		1	A19-235154-0 (A13-060351-0)		
									20.2 X 1	
048		MEASURING TOOL FOR CYL. LINER			1		1	A19-235514-6 (A14-188088-1)	1226533-4.0	
									2.03X1	
Similar no.: A14-274210-2.3					Ship no.:		Scale: NONE		Mass. (kg):	
Date	Des.	Chk.	Appd.	A.G	Replaced by Ident.no.:					
				*						
				*						
				*						
				*						
				*						
111208 JHY/KMO/KPJ					* Replacement for Ident.no.:					
TOOLS		Type:		S90MC-C8.2/ME-C8.2						
Info. no.		Confidential:		Description:					Ident.no.:	
902000		B		CYLINDER LINER					A14-441391-7	

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HEAVY INDUSTRIES CO., LTD.

TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.																																																	
					STAND- -ARD	ADDI- -TION	TOTAL																																																				
083		TEST EQUI. FOR ACCUMULATORS		MAKER	1		1	A19- 233474-7	5001623- 5.0																																																		
									3.18X 1																																																		
012		PRESSURE GAUGE		MAKER	1		1	A14- 256978-3	1270552- 6.1																																																		
									0.54X 1																																																		
Similar no.: Ship no.: Scale: Mass.(kg): <table border="1"> <thead> <tr> <th>Date</th> <th>Des.</th> <th>Chk.</th> <th>Appd.</th> <th>A.C</th> <th>Replaced by Ident.no.:</th> <th>R</th> </tr> </thead> <tbody> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>5</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>4</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>3</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>2</td></tr> <tr><td>041006</td><td>KML</td><td>KJM</td><td>KYJ</td><td>*</td><td>TOOL NO ADDED.</td><td>1</td></tr> <tr><td>040718</td><td>KCH</td><td>YSC</td><td>YSC</td><td>*</td><td>Replacement for Ident.no.:</td><td>0</td></tr> </tbody> </table> TOOLS Type: ME/ME-C Ident.no.: Info. no. Description: Ident.no.: 902000 TEST EQUIPMENT FOR ACCUMULATORS A14-258105-0 											Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R					*		5					*		4					*		3					*		2	041006	KML	KJM	KYJ	*	TOOL NO ADDED.	1	040718	KCH	YSC	YSC	*	Replacement for Ident.no.:	0
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R																																																					
				*		5																																																					
				*		4																																																					
				*		3																																																					
				*		2																																																					
041006	KML	KJM	KYJ	*	TOOL NO ADDED.	1																																																					
040718	KCH	YSC	YSC	*	Replacement for Ident.no.:	0																																																					

①

TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STANDARD	ADDITION	TOTAL			
90451-0146 202	P904	LIFTING ATTACHMENT FOR CROSSHEAD BEARING CAP		STEEL	2		2	A13-204380-6	1733676-4.2	
									4.9 X 2	
90451-0146 047	P904	GUIDE FOR WIRE		STEEL	1		1	A19-169633-0 (A13-254991-4)	3127082-2.2	
									1.590 X 1	
90451-0146 059	P904	LIFTING ATTACHMENT FOR CON. ROD		STEEL	4		4	A19-233550-3 (A13-177986-2)	3127526-9.2	
									17.48 X 4	
90451-0146 060	P904	LIFTING TOOL FOR CROSSHEAD		STEEL	1		1	A19-234318-0 (A13-193657-5)	3127909-3.2	
									34.89 X 1	
Similar no.:		Ship no.:		Scale: NONE		Mass. (kg):				
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:					R
				*						S
				*						4
				*						3
				*						2
111010	SJS	PNG	YGS	*	TOOL NO.047 DWG.NO.MODIFIED					1
050531	PNG	YGS	KBY	*	Replacement for Ident.no.: A14-193713-0.5					0
TOOLS		Type:		S90MC-C/ME-C						
Info. no.		Description:		CROSSHEAD AND CON. ROD				Ident.no.:		
904-00								A14-272693-2		

TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.	
					STAND- -ARD	ADDI- -TION	TOTAL				
072	P904	CHAIN FOR SUSPENDING PISTON		STEEL	2		2	A19- 169636-6 (A13- 285000-6)	3127030-7.1		
									6.770 x 2		
118	P904	BRACKET FOR SUPPORT OF CROSSHEAD		STEEL	2		2	A19- 308411-0 (A13- 392516-7)	5074766-0.2		
									20.86 x 1		
084	P904	RETAINING TOOL FOR TELESCOPE PIPE		STEEL	1		1	A19- 186477-5 (A14- 178710-8)	3127081-0.2		
									0.210 x 1		
132	P904	TORQUE WRENCH OFFSET TOOL		STEEL	1		1	A13- 193663-3	3188878-7.1		
									0.650 x 1		
096	P904	RUBBER COVER FOR CROSSHEAD		RUBBER	1		1	A13- 013947-0	1423857-2.0		
									3.0 x 1		
106	P904	RUBBER COVER FOR CROSSHEAD		RUBBER	1		1	A13- 182969-6	1433547-3.3		
									2.9 x 1		
Similar no.:		SIMILAR NO.		Ship no.:		SHIP NO.		Scale:	S90ME	Mass (kg):	MASS
Date	Des.	Chk.	Appd.	A.C	Replace by Ident.no.:						R
											5
											4
											3
											2
											1
2011130	SJS	PNG	YGS		Replace for Ident.no.:						0
TOOLS		Type: S90ME-C8.2									
Info. no.		Description:							Ident. no.:		
904000		CROSSHEAD AND CON. ROD (DOT2)							A14-442814-5		

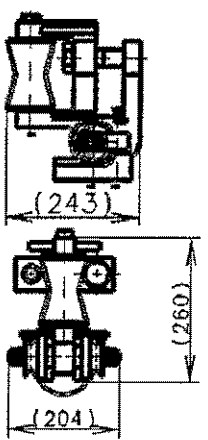
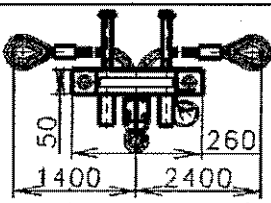
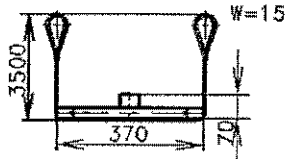
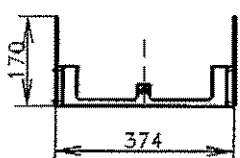
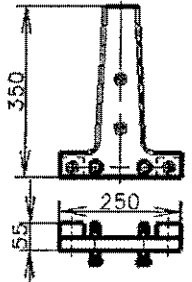
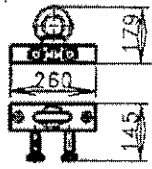
HYUNDAI
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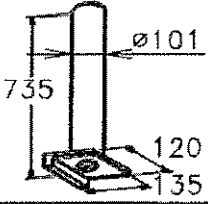
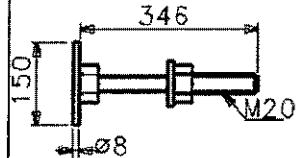
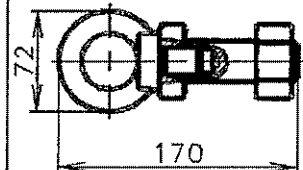
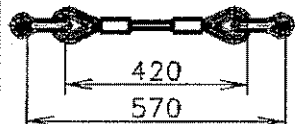
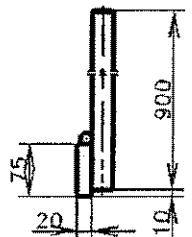
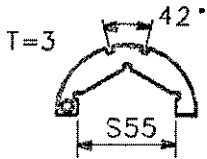
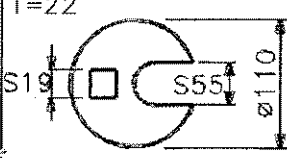
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TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STANDARD	ADDITION	TOTAL			
90462-0032 011	S	LIFTING TOOL FOR CRANK PIN BEARING SHELL		STEEL	1		1	A19-234321-3 (A11-397172-2)	3127542-4.1	
									11.62 X 1	

Similar no.:					Ship no.:					Scale: NONE					Mass. (kg):				
Date	Des.	Chk.	Appd.	A.G.	Replaced by Ident.no.:														
110406	SJS	PNG	YGS	*	DWG. NO. MODIFIED														
050531	PNG	YGS	KBY	*	PLATE NO. ADDED														
041021	JGS	KJM	KYJ	*	PART NO ADDED														
011221	KML	JGS	KSL	*	TOOL NO. 072-->011 CHANGED.														
000124	LJC	YGS	KSL	*	Replacement for Ident.no.:														

TOOLS		Type:	S90MC-C/ME-C			
Info. no.		Description:	CROSSHEAD AND CON. ROD		Ident.no.:	
904-000					A14-193717-8	

TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.	
					STANDARD	ADDITION	TOTAL				
040	P905	PULLEY FOR WIRE FOR MAIN BEARING		STEEL	1		1	A19-234322-5 (A12-236219-5)	3167885-6.0		
									22.22x1		
076	P905	LIFTING TOOL FOR MAIN BRG CAP		STEEL	1		1	A19-234323-7 (A11-188299-8)	3127836-1.4		
									7.91x1		
088	P905	DISM. TOOL FOR MAIN BRG SHELL		STEEL	1		1	A19-234324-9 (A11-188305-6)	3127882-6.0		
									1.78X1		
090	P905	MOUNTING TOOL FOR THIN BRG SHELL		STEEL	1		1	A19-234325-0 (A13-188307-0)	3127879-2.1		
									5.76x1		
100	P905	TOOL F. TURN OUT SEGMENT		STEEL	1		1	A19-233566-0 (A13-261504-4)	3127275-2.2		
									7.99 X 1		
111	P905	LIFTING ATTACHMENT		STEEL	1		1	A19-230612-9 (A12-188312-6)	3127878-0.1		
									11.5X1		
Similar no.:			Ship no.:		Scale: NONE			Mass. (kg):			
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
				*							5
				*							4
				*							3
				*							2
041223	KMO	JGS	KYJ	*	PART NO. REPL.: 100(A19-234326-2->A19-233566-0), 111(A19-234327-4->A19-230612-9)						1
041022	JGS	KJM	KYJ	*	Replacement for Ident.no.:						0
TOOLS		Type:			S90MC-C/ME-C						
Info. no.		Description:			MAIN BEARING TOOL			Ident. no.:			
905000								A14-261546-0			

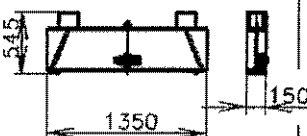
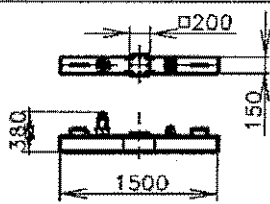
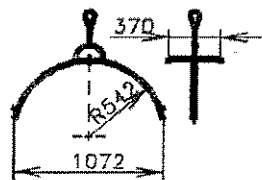
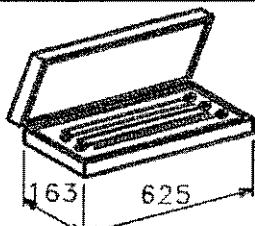
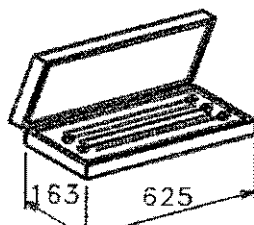
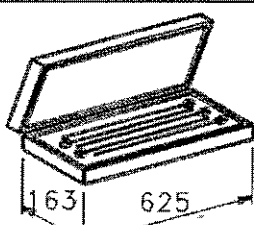
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STANDARD	ADDITION	TOTAL			
123	P905	RETAINING TOOL FOR BEARING SHELL		STEEL	2		2	A19-234329-8 (A13-188314-0)	3127880-2.0 11.01 X 2	
135	P905	LIFTING TOOL FOR CRANK CASE RELIEF VALVE		STEEL	1		1	A19-193576-0 (A13-004116-6)	0955735-2.0 1.23 X 1	
147	P905	EYE BOLT		STEEL	1		1	A19-224683-0 (A14-160989-0)	3127668-3.0 1.3X1	
160	P905	WIRE		MAKER	1		1	A19-233568-3 (A13-160992-2)	3127505-4.0 1.4X1	
172	P905	MOUNT TOOL, THIN BRG. SHELL		STEEL	1		1	A19-233578-9 (A12-188318-7)	3.4X1	
196	P905	TIGHTENING GAUGE FOR A.V. DAMPER		STEEL	1		1	A14-193695-3	3188664-2.0 0.040 X 1	
206	P905	CROW FOOT WRENCH		STEEL	1		1	A13-065047-0	0694115-9.3 0.9x1	

Similar no.: Ship no.: Scale: Mass. (kg):

Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	
				*		R
				*		5
				*		4
				*		3
				*		2
				*		1
				*		0

041022 JGS KJM KYJ Replacement for Ident.no.:

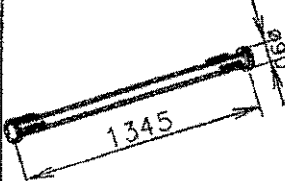
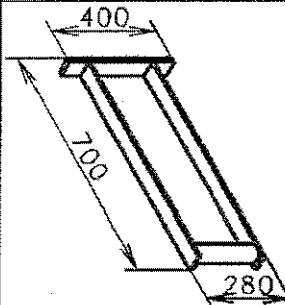
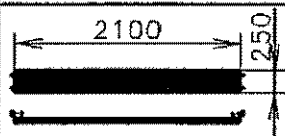
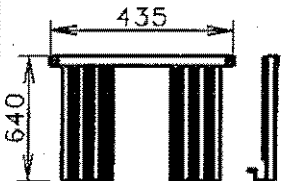
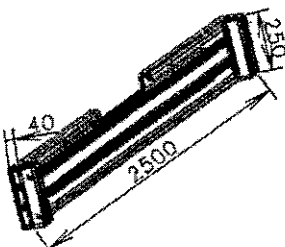
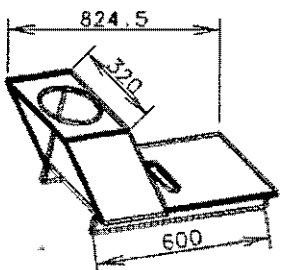
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Info. no.		Description:		Ident.no.:	
905000		MAIN BEARING TOOL		A14-261547-1	

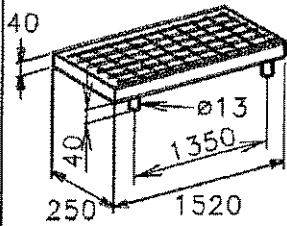
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.	
					STAND- -ARD	ADDI- -TION	TOTAL				
064	S	LIFTING TOOL FOR CRANKSHAFT		STEEL	1		1	A19- 234330-7 (A12-188321-0)	3127767-7.1 TO BE USED EXH. VALVE JACK M76X6 140X1		
019	S	LIFTING TOOL FOR THRUST SHAFT		STEEL	1		1	A19- 234331-9 (A12-188325-7)	3127846-8.1 98 X 1		
014	S	LIFTING TOOL FOR MAIN BRG SHELL		STEEL	1		1	A19- 234332-0 (A11-188327-0)	3127885-1.1 3.3X1		
033		FEELER GAUGE SET	 T=0.40, 0.45, 0.50, 0.55, 0.60, 0.65, 0.70	MAKER	1		1	A19- 225005-7 (A13-204327-6)	3128245-8.0 2.39X 1		
021		FEELER GAUGE SET	 T=0.05, 0.10, 0.15, 0.20, 0.25, 0.30, 0.35	MAKER	1		1	A19- 225004-5 (A13-204326-4)	3128237-5.1 2.39X 1		
045		FEELER GAUGE SET	 T=0.75, 0.80, 0.85, 0.90, 0.95, 1.00, 1.05	MAKER	1		1	A19- 225006-9 (A13-179699-7)	3128249-5.0 2.39X 1		
Similar no.:		Ship no.:			Scale: NONE			Mass. (kg):			
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
				*							5
				*							4
				*							3
050527	KML	KJM	KYJ	*	TOOL NO CORRECTED.						2
041223	KMO	JGS	KYJ	*	PART NO. REPL. : 052 (A19-225004-5-->A19-225005-7)						1
041025	JGS	KJM	KYJ	*	Replacement for Ident.no.:						0
TOOLS		Type:			S90MC-C/ME-C						
Info. no.		Description:			MAIN BEARING TOOL			Ident. no.:			
905000								A14-261551-6			

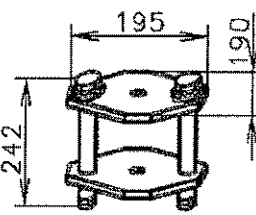
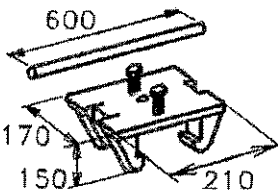
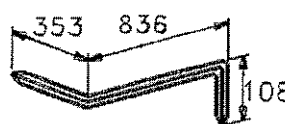
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.
					STAND- -ARD	ADDI- -TION	TOTAL			
048		CRANKSHAFT MEASURING TOOL (DIAL GAUGE)	L=17,22,27  L=15,30,60,120 210	MAKER	1 SET		1 SET	A19- 225039-0 (A13- 004254-9)	0.457 X 1	

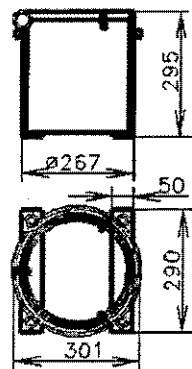
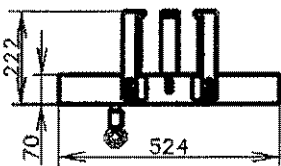
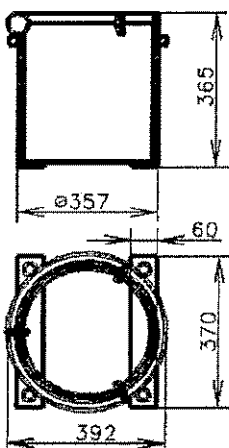
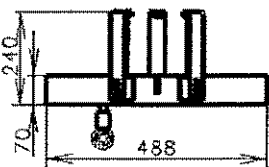
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Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:										R				
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				*											4				
				*											3				
				*											2				
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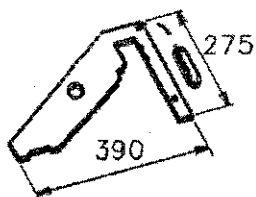
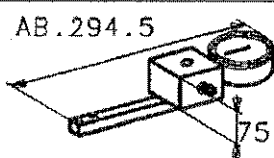
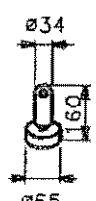
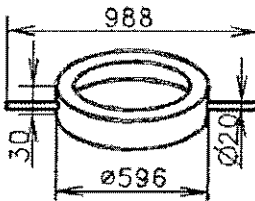
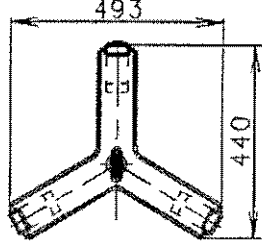
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Info. no.		Description:					Ident.no.:		
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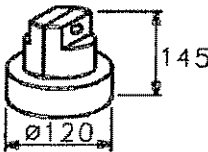
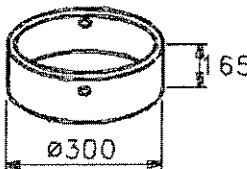
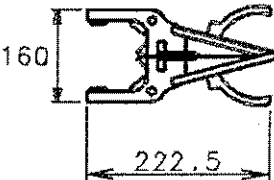
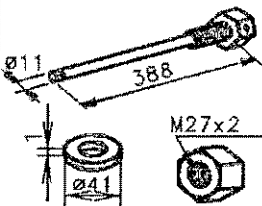
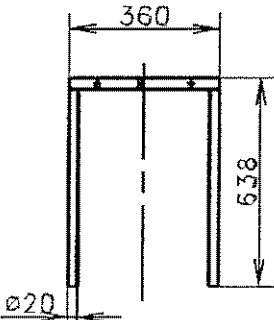
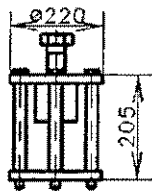
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.	
					STAND- -ARD	ADDI- -TION	TOTAL				
013	S	WORKING PLATFORM SUPPORT		STEEL	2		2	A19- 234910-3 (A11-236231-1)	3167706- 1.0	KIT : A19-217966-7	
									5.645x2		
025	S	WORKING PLATFORM SUPPORT		STEEL	1		1	A19- 228226-0 (A12-236161-3)	3167293- 6.0		
									3.542x1		
037	S	PLATFORM BOARD		STEEL	1		1	A19- 234911-5 (A12-236234-7)	3167707- 3.0		
									13.103x1		
049	S	PLATFORM BOARD		STEEL	2		2	A19- 234301-2 (A12-238269-0)	3167696- 3.0		
									7.133x2		
050	S	PLATFORM BOARD		STEEL	2		2	A19- 234912-7 (A11-238275-8)	3167674- 7.0		
									14.79x2		
086	S	LADDER		STEEL	1		1	A19- 234913-9 (A13-238277-1)	3167708- 5.0		
									6.87 x1		
Similar no.:			Ship no.:			Scale: NONE			Mass. (kg):		
Date	Des.	Chk.	Appd.	A.C.	Replaced by Ident.no.:						
050217	KML	KJM	KYJ	*	PAGE MOVED. (13-15-->5-8)						
041223	KMO	JGS	KYJ	*	PART NO. ADDED						
040528	KMO	JGS	KYJ	*	TOOL NO. CORR.: 701->013, 702->025, 703->037, 704->049, 705->050, 706->086						
031029	JGS	KJM	KYJ	*	PANEL NO. 701-706: S ADDED, DIM.: 702(685->700), 706(230->320)						
030923	KMO	JGS	KYJ	*	Replacement for Ident.no.:						
TOOLS		Type:			S90MC-C/ME-C			HYUNDAI HEAVY INDUSTRIES CO., LTD.			
Info. no.		Description:			Ident.no.:			A14-238284-1			
913000		FRAME BOX AND MAIN/THRUST BRG.									

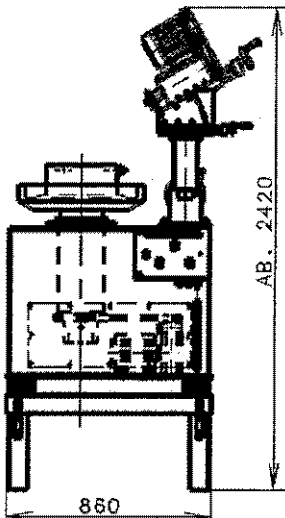
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.																																																								
					STANDARD	ADDITION	TOTAL																																																											
062	S	FOOT GRATING		ALUMI-NUM ALLOY	6		6	A14-188179-2	3127932-9																																																									
									6.66 X 6																																																									
Similar no.: Ship no.: Scale: Mass. (kg): <table border="1"> <thead> <tr> <th>Date</th> <th>Des.</th> <th>Chk.</th> <th>Appd.</th> <th>A.C</th> <th>Replaced by Ident.no.:</th> <th></th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td>*</td> <td></td> <td>R</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>*</td> <td></td> <td>S</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>*</td> <td></td> <td>4</td> </tr> <tr> <td>050217</td> <td>KML</td> <td>KJM</td> <td>KYJ</td> <td>*</td> <td>PAGE MOVED. (13-11-->5-9)</td> <td>3</td> </tr> <tr> <td>040528</td> <td>KMO</td> <td>JGS</td> <td>KYJ</td> <td>*</td> <td>TOOL NO. CORRECTED: 043->062</td> <td>2</td> </tr> <tr> <td>031029</td> <td>JGS</td> <td>KJM</td> <td>KYJ</td> <td>*</td> <td>GEOMETRIC CORRECTED</td> <td>1</td> </tr> <tr> <td>990914</td> <td>BSJ</td> <td>KBG</td> <td>KRY</td> <td>*</td> <td>Replacement for Ident.no.:</td> <td>0</td> </tr> </tbody> </table> TOOLS Type: S90MC-C  Info. no. 913000 Description: FRAME BOX AND MAIN/THRUST BRG. Ident.no.: A14-188156-6											Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						*		R					*		S					*		4	050217	KML	KJM	KYJ	*	PAGE MOVED. (13-11-->5-9)	3	040528	KMO	JGS	KYJ	*	TOOL NO. CORRECTED: 043->062	2	031029	JGS	KJM	KYJ	*	GEOMETRIC CORRECTED	1	990914	BSJ	KBG	KRY	*	Replacement for Ident.no.:	0
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:																																																													
				*		R																																																												
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050217	KML	KJM	KYJ	*	PAGE MOVED. (13-11-->5-9)	3																																																												
040528	KMO	JGS	KYJ	*	TOOL NO. CORRECTED: 043->062	2																																																												
031029	JGS	KJM	KYJ	*	GEOMETRIC CORRECTED	1																																																												
990914	BSJ	KBG	KRY	*	Replacement for Ident.no.:	0																																																												

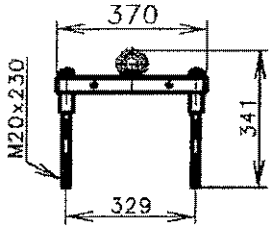
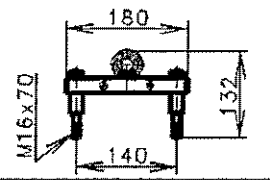
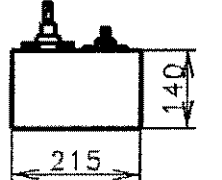
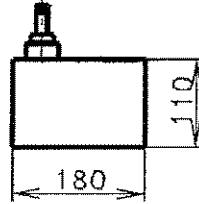
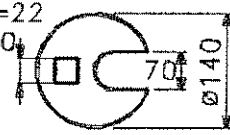
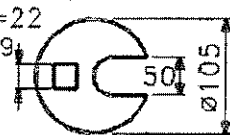
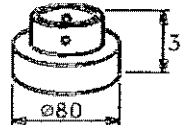
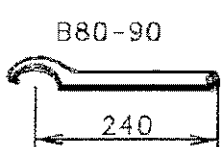
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.																																																								
					STANDARD	ADDITION	TOTAL																																																											
070	P906	CHAIN ASSEMBLING TOOL (4.5")		STEEL	1		1	A19-224620-2 (A13-178724-0)	3127382-9.1																																																									
									11.60 X 1																																																									
081	P906	CHAIN DISASSEMBLING TOOL (4.5")		STEEL	1		1	A19-224619-3 (A14-190122-6) (A14-135278-0)	3127385-4.2																																																									
									13.8 X 1																																																									
200	P906	PIN GAUGE FOR CRANKSHAFT		STEEL	1		1	A14-016506-9	1433365-1.1																																																									
			CONTROL MEAS.=895						2.45 X 1																																																									
Similar no.: Ship no.: Scale: NONE Mass.(kg): <table border="1"> <thead> <tr> <th>Date</th> <th>Des.</th> <th>Chk.</th> <th>Appd.</th> <th>A.C</th> <th>Replaced by Ident.no.:</th> <th></th> </tr> </thead> <tbody> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>6</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>5</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>4</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>3</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>2</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>1</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>0</td></tr> </tbody> </table> 071123KPIPKBY Replacement for Ident.no.:											Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						*		6					*		5					*		4					*		3					*		2					*		1					*		0
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:																																																													
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TOOLS		Type: S90ME-C																																																																
Info. no. 906000		Description: MECHNICAL CONTROL GEAR, TOOLS				Ident.no.: A14-309283-7																																																												

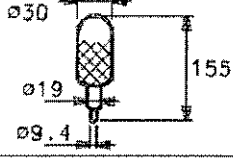
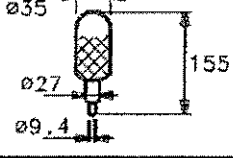
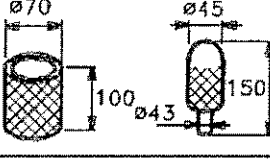
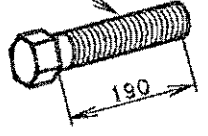
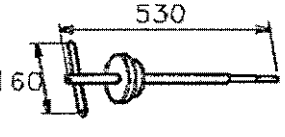
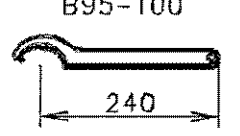
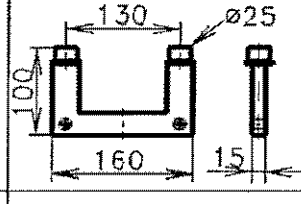
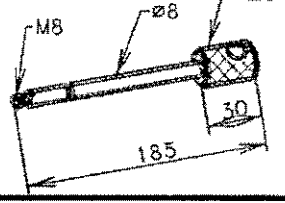
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.				
					STAND- -ARD	ADDI- -TION	TOTAL							
021		HOOK WRENCH FOR ACCUMULATOR (4 Liter)		STEEL	1		1	A19- 246463-3	A19-246464-5					
			24.6 x 1											
									STEEL		1		1	A19-246465-7
			20.2 x 1											
021		HOOK WRENCH FOR ACCUMULATOR (10 Liter)		STEEL	1		1	A19- 246466-9	A19-246467-0					
			41.2 x 1											
									STEEL		1		1	A19-246468-2
			19.8 x 1											
Similar no.:			Ship no.:			Scale: NONE		Mass. (kg):						
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R			
				*							5			
080612	AJY	MHK	YSC	*	ITEM CHANGED.						4			
060426	MHK	YDY	YDY	*	TOOL DRAWING MODIFIED						3			
050527	KML	KJM	KYJ	*	TOOL NO ADDED.						2			
041101	JGS	KJM	KYJ	*	LICENSOR PART NO. ADDED						1			
040916	KML	KJM	KYJ	*	Replacement for Ident.no.:						0			
TOOLS		Type: 4L + 10L												
Info. no.		Description:							Ident.no.:					
909905		TOOL FOR MEMB. ACCUMULATOR							A14-259566-7					

TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.	
					STAND- -ARD	ADDI- TION	TOTAL				
090	P908	GAUGE FOR EXH. V/V SPINDLE		STEEL	1		1	A19- 167324-6 (A12-027308-0)	0984511-8 1.05 x 1		
150	P908	GAUGE FOR EXH. V/V BOTTOM PIECE		STEEL	1		1	A13- 013998-9	1433568-8 0.32x1		
089	P908	TEST EQUIP. FOR EXHAUST VALVE	 0-50 Bar	STEEL	1		1	A19- 124252-2	5.13x 1 5202439-1		
112	P908	GRINDING TOOL FOR HIGH PRESS. PIPE		STEEL	1		1	A13- 347453-3	6.8 x 1		
185	P908	GRINDING RING FOR EXHAUST VALVE SEAT			1		1	A19- 167335-3 (A14-176781-0)	10.86x 1 3101769-6		
161	P908	LIFT TOOL FOR EXH. VALVE		STEEL	1		1	A19- 167330-4 (A13-176776-4)	9.25X 1 3102780-7		
Similar no.:		Ship no.:			Scale:			Mass. (kg):			
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
				*							5
				*							4
				*							3
				*							2
110930	KHT	OJS	KSL	*	TOOL NO.089/112 DWG.NO.REVISED						1
110511	KHT	OJS	KSL	*	Replacement for Ident.no.:						0
TOOLS		Type:			S90ME-C (LOW FORCE)			Ident.no.:			
Info. no.		Description:			EXHAUST VALVE, TOOLS			A14-421846-6			
908000											

TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.	
					STAND- -ARD	ADDI- -TION	TOTAL				
065	P908	LIFTING TOOL FOR EXH. V/V SPINDLE		STEEL	1		1	A19- 166531-1 (A13- 198247-0)	0984510- 6		
									4.8 x 1		
077	P908	CONERING FOR PNEUMATIC PISTON		STEEL	1		1	A12- 347456-9	5250837-9		
									6.0 x 1		
0802		PISTON RING OPENER (EXH. VALVE)		STEEL	1		1	A19- 121413-0 (A12- 009998-8)			
									0.62 x 1		
124	P908	TOOL FOR EMERGENCY OPEN EXHAUST VALVE (GASKET) (PLUG M27x2)		STEEL	1		1	A14- 347449-9	5251597-5		
					2		2	460.82.027041			
					2		2	A14-260846-0	0.7 x 1		
136	P908	BRIDGE GAUGE FOR EXHAUST VALVE		STEEL	1		1	A13- 347446-3	0938803-1		
									6.0 x 1		
148	P908	TOOL FOR HYDRAULIC PISTON		STEEL	1		1	A19- 167328-3 (A11- 115649-9)	0938969-6		
									22.06 x 1		
Similar no.:			Ship no.:			Scale:		Mass. (kg):			
Date	Des.	Chk.	Appd.	A.G	Replaced by Ident.no.:						R
				*							5
				*							4
				*							3
				*							2
110930	KHT	OJS	KSL	*	TOOL NO.077/124/136 DWG.NO.REVISED						1
110511	KHT	OJS	KSL	*	Replacement for Ident.no.:						0
TOOLS		Type:			S90ME-C (LOW FORCE)						
Info. no.		Description:			EXHAUST VALVE, TOOLS				Ident.no.:		
908000									A14-421847-8		

TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.																																																								
					STANDARD	ADDITION	TOTAL																																																											
046	S	EXHAUST V/V SPINDLE AND SEAT GRINDING MACHINE		MAKER	1	1		A10-268269-8	KOKACO TYPE: NKK-90BG -ME																																																									
									580 X 1																																																									
Similar no.: Ship no.: Scale: Mass. (kg): <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Date</th> <th>Des.</th> <th>Chk.</th> <th>Appd.</th> <th>A.O</th> <th>Replaced by Ident.no.:</th> <th></th> </tr> </thead> <tbody> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>R</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>S</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>4</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>3</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>2</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>1</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>0</td></tr> </tbody> </table> 090820 CRS QJS SJR * Replacement for Ident.no.:											Date	Des.	Chk.	Appd.	A.O	Replaced by Ident.no.:						*		R					*		S					*		4					*		3					*		2					*		1					*		0
Date	Des.	Chk.	Appd.	A.O	Replaced by Ident.no.:																																																													
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				*		3																																																												
				*		2																																																												
				*		1																																																												
				*		0																																																												
TOOLS		Type: S90ME-C																																																																
Info. no. 908000		Description: EXHAUST VALVE, TOOLS			Ident.no.: A14-354111-6																																																													

TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.	
					STAND- -ARD	ADDI- -TION	TOTAL				
069	P909	LIFTING TOOL FOR FUEL PUMP		STEEL	1		1	A19- 230554-0 (A13-253971-0)	7.42x1		
368	P909	LIFTING TOOL FOR HYDR. PLUNGER		STEEL	1		1	A19- 281953-3	1.87x1		
094	P909	MILLING TOOL FOR SEAT FOR FUEL OIL PIPE		STEEL WOOD	1		1	A19- 335852-0	4.74 X 1		
104	P909	MILLING TOOL FOR FUEL OIL PIPE (DOBULE WALL TYPE)		STEEL WOOD	1		1	A19- 234340-2	3.92 X 1		
116	P909	CROWFOOT SPANNER FOR FUEL OIL PIPE		STEEL	1		1	A13- 394250-1	1.8 X1		
128	P909	CROWFOOT SPANNER FOR FUEL OIL PIPE		STEEL	1		1	A13- 004270-2	0.8 X1		
153	P909	FLAGE-DISM. FOR NON RETURN VALVE		CARBON STEEL	1		1	A14- 023688-2	0.495 X 1		
249		HOOK WRENCH FOR FUEL VALVE		STEEL	1		1	A13- 007710-3	0.23 X 1		
Similar no.:		Ship no.:			Scale:			Mass. (kg):			
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
				*							5
				*							4
				*							3
				*							2
111010	KHT	QJS	KSL	*	TOOL NO. 116, 128: DWG. NO. CORRECTED						1
110930	KHT	QJS	KSL	*	Replacement for Ident.no.:						0
TOOLS		Type:			S90ME-C(300 bar)						
Info. no.		Description:			HYDR. AND FUEL OIL SYSTEM, TOOLS				Ident. no.:		
909000									A14-439669-5		

TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STANDARD	ADDI-TION	TOTAL			
165	P909	GRINDING MANDREL FOR VALVE HEAD		TOOL STEEL	1		1	A19-205806-0 (A14-210007-0)	3128671-1.1	
									0.54 X 1	
177	P909	GRINDING MANDREL FOR THRUST SPINDLE		TOOL STEEL	1		1	A19-205805-8 (A14-210005-6)	3128672-3.1	
									0.8 X 1	
189	P909	GRINDING MANDREL FOR OUTSIDE OF HOLDER		CAST IRON STEEL	1		1	A19-217998-7 (A13-226255-7)	3180360-2.0	
									3.201 X 1	
200	P909	SCREW FOR DISMANTLING OF TOP COVER		STEEL	2		2	220R6 120190	EN61W20200	
									0.54 x 2	
190	P909	GRINDING MANDREL		STEEL	1		1	A19-205804-6 (A13-210001-9)	3128674-7.2	
									2.51 x 1	
248	P909	HOO WRENCH FOR FUEL VALVE		STEEL	1		1	A13-004163-8	1423812-8.2	
									0.3 x 1	
297	P909	ASSEMBLING TOOL FOR FUEL VALVE		STEEL	1		1	A19-206287-1 (A13-179841-4)	3128600-5.1	
									1.03 X 1	
320	P909	LOCKING DEVICE		STEEL	1		1	A13-293024-8	5010974-4.0	
									0.12x1	

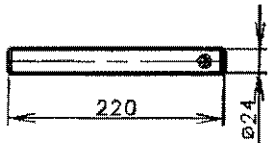
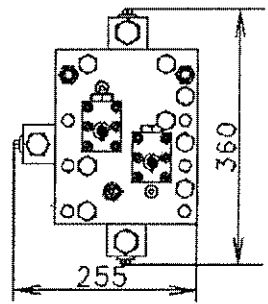
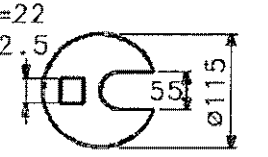
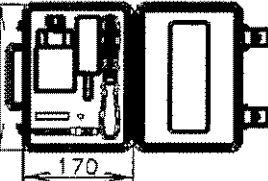
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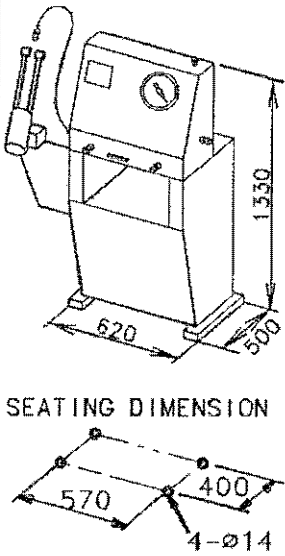
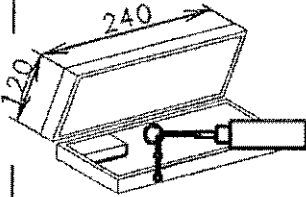
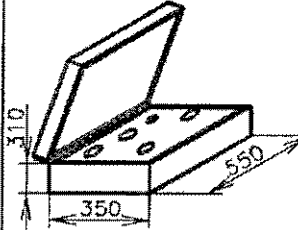
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				*		5
				*		4
				*		3
				*		2
				*		1
				*		0

110930(KHT)OJS(KSL) * Replacement for Ident.no.:

TOOLS	Type: S90ME-C(300 bar)	
Info. no. 909000	Description: HYDR. AND FUEL OIL SYSTEM, TOOLS	Ident. no.: A14-439670-4

T29

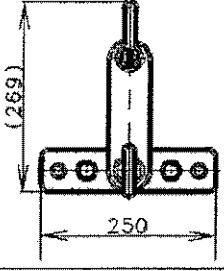
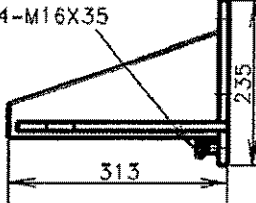
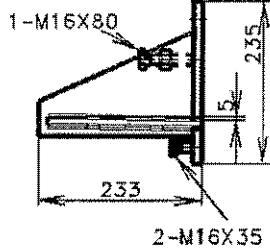
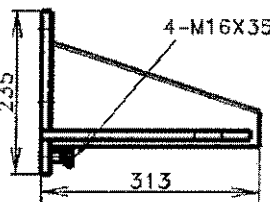
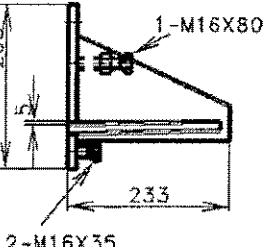
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STANDARD	ADDITION	TOTAL			
250	P909	DRIFT SPINDLE GUIDE		COPPER	1		1	A13-022399-2	1770602-3.2	
332	P909	CLEANING TOOL		STEEL	1		1	A19-230563-3	FIVA II 3.350x1	
130	P909	CROWFOOT SPANNER FOR FUEL OIL PIPE		STEEL	1		1	A13-407888-8	0.8 X1	
212		CLEANING SET FOR AUTOMIZER (SLIDE TYPE)		MAKER	1		1	A19-238659-2	2.68 x 1	
Similar no.: Ship no.: Scale: Mass. (kg):										
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:					R
				*						5
				*						4
				*						3
				*						2
120103	KHT	CHJ	KSL	*	TOOL NO.212 DWG.NO.REVISED					1
111013	KHT	OJS	KSL	*	Replacement for Ident.no.:					0
TOOLS		Type:			S90ME-C(300 bar)					
Info. no.	Confidential:	Description:					Ident.no.:			
909000	B	HYDR.AND FUEL OIL SYSTEM, TOOLS					A14-439677-7			

TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.
					STAND- -ARD	ADDI- -TION	TOTAL			
063	S	FUEL VALVE TEST DEVICE -SLIDE TYPE	 SEATING DIMENSION	MAKER	1		1	A19- 245648-7	TYPE: HDFD-1100 POWER SUPPLY :115~230V AC	125 x 1
075		PROBE LIGHT	 TYPE: 99-860	MAKER	1		1	A13- 021646-0	1750635- 0.1	1.1 x 1
021	S	TOOLS FOR MOUNTING OF SEALING FOR FUEL PUMP		MAKER	1		1	A19- 230566-9 (A13- 253984-0)	5001493- 9.0	12 x 1

Similar no.:					Ship no.:					Scale:					Mass.(kg):				
Date	Des.	Chk.	Appd.	A.G	Replaced by Ident.no.:										R				
				*											5				
				*											4				
				*											3				
				*											2				
				*											1				
110930	KHT	QJS	KSL	*	Replacement for Ident.no.:										0				

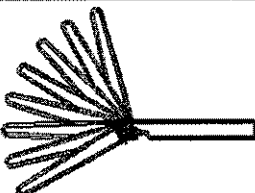
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Info. no. 909000		Description: HYDR. AND FUEL OIL SYSTEM, TOOLS		Ident. no.: A14-439672-8	

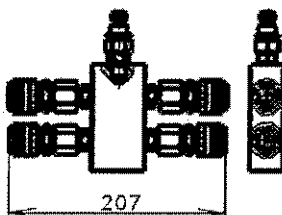
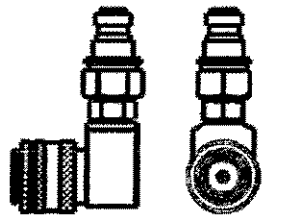
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.	
					STAND- -ARD	ADDI- -TION	TOTAL				
212.	MC-C(P910)	PULLING TOOL FOR COMPENSATOR		STEEL	3		3	A19- 124185-0 (A13- 157349-3)	3102097-8		
									0.692 x 3		
224	MC-C(P910)	EYEBOLT		STEEL	2		2	780DP 201200	EN69R12		
									0.2 x 2		
195	S	THROTTLE PLATE	T=13 	STEEL	1		1	A19- 208665-2 (A13- 180023-0)	3127298-0		
									26.99 x 1		
205	S	BLANK PLATE	T=13 	STEEL	1		1	A19- 208667-6 (A13- 180024-2)	3127299-2		
									27.02 x 1		
146	S	BLIND FLANGE	T=3.2 	STEEL	1		1	A14- 388621-7			
									25.5 x 1		
183	S	THROTTLE PLATE	T=6 	STEEL	1		1	A14- 180026-6	1262415-6		
									13.20 X 1		
171	S	BLANK PLATE	T=6 	STEEL	1		1	A14- 180027-8	1262414-4		
									13.20 x 1		
218		BOLT	M24x50 	STEEL	4		4	221R6 - 124050	EN61V2450		
									0.27 x 4		
Similar no.:		Ship no.:			Scale:			Mass. (kg):			
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
				*							5
				*							4
				*							3
				*							2
				*							1
110302KNHJYG/PBS				*	Replacement for Ident.no.:						0
TOOLS		Type:			L/S/K-MC/MC-C						
Info. no.		Description:			T/C SYSTEM (MET71MB)			Ident.no.:			
910-000000								A14-388620-5			

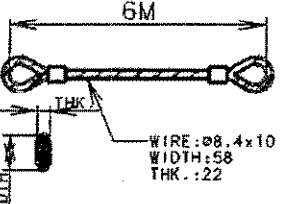
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STANDARD	ADDITION	TOTAL			
045		LIFTING ATTACHMENT A.C. FORE END		STEEL	2		2	A19-124295-0 (A13-148520-6)	3101434-1	
									5.29 X 2	
057		GUIDE RAIL A.C. FORE END		STEEL	1		1	A19-124296-1 (A13-169155-2)	3102598-7	
									6.64 X 1	
070		GUIDE RAIL A.C. REAR END		STEEL	1		1	A19-124297-3 (A13-169159-0)	3102608-5	
									5.87 X 1	
069		GUIDE RAIL A.C. FORE END		STEEL	1		1	A19-164296-2 (A13-16899-6)	3102599-9	
									6.97 X 1	
082		GUIDE RAIL A.C. REAR END		STEEL	1		1	A19-124298-5 (A13-169163-4)	3102609-7	
									5.87 X 1	

Similar no.:					Ship no.:					Scale:					Mass. (kg):				
Date	Des.	Chk.	Appd.	A.C.	Replaced by Ident.no.:										R				
				*											5				
				*											4				
				*											3				
				*											2				
				*											1				
070110KMLJGSJKYJ					Replacement for Ident.no.:										0				

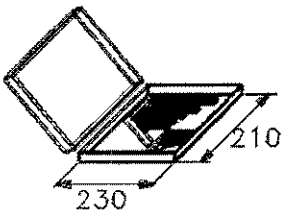
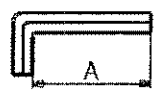
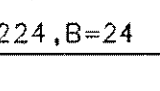
TOOLS		Type: L/S/K-MC-C		HYUNDAI HEAVY INDUSTRIES CO., LTD.	
Info. no. 910-000000		Description: AIR COOLER (LKMx-B)		Ident. no.: A14-291816-5	

TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.																																																								
					STAND- -ARD	ADDI- -TION	TOTAL																																																											
057		FELLER GAUGE	 FELLER GAUGE SIZE: 0.05/0.10/0.15/0.20/0.25 0.30/0.35/0.40/0.45/0.50 0.55/0.60/0.65/0.70/0.75 0.80/0.85/0.90/0.95/1.00	MAKER	1		1	A14- 176044-2	1414820-1.0																																																									
									0.09 X 1																																																									
061		SLIDE CALIPER	 Measuring range: 0 - min. 140 mm.	MAKER	1		1	A14- 176045-4	1414821-3.0																																																									
									0.153 X 1																																																									
046		HOSE-STEEL WITH 2 UNION	 L=1.5 M WORKING PRESSURE:2500BAR	MAKER	4		4	A19- 244014-2																																																										
			 L=3.0 M WORKING PRESSURE:2500BAR		1		1	A19- 244019-1																																																										
			 L=5.0 M WORKING PRESSURE:2500BAR		1		1	A19- 244020-0																																																										
									1.84 X 4																																																									
									2.86 X 1																																																									
									4.22 X 1																																																									
Similar no.: Ship no.: Scale: Mass.(kg): <table border="1"> <thead> <tr> <th>Date</th> <th>Des.</th> <th>Chk.</th> <th>Appd.</th> <th>A.C</th> <th>Replaced by Ident.no.:</th> <th></th> </tr> </thead> <tbody> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>R</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>5</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>4</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>3</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>2</td></tr> <tr><td>071220</td><td>KML</td><td>JGS</td><td>KYJ</td><td>*</td><td>CORRECTED.</td><td>1</td></tr> <tr><td>070403</td><td>KML</td><td>JGS</td><td>KYJ</td><td>*</td><td>Replacement for Ident.no.: A14-246843-0.5</td><td>0</td></tr> </tbody> </table> TOOLS Type: S90ME -C/K98ME/ME -C  Info. no. 913000 Description: GENERAL TOOLS Ident.no.: A14-297926-7											Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						*		R					*		5					*		4					*		3					*		2	071220	KML	JGS	KYJ	*	CORRECTED.	1	070403	KML	JGS	KYJ	*	Replacement for Ident.no.: A14-246843-0.5	0
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:																																																													
				*		R																																																												
				*		5																																																												
				*		4																																																												
				*		3																																																												
				*		2																																																												
071220	KML	JGS	KYJ	*	CORRECTED.	1																																																												
070403	KML	JGS	KYJ	*	Replacement for Ident.no.: A14-246843-0.5	0																																																												

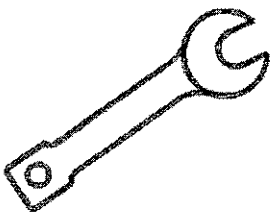
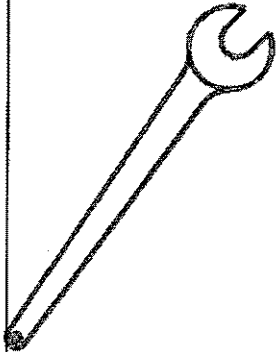
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.
					STAND- -ARD	ADDI- -TION	TOTAL			
105		DISTRIBUTOR BLOCK (3-WAY)	 WORKING PRESSURE:2500BAR	STEEL	2		2	A19- 233465-3 (A14-252600-2)	3167763-4.0	
117		DISTRIBUTOR BLOCK (5-WAY)	 WORKING PRESSURE:2500BAR	STEEL	1		1	A19- 233466-5 (A14-252602-6)	0.97x2 3401123-5.0	
166		ELBOW COUPLINGS	 WORKING PRESSURE:2500BAR	STEEL	2		2	A19- 233467-7 (A14-252604-0)	2.31x1 3401180-8.1	
									0.364x2	

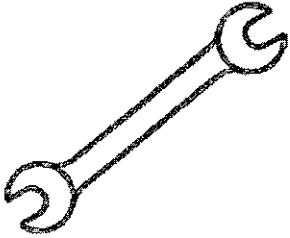
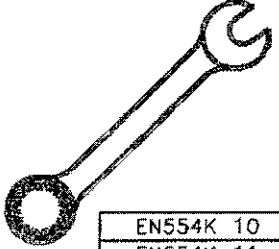
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.	
					STANDARD	ADDITION	TOTAL				
020		SHACKLE FOR LIFTING		EN518G10	4		4	786D3101000	EN518G		
031	EN518G12			4		4	786D3101200				
043	EN518G16			4		4	786D3101600				
055	EN518G20			4		4	786D3102000				
067	EN518G24			4		4	786D3102400				
079	EN518G30			4		4	786D3103000				
080	EN518G33			4		4	786D3103300				
092	EN518G42			4		4	786D3104200				
								77.00			
114		EYE BOLT		EN69R10	4		4	780DP201000	EN69R		
126	EN69R12			4		4	780DP201200				
138	EN69R16			4		4	780DP201600				
140	EN69R20			4		4	780DP202000				
151	EN69R24			8		8	780DP202400				
163	EN69R30			6		6	780DP203000				
175	EN69R36			2		2	780DP203600				
197	EN69R42			4		4	780DP204200				
199	EN69R48	4		4	780DP204800		67.2				
305	S	WIRE ROPE		STEEL	1		1	A19-189410-0 (A12-111288-6)	0752279-9.0		
			SWL. 9200KG						17.4 X 1		
Similar no.:		Ship no.:		Scale:		Mass. (kg):					
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
				*							5
				*							4
				*							3
				*							2
090930	KML	LKI	LKI	*	TOOL NO 197 ADDED.						1
041223	KMO	JGS	KYJ	*	Replacement for Ident.no.:						0
TOOLS		Type:		S90ME-C							
Info. no.		Description:		GENERAL TOOLS						Ident.no.:	
913000										A14-263468-7	

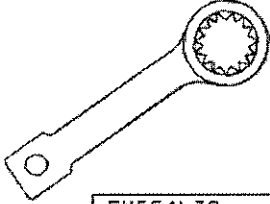
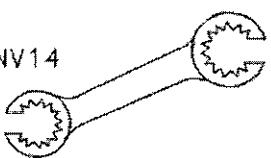
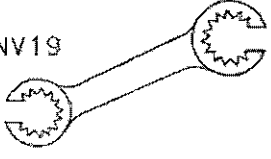
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.																									
					STANDARD	ADDITION	TOTAL																												
016		SOCKET WRENCH SET	EN563H1 (12.5 MM) <table border="1"> <tr><td>RATCHET HANDLE</td><td>EN506B 12.0</td></tr> <tr><td>HANDLE WITH SLIDING PIESE</td><td>EN506A 12.0</td></tr> <tr><td>UNIVERSAL JOINT</td><td>EN506P 12.0</td></tr> <tr><td>EXTENDER</td><td>EN506F 12.5 125</td></tr> <tr><td></td><td>EN506F 12.5 250</td></tr> <tr><td rowspan="5">BOX SPANNER</td><td>EN506L 10</td></tr> <tr><td>EN506L 13</td></tr> <tr><td>EN506L 17</td></tr> <tr><td>EN506L 19</td></tr> <tr><td>EN506L 22</td></tr> <tr><td rowspan="5">BOX SPANNER FOR INSIDE HEXAGON</td><td>EN506G 5</td></tr> <tr><td>EN506G 6</td></tr> <tr><td>EN506G 7</td></tr> <tr><td>EN506G 8</td></tr> <tr><td>EN506G 10</td></tr> <tr><td></td><td>EN506G 12</td></tr> <tr><td>BOX FOR TOOL SET</td><td>EN563G 1</td></tr> </table>	RATCHET HANDLE	EN506B 12.0	HANDLE WITH SLIDING PIESE	EN506A 12.0	UNIVERSAL JOINT	EN506P 12.0	EXTENDER	EN506F 12.5 125		EN506F 12.5 250	BOX SPANNER	EN506L 10	EN506L 13	EN506L 17	EN506L 19	EN506L 22	BOX SPANNER FOR INSIDE HEXAGON	EN506G 5	EN506G 6	EN506G 7	EN506G 8	EN506G 10		EN506G 12	BOX FOR TOOL SET	EN563G 1	TOOL STEEL	1 SET	1 SET	791V1110000	EN563H1	
				RATCHET HANDLE	EN506B 12.0																														
HANDLE WITH SLIDING PIESE	EN506A 12.0																																		
UNIVERSAL JOINT	EN506P 12.0																																		
EXTENDER	EN506F 12.5 125																																		
	EN506F 12.5 250																																		
BOX SPANNER	EN506L 10																																		
	EN506L 13																																		
	EN506L 17																																		
	EN506L 19																																		
	EN506L 22																																		
BOX SPANNER FOR INSIDE HEXAGON	EN506G 5																																		
	EN506G 6																																		
	EN506G 7																																		
	EN506G 8																																		
	EN506G 10																																		
	EN506G 12																																		
BOX FOR TOOL SET	EN563G 1																																		
								5.4 X 1																											
028			EN563H2 (20.0 MM) <table border="1"> <tr><td>RATCHET HANDLE</td><td>EN506B 20.0</td></tr> <tr><td>HANDLE WITH SLIDING PIESE</td><td>EN506A 20.0</td></tr> <tr><td>UNIVERSAL JOINT</td><td>EN506P 20.0</td></tr> <tr><td>EXTENDER</td><td>EN506F 20.0 200</td></tr> <tr><td></td><td>EN506F 20.0 400</td></tr> <tr><td rowspan="7">BOX SPANNER</td><td>EN506L 24</td></tr> <tr><td>EN506L 27</td></tr> <tr><td>EN506L 30</td></tr> <tr><td>EN506L 32</td></tr> <tr><td>EN506L 36</td></tr> <tr><td>EN506L 41</td></tr> <tr><td>EN506G 14</td></tr> <tr><td rowspan="3">BOX SPANNER FOR INSIDE HEXAGON</td><td>EN506G 17</td></tr> <tr><td>EN506G 19</td></tr> <tr><td>EN506G 2</td></tr> </table>	RATCHET HANDLE	EN506B 20.0	HANDLE WITH SLIDING PIESE	EN506A 20.0	UNIVERSAL JOINT	EN506P 20.0	EXTENDER	EN506F 20.0 200		EN506F 20.0 400	BOX SPANNER	EN506L 24	EN506L 27	EN506L 30	EN506L 32	EN506L 36	EN506L 41	EN506G 14	BOX SPANNER FOR INSIDE HEXAGON	EN506G 17	EN506G 19	EN506G 2		1 SET	1 SET	791V1120000	EN563H2					
				RATCHET HANDLE	EN506B 20.0																														
HANDLE WITH SLIDING PIESE	EN506A 20.0																																		
UNIVERSAL JOINT	EN506P 20.0																																		
EXTENDER	EN506F 20.0 200																																		
	EN506F 20.0 400																																		
BOX SPANNER	EN506L 24																																		
	EN506L 27																																		
	EN506L 30																																		
	EN506L 32																																		
	EN506L 36																																		
	EN506L 41																																		
	EN506G 14																																		
BOX SPANNER FOR INSIDE HEXAGON	EN506G 17																																		
	EN506G 19																																		
	EN506G 2																																		
							13.9 X 1																												
Similar no.:		Ship no.:		Scale: NONE		Mass. (kg):																													
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:					IR																									
				*						5																									
				*						4																									
				*						3																									
				*						2																									
040820	JGS	KJM	KYJ	*	.TOOL NO CORRECETD:914->016,028 ADDED					1																									
040207	PNGL	YGS	SCR	*	Replacement for Ident.no.:					0																									
TOOLS		Type:		L/S-MC/-C/ME/ME-C					HYUNDAI HEAVY INDUSTRIES CO., LTD.																										
Info. no.		Description:		GENERAL TOOLS					Ident.no.:																										
913000									A14-246847-8																										

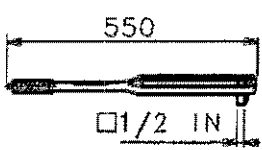
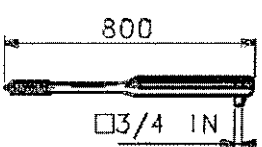
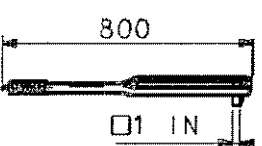
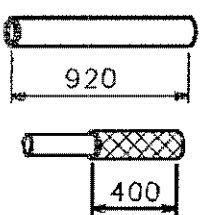
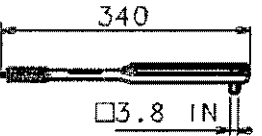
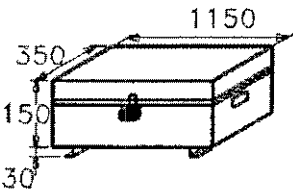
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.																													
					STANDARD	ADDITION	TOTAL																																
030		SOCKET WRENCH KEY SET FOR INTERNAL HEXAGON		TOOL STEEL	1 SET		1 SET	790V31 00000	EN549G1																														
			<table border="1"> <tr><td>EN549A1.5</td></tr> <tr><td>EN549A2</td></tr> <tr><td>EN549A2.5</td></tr> <tr><td>EN549A3</td></tr> <tr><td>EN549A4</td></tr> <tr><td>EN549A5</td></tr> <tr><td>EN549A6</td></tr> <tr><td>EN549A7</td></tr> <tr><td>EN549A8</td></tr> <tr><td>EN549A10</td></tr> <tr><td>EN549A12</td></tr> <tr><td>EN549A14</td></tr> <tr><td>EN549A17</td></tr> <tr><td>EN549A19</td></tr> <tr><td>EN549C1</td></tr> </table>	EN549A1.5	EN549A2	EN549A2.5	EN549A3	EN549A4	EN549A5	EN549A6	EN549A7	EN549A8	EN549A10	EN549A12	EN549A14	EN549A17	EN549A19	EN549C1				<table border="1"> <tr><td>727V1201500</td></tr> <tr><td>727V1202000</td></tr> <tr><td>727V1202500</td></tr> <tr><td>727V1203000</td></tr> <tr><td>727V1204000</td></tr> <tr><td>727V1205000</td></tr> <tr><td>727V1206000</td></tr> <tr><td>727V1207000</td></tr> <tr><td>727V1208000</td></tr> <tr><td>727V1210000</td></tr> <tr><td>727V1212000</td></tr> <tr><td>727V1214000</td></tr> <tr><td>727V1217000</td></tr> <tr><td>727V1219000</td></tr> <tr><td>790ZZ200000</td></tr> </table>	727V1201500	727V1202000	727V1202500	727V1203000	727V1204000	727V1205000	727V1206000	727V1207000	727V1208000	727V1210000	727V1212000	727V1214000	727V1217000	727V1219000	790ZZ200000		
EN549A1.5																																							
EN549A2																																							
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EN549A3																																							
EN549A4																																							
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EN549A19																																							
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727V1208000																																							
727V1210000																																							
727V1212000																																							
727V1214000																																							
727V1217000																																							
727V1219000																																							
790ZZ200000																																							
150		SPANNER	A=200, B=22 	TOOL STEEL	1		1	727V1 222000	EN549A22																														
161			A=224, B=24 		1		1	727V1 224000	EN549A24																														

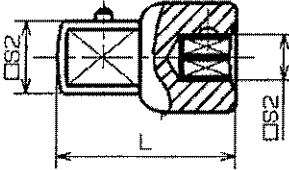
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Date	Des.	Chk.	Appd.	A.C	Replace by Ident.no.:										R				
				*											S				
				*											4				
				*											3				
070126	KML	JGS	KYJ	*	TOOL NO 150, 161 ADDED.										2				
040820	JGS	KJM	KYJ	*	TOOL NO. CORRECTED: 915-->030										1				
040207	JGS	KJM	KYJ	*	Replace for Ident.no.:										0				
TOOLS					Type: L/S-MC/MC-C/ME/ME-C														
Info. no. 913-913902					Description: GENERAL TOOLS										Ident. no.: A14-246848-0				

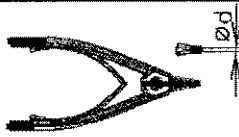
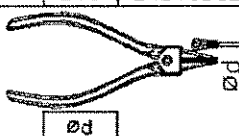
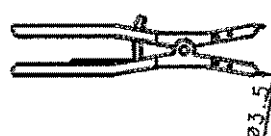
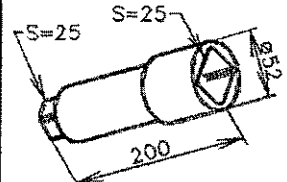
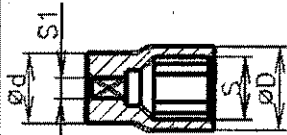
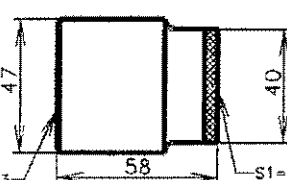
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.	
					STANDARD	ADDITION	TOTAL				
		SINGLE OPEN ENDED IMPACT SPANNER		TOOL STEEL	EACH 1		EACH 1	A19-235443-6	0937925-9.0		
			EN553E 30				1	707V2103000			
			EN553E 32					707V2103200			
			EN553E 36					707V2103600			
			EN553E 41					707V2104100			
			EN553E 46					707V2104600			
			EN553E 50					707V2105000			
			EN553E 55					707V2105500			
			EN553E 60					707V2106000			
			EN553E 65					707V2106500			
			EN553E 70					707V2107000			
			EN553E 75					707V2107500			
			EN553E 80					707V2108000			
			EN553E 85					707V2108500			
			EN553E 95					707V2109500			
			EN553E 105					707V2110500			
			EN553E 115					707V2111500	65.3		
		SINGLE ENDED SPANNER		TOOL STEEL	EACH 1		EACH 1	A19-235442-4	0992444-1.1		
			EN551F65					704V1206500			
			EN551F70					704V1207000			
			EN551F75					704V1207500			
			EN551F80					704V1208000			
			EN551F85					704V1208500			
			EN551F95					704V1209500			
			EN551F105					704V1210500			
			EN551F115					704V1211500	35.527		
Similar no.:		Ship no.:			Scale:			Mass. (kg):			
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
				*							5
				*							4
				*							3
				*							2
071126	KML	JGS	KYJ	*	PART NO ADDED.						1
041025	JGS	KJMKYJ	*	Replacement for Ident.no.:						0	
TOOLS		Type:			S90MC-C/ME-C			HYUNDAI HEAVY INDUSTRIES CO., LTD.			
Info. no.		Description:			GENERAL TOOLS			Ident. no.:			
913000								A14-261576-6			

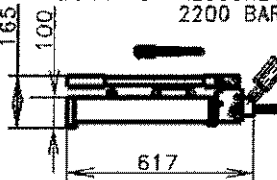
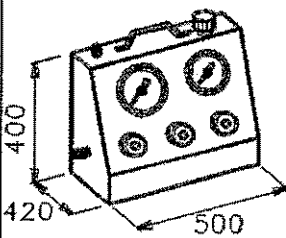
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.	
					STANDARD	ADDITION	TOTAL				
		DOUBLE HEAD OPEN ENDED SPANNER		TOOL STEEL	EACH 1		EACH 1	A19-235445-0	0937911-5.1		
								701V1206070			
								701V1208100			
								701V1212140			
								701V1213170			
								701V1216180			
								701V1219220			
								701V1224300			
								701V1227320			
								701V1236410			
								701V1246500			
								701V1255600	5.30		
		COMBINATION SPANNER		TOOL STEEL	EACH 1		EACH 1	A19-235444-8	3102526-9.0		
015			EN554K 10					708V1101000			
027			EN554K 11					708V1101100			
039			EN554K 12					708V1101200			
040			EN554K 13					708V1101300			
052			EN554K 14					708V1101400			
064			EN554K 15					708V1101500			
076			EN554K 16					708V1101600			
088			EN554K 17					708V1101700			
090			EN554K 18					708V1101800			
100			EN554K 19					708V1101900			
111			EN554K 21					708V1102100			
123			EN554K 22					708V1102200			
135			EN554K 24					708V1102400			
147			EN554K 27					708V1102700			
159			EN554K 30					708V1103000			
160			EN554K 32					708V1103200			
172			EN554K 34					708V1103400			
184			EN554K 36					708V1103600			
196			EN554K 41					708V1104100			
206			EN554K 46					708V1104600			
218			EN554K 50					708V1105000			
220			EN554K 55					708V1105500			
231			EN554K 60					708V1106000	45.55		
Similar no.:		Ship no.:			Scale:			Mass. (kg):			
Date	Des.	Chk.	Appd.	A.C.	Replaced by Ident.no.:						R
				*							5
				*							4
				*							3
				*							2
071126	KML	JGS	KYJ	*	PART NO ADDED.						1
041025	JGS	KJM	KYJ	*	Replacement for Ident.no.:						0
TOOLS		Type:			S90MC-C/ME-C						
Info. no.		Description:			GENERAL TOOLS			Ident. no.:			
913000								A14-261577-8			

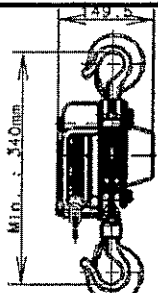
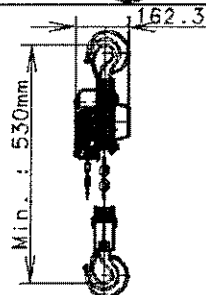
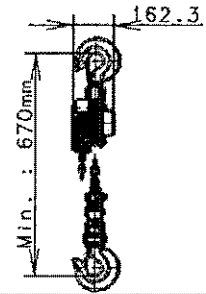
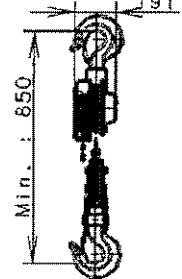
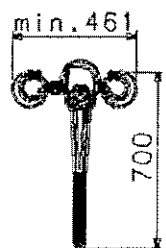
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.
					STANDARD	ADDITION	TOTAL			
		RING IMPACT SPANNER		TOOL STEEL	EACH 1		EACH 1	A19-235446-1	3101839-7.2 EN554L	
022			EN554L30					713V2103000		
034			EN554L32					713V2103200		
046			EN554L34					713V2103400		
058			EN554L36					713V2103600		
060			EN554L41					713V2104100		
071			EN554L46					713V2104600		
083			EN554L50					713V2105000		
095			EN554L55					713V2105500		
117			EN554L65					713V2106500		
120			EN554L70					713V2107000		
130			EN554L75					713V2107500		
142			EN554L80					713V2108000		
154			EN554L85					713V2108500		
164			EN554L90					713V2109000		
178			EN554L95					713V2109500		
180			EN554L100					713V2110000		
191			EN554L105					713V2110500		
213			EN554L115					713V2111500		
225			EN554L120					713V2112000		
									74.25	
011		12 POINT WRENCH	NV17  NV14	TOOL STEEL	1		1	A14-137121-3	0555607-0.2	
									0.1 X 1	
023		12 POINT WRENCH	NV22  NV19	TOOL STEEL	1		1	A14-169276-0	1281330-7.2	
									0.25X 1	
Similar no.:		Ship no.:		Scale:		Mass. (kg):				
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:					R
				*						5
				*						4
				*						3
				*						2
071126	KML	JGS	KYJ	*	TOOL NO 164 ADDED.					1
041025	JGS	KJM	KYJ	*	Replacement for Ident.no.:					0
TOOLS		Type:		S90MC-C/ME-C						
Info. no.		Description:		GENERAL TOOLS					Ident. no.:	
913000									A14-261578-0	

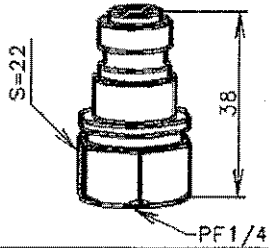
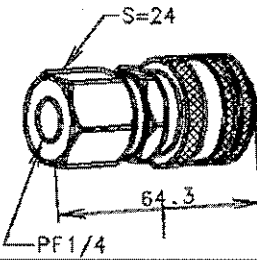
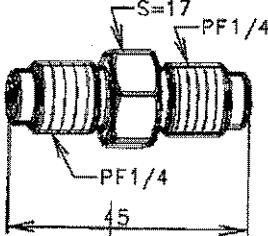
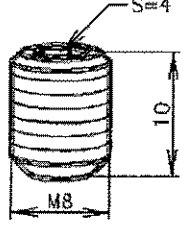
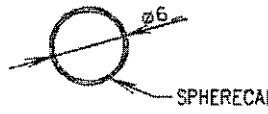
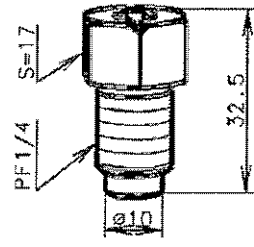
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.	
					STAND- -ARD	ADDI- -TION	TOTAL				
038		TORQUE SPANNER	 40 - 200 NM	MAKER	1		1	A13- 291798-8	1.4 X 1		
040			 140 - 760 NM	MAKER	1		1	A13- 189944-7	5.0 X 1		
051			 750 - 2000 NM 	MAKER	1		1	A13- 004150-7	0404364- 1.5	11.6 X 1	
014			 8 - 40 NM	MAKER	1		1	A13- 291799-0	0.9 X 1		
1550		TOOL BOX FOR TORQUE WRENCH		STEEL	1		1	A19- 263570-2			
Similar no.:					Ship no.:			Scale:		Mass. (kg):	
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
110901	KML	SDC	SDC	*	TYPE ADDED.						5
080509	KML	LGS	LKI	*	TOOL NO 1550 ADDED.						4
061219	KML	JGS	KYJ	*	TOOL NO 038, 014 DWG. NO CORRECTED.						3
040715	KJM	JGS	KYJ	*	CORRECTED TOOL NO.						2
040602	KML	KJM	KJM	*	TYPE CHANGED. (50MC-->MC/MC-C)						1
010727	SJK	KJM	KSL	*	Replacement for Ident.no.:						0
TOOLS		Type: MC/MC-C/ME/ME-C/ME-B									
Info. no.		Description: GENERAL TOOLS							Ident.no.:		
913902									A14-180092-7		

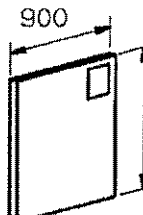
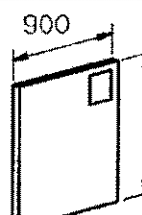
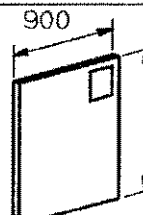
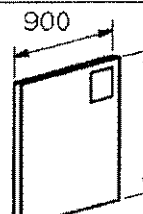
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.					
					STAND- -ARD	ADDI- -TION	TOTAL								
		ADAPTOR		TOOL STEEL				A14- 004272-6							
026					S1	S2	L				1		1	A19-225036-5	0820112-5
041			#06		12.5	10	38				1		1	A19-225037-7	0820113-7
053			#07		20	12.5	50				1		1	A19-230448-7	0820114-9
000			#08		25	20	68				1		1	A19-230585-8	0820109-1
056			#03		12.5	20	58				1		1	A19-230586-0	0820110-1
			#04	20	25	85									

TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.																			
					STANDARD	ADDITION	TOTAL																						
010 021 033 045		PLIER FOR RETAINING RING	 <table border="1"> <tr><th>Ød</th><th></th></tr> <tr><td>0.9</td><td>EN515D5</td></tr> <tr><td>1.3</td><td>EN515D10</td></tr> <tr><td>1.8</td><td>EN515D19</td></tr> <tr><td>2.3</td><td>EN515D32</td></tr> </table>	Ød		0.9	EN515D5	1.3	EN515D10	1.8	EN515D19	2.3	EN515D32	TOOL STEEL	EACH 1	EACH 1	A19-230454-5	3102472-8.2											
Ød																													
0.9	EN515D5																												
1.3	EN515D10																												
1.8	EN515D19																												
2.3	EN515D32																												
128 130 141 153	 <table border="1"> <tr><th>Ød</th><th></th></tr> <tr><td>1.1</td><td>EN515H10</td></tr> <tr><td>1.8</td><td>EN515H19</td></tr> <tr><td>2.3</td><td>EN515H32</td></tr> <tr><td>3.2</td><td>EN515H85</td></tr> </table>	Ød		1.1	EN515H10	1.8	EN515H19	2.3	EN515H32	3.2	EN515H85	740V1100500 740V1101000 740V1101900 740V1103200																	
Ød																													
1.1	EN515H10																												
1.8	EN515H19																												
2.3	EN515H32																												
3.2	EN515H85																												
069	 EN515F125	740V1501000 740V1501900 740V1503200 740V1508500																											
130		EXTENSION BAR		TOOL STEEL	1	1	750V1125200	EN506F25.0200																					
100 112 124		BOX SPANNER	 <table border="1"> <tr><th>Ød</th><th>ØD</th><th>S1</th><th>S</th><th></th></tr> <tr><td>50</td><td>62</td><td>20</td><td>46</td><td>EN506L46</td></tr> <tr><td>55</td><td>71</td><td>25</td><td>50</td><td>EN506L50</td></tr> <tr><td>57</td><td>77</td><td>25</td><td>55</td><td>EN506L55</td></tr> </table>	Ød	ØD	S1	S		50	62	20	46	EN506L46	55	71	25	50	EN506L50	57	77	25	55	EN506L55	TOOL STEEL	EACH 1	EACH 1	752V1246060 752V1250080 752V1255080	EN506L	
Ød	ØD	S1	S																										
50	62	20	46	EN506L46																									
55	71	25	50	EN506L50																									
57	77	25	55	EN506L55																									
207		SOCKET SPANNER		TOOL STEEL	1	1	A14-190098-0	1271720-9.0																					
								0.38 X 1																					
Similar no.:		Ship no.:		Scale:		Mass.(kg):																							
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:					R																			
				*						5																			
				*						4																			
				*						3																			
051019	KML	KJM	KYJ	*	PART NO ADDED.					2																			
040820	JGS	KJM	KYJ	*	TOOL NO. CHANGE : 072->010, 024->021, 036->033, 106->045, 131->128, 145->130, 155->141, 162->153, 180->069, 1302->100, 112, 124, 202->207, TOOL NO. 130 ADDED					1																			
040207	JGS	KJM	KYJ	*	Replacement for Ident.no.:					0																			
TOOLS		Type:		K98MC/-C/ME/ME-C		HYUNDAI HEAVY INDUSTRIES CO., LTD.																							
Info. no.		Description:		GENERAL TOOLS		Ident.no.:		A14-246853-6																					
913000																													

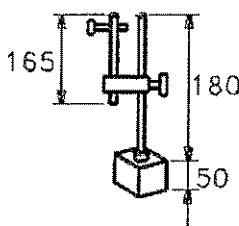
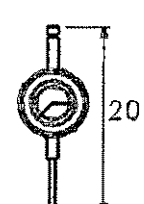
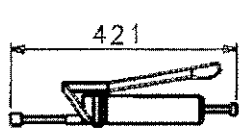
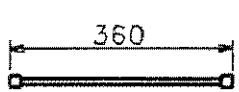
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.																																																								
					STANDARD	ADDITION	TOTAL																																																											
Q22		HYDR. PUMP FOR HAND OPERATED	HOSE : 3M WITH QUICK COUPLING WORKING PRESSURE : 2200 BAR 	MAKER	1		1	A13-252607-5	1274147-5.1 MODEL : HML3500																																																									
									15x1																																																									
010		PNEUMATIC HIGH PRESS. PUMP	WORKING PRESSURE : 2200 BAR 	MAKER	1		1	A14-252606-3	1270538-4.3 MODEL : AHP3500																																																									
									42x1																																																									
Similar no.: Ship no.: Scale: Mass. (kg): <table border="1"> <thead> <tr> <th>Date</th> <th>Des.</th> <th>Chk.</th> <th>Appd.</th> <th>A.C</th> <th>Replaced by Ident.no.:</th> <th></th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td>*</td> <td></td> <td>R</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>*</td> <td></td> <td>S</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>*</td> <td></td> <td>4</td> </tr> <tr> <td>070126</td> <td>KML</td> <td>JGS</td> <td>KYJ</td> <td>*</td> <td>TYPE CORRECTED.</td> <td>3</td> </tr> <tr> <td>041223</td> <td>KMO</td> <td>JGS</td> <td>KYJ</td> <td>*</td> <td>ENG. TYPE ADDED: S90ME-C, WORKING PRESSURE: 2500->2200 BAR</td> <td>2</td> </tr> <tr> <td>040820</td> <td>JGS</td> <td>KJM</td> <td>KYJ</td> <td>*</td> <td>TOOL NO. CORRECTED: 262->022, 274->010 AND DIM. ADDED</td> <td>1</td> </tr> <tr> <td>040207</td> <td>JGS</td> <td>KJM</td> <td>KYJ</td> <td>*</td> <td>Replacement for Ident.no.:</td> <td>0</td> </tr> </tbody> </table> TOOLS Type: ME/ME-C Ident.no.: Info. no. Description: Ident.no.: 913000 GENERAL, TOOLS A14-246854-8 											Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						*		R					*		S					*		4	070126	KML	JGS	KYJ	*	TYPE CORRECTED.	3	041223	KMO	JGS	KYJ	*	ENG. TYPE ADDED: S90ME-C, WORKING PRESSURE: 2500->2200 BAR	2	040820	JGS	KJM	KYJ	*	TOOL NO. CORRECTED: 262->022, 274->010 AND DIM. ADDED	1	040207	JGS	KJM	KYJ	*	Replacement for Ident.no.:	0
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:																																																													
				*		R																																																												
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070126	KML	JGS	KYJ	*	TYPE CORRECTED.	3																																																												
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040820	JGS	KJM	KYJ	*	TOOL NO. CORRECTED: 262->022, 274->010 AND DIM. ADDED	1																																																												
040207	JGS	KJM	KYJ	*	Replacement for Ident.no.:	0																																																												

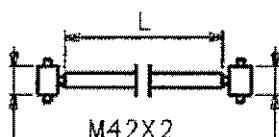
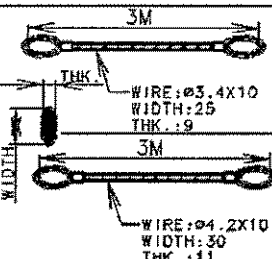
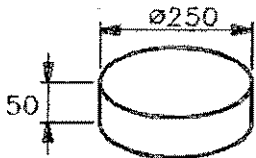
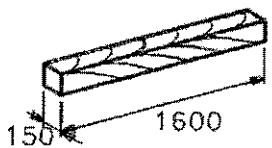
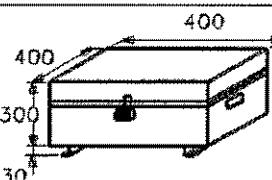
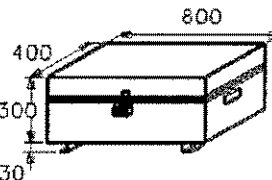
TOOL NO.		DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.		
					STAND- -ARD	ADDI- -TION	TOTAL					
079	S	CHAIN BLOCK 1.0 TON		MAKER	2		2	A13- 176041-7				
									12 X 2			
080	S	CHAIN BLOCK 3.0 TON		MAKER	2		2	A12- 116605-3				
									28.5 X 2			
092	S	CHAIN BLOCK 5.0 TON		MAKER	2		2	A12- 169454-4				
									44 X 2			
102	S	CHAIN BLOCK 8.0 TON		MAKER	1		1	A12- 190094-3				
									91.0 X 1			
114	S	PULL LIFT	 Max. 3.0t	MAKER	2		2	A13- 004130-6	1383925-6.0			
									26.0 X 1			
Similar no.:					Ship no.:			Scale:		Mass. (kg):		
Date	Des.	Chk.	Appd.	A.C.	Replaced by Ident.no.:							R
				*								5
				*								4
				*								3
				*								2
110808	KML	SDC	SDC	*	CORRECTED.							1
040207	JGS	KJM	KYJ	*	Replacement for Ident.no.:							0
TOOLS		Type:			MC/MC-C/ME/ME-C							
Info. no.		Description:			GENERAL TOOLS				Ident.no.:			
913000									A14-246855-0			

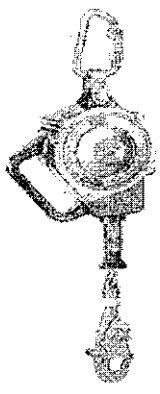
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.	
					STAND- -ARD	ADDI- -TION	TOTAL				
201		QUICK COUPLING-MALE		MAKER	2		2	A14- 246891-4	3180373-4.1		
									0.06x2		
213		QUICK COUPLING-FEMALE		MAKER	2		2	A14- 246902-1	1274141-4.1		
									0.21x2		
225		HEXAGON NIPPLE		MAKER	4		4	A14- 246894-0	3180374-6.1		
									0.05x4		
237		HEX. SOCKET SET SCREW		STEEL	5		5	204.DP 408010	EN63Q810		
									0.003x5		
250		STEEL BALL SOLID		STEEL	5		5	A14- 185691-0	1162635-7.1		
									0.001x5		
262		BLOW OFF VALVE		MAKER	5		5	A14- 246897-5	3058877-1.0		
									0.033x5		
Similar no.:			Ship no.:			Scale:		Mass. (kg):			
Date	Des.	Chk.	Appd.	A.C.	Replaced by Ident.no.:						R
				*							5
				*							4
				*							3
				*							2
040820 JGS KJM KYJ					* TOOL NO. 201, 213, 225, 237, 250, 262 ADDED						1
040207 JGS KJM KYJ					* Replacement for Ident.no.:						0
TOOLS				Type: ME/ME-C				HYUNDAI HEAVY INDUSTRIES CO., LTD.			
Info. no. 913000				Description: GENERAL TOOLS				Ident. no.: A14-246845-4			

TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STAND- -ARD	ADDI- -TION	TOTAL			
010	S	CYL. COVER PANEL (P901)		STEEL		1	1	A19- 170548-0	56x1	
014	S	PISTON AND PISTON ROD PANEL (P902)		STEEL		1	1	A19- 234341-4	59x1	
011	S	CONNECTING ROD AND CROSSHEAD PANEL (P904)		STEEL		1	1	A19- 333271-4	55.8x1	
015	S	CRANKSHAFT & MAIN BRG. PANEL (P905)		STEEL		1	1	A19- 234343-8	55x1	
019	S	MECHANICAL CONTROL PANEL (P906)		STEEL		1	1	A19- 234344-0	44x1	
016	S	EXH. VALVE PANEL (P908)		STEEL		1	1	A11- 347457-0	46x1	
Similar no.:		Ship no.:			Scale:			Mass. (kg):		
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:					R
				*						8
				*						4
				*						3
				*						2
				*						1
111202	KML	SDC	SDC	*	Replacement for Ident.no.:					0
TOOLS		Type:			S90ME-C					
Info. no.		Description:						Ident.no.:		
915000		GENERAL TOOLS						A14-448970-7		

[illegible]

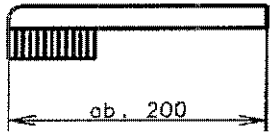
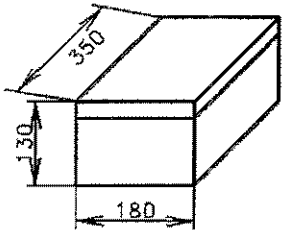
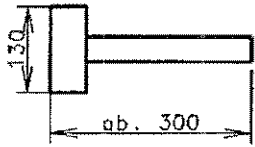
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.																																																	
					STANDARD	ADDITION	TOTAL																																																				
1501		MAGNET BASE		MAKER	1		1	A19-205481-6	(CBE-1)																																																		
1502		DIAL GAUGE		MAKER	1		1	A19-205482-8	(CBE-2)																																																		
1503		GREASE GUN (BALL TYPE)		MAKER	1		1	A19-205483-0	(CBE-3-BALL)																																																		
					1		1	A19-205484-1	JIS B1575 (PT1/8) (CBE-3-1-BALL)																																																		
1505		CARBORUNDUM	NO 3000  NO 80 		1		1	A19-226484-0																																																			
					1		1	(A14-024686-2)	0.3x1																																																		
									0.5x1																																																		
Similar no.: Ship no.: Scale: Mass. (kg): <table border="1"> <thead> <tr> <th>Date</th> <th>Des.</th> <th>Chk.</th> <th>Appd.</th> <th>A.G.</th> <th>Replaced by Ident.no.:</th> <th>R</th> </tr> </thead> <tbody> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>5</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>4</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>3</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>2</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>1</td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td><td>0</td></tr> </tbody> </table> 040319 JGS KJM KYJ * Replacement for Ident.no.:											Date	Des.	Chk.	Appd.	A.G.	Replaced by Ident.no.:	R					*		5					*		4					*		3					*		2					*		1					*		0
Date	Des.	Chk.	Appd.	A.G.	Replaced by Ident.no.:	R																																																					
				*		5																																																					
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				*		2																																																					
				*		1																																																					
				*		0																																																					
TOOLS		Type: L/S/K46-98MC/-C/ME/-C																																																									
Info. no. 990000		Description: GENERAL TOOLS				Ident.no.: A14-252615-7																																																					

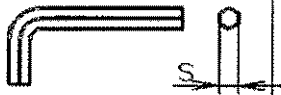
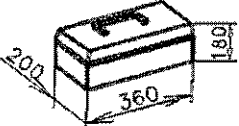
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.		
					STANDARD	ADDITION	TOTAL					
1506	S	AIR HOSE	 M42X2 JISF7335 Ø15			2	2	A19-224607-4 (A14-009881-5)	L=10M 5.85 X 2			
1507						1	1	A19-224612-0 (A14-009882-7)	L=20M 11.53 X 1			
1508		WIRE ROPE	 WIRE: Ø3.4X10 WIDTH: 25 THK.: 9 WIRE: Ø4.2X10 WIDTH: 30 THK.: 11	WIRE STEEL		2	2	A19-189372-2	0582811-4 SWL=1600KG			
1509						2	2	A12-111288-6 A19-189379-5	1.5 X 2 0582819-9 SWL=2400KG 2.4 X 2			
1510		SURFACE PLATE		STEEL		1	1	A13-009863-8	13.3 X 1			
1511	S	SLEEPER		WOOD		4	4	A14-009376-6	14.4 X 4			
1512		SCREW DRIVER		STEEL		1	1	730V3 110250	0.3 X 1			
1550		STEEL BOX FOR GENERAL TOOL		STEEL		2	2	A19-244033-1 (A13-012704-0)	ONLY FOR HYUNDAI, HYUNDAI-MIPO SHIPYARD 15 X 2			
1550		STEEL BOX FOR GENERAL TOOL		STEEL		7	7	A19-224617-0 (A13-012704-0)	ONLY FOR HYUNDAI-MIPO, HANJIN, DAEREO SHIPYARD			
						8	8		ONLY FOR HYUNDAI, OTHER SHIPYARD			
						9	9		ONLY FOR SAMSUNG SHIPYARD			
						2	2	A19-236129-6 (A13-012704-0)	20 X 8			
Similar no.:					Ship no.:			Scale: NONE			Mass. (kg):	
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:							R
				*								5
				*								4
				*								3
				*								2
				*								1
080514 KML LGS I K I					Replacement for Ident.no.:							0
TOOLS		Type: L/S/K90/98-MC/MC-C/-S/ME/-C								HYUNDAI HEAVY INDUSTRIES CO., LTD.		
Info. no.		Description:								Ident. no.:		
990-000		OTHER TOOLS								A14-330242-9		

TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STANDARD	ADDITION	TOTAL			
		Fall Arrest Block & Safety Hook		MAKER	1	1		A13-400290-8		
		Rescue Harness		MAKER	1	1		A14-400291-8		

Shelfer no. :					Ship no. :					Scale :					Wt. (kg) :				
Date	Qty.	Unit	Appd.	A.C.	Received by (Signature)														
JOSHI KUNAL					Approved by (Signature)														

TOOLS		Type:			
Info. no.		Description:		Serial No. :	
000000		SAFETY EQUIPMENT		A14-400292-0	

TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.
					STAND-ARD	ADDI-TION	TOTAL			
908-1		STEEL BRUSH		STEEL WOOD	12		12	A19-302892-2		
		BOX		PLASTIC	1		1			
		HAMMER		PLASTIC WOOD	1		1			
Similar no.: Ship no.: Scale: Mass.(kg):										
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:					R
										5
										4
										3
										2
										1
101220ICRSIOJSKBY * Replacement for Ident.no.:										0
TOOLS		Type: K/S/L-MC/-C, ME/-C								
Info. no. 000000		Description: PLASTIC BOX AND STEEL BRUSH & HAMMER								
		Ident.no.: A14-365119-7								

TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STANDARD	ADDITION	TOTAL			
1		HEX. WRENCH		TOOL STEEL	EACH 1		EACH 1		SIZE: 1.5/2/2.5 3/3.5/4/5 6/8/10	
2		+ DRIVER		MAKER	1		1			
3		DIAL GAUGE		MAKER	1		1		RANGE: 0.01~10mm	
4		MAGNET STAND		MAKER	1		1			
5		TOOL BOX		MAKER	1		1			

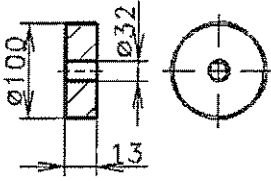
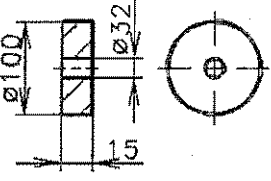
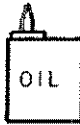
NKK-90/98 BG/ME



KOKACO CO., LTD

Similar no.:					Ship no.:					Scale: NONE					Mass. (kg):				
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:										R				
				*											5				
051002	CRS	OJS	KBY	*	DWG. CORRECTED.										4				
060220	CRS	OJS	KBY	*	DWG. CORRECTED.										3				
050630	CRS	OJS	KBY	*	DWG. CORRECTED.										2				
040825	JGS	KJM	KYJ	*	MODEL AND ENG. TYPE ADDED: ME										1				
010815	JGS	KJM	KYJ	*	Replacement for Ident.no.: TRANS. CADAM DWG.										0				

TOOLS		Type:		L/S/K/90~98MC/-C, ME/-C		HYUNDAI HEAVY INDUSTRIES CO., LTD.	
Info. no.		Description:		Ident. no.:			
908000		EXH. VALVE GRINDING MACHINE(1/2)		A14-238337-4			

ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP				PLATE/ DRAWING		REMARKS	BOX NO.
				WORKING	STAND- ARD	SPARE	ADDITION	TOTAL	NO.	PART NO.	
1	GRINDING STONE (ROUGH)		PA54L35S	1	2			2			
2	GRINDING STONE (FINE)		PVA150	1	1			1			
3	V - BELT		MAKER	2	2			2			GATE 5M615
				1	1			1			A 26
				1	1			1			A 33
				1	1			1			B 59
4	LAPPING OIL		MAKER	1	-			-			HANCUT A-60H HANYOUNG CHEMICAL

NKK-90/98 BG/ME



KOKACO CO., LTD

Similar no.:					Ship no.:					Scale:					Mass.(kg):				
Date	Des.	Chk.	Appd.	A.G	Replaced by Ident.no.:														
				*											R				
061002	CRS	OJS	KBY	*	DWG. CORRECTED.										5				
060220	CRS	OJS	KBY	*	DWG. CORRECTED.										4				
050630	CRS	OJS	KBY	*	DWG. CORRECTED.										3				
040825	JGS	KJM	KYJ	*	MODEL AND ENG. TYPE ADDED:ME/-C										2				
031029	JGS	KJM	KYJ	*	Replacement for Ident.no.: TRANS CADAM DWG										1				
				*											0				

SPARES

Type:

L/S/K90~98MC/-C, ME/-C

Info. no.

908000

Description:

EXH. VALVE GRINDING MACHINE (2/2)

Ident. no.:

A14-238337-4

TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.																								
					STAND- -ARD	ADDI- -TION	TOTAL																											
1		TOOL BOX		PLASTIC	1		1																											
1-1		COMBINATION SPANNER		TOOL STEEL	1		1																											
1-2		HEXAGON HEAD PLUG WITH FLANGE AND GASKET		① P.U.R ② STEEL ③ COPPER ④ STEEL	1		1	<table><tr><td>*I"</td><td>M16x1.5</td><td>M18x1.5</td><td>G1/4"</td><td>G3/8"</td></tr><tr><td>ENG. TYPE</td><td>S46/50MC-C</td><td>S46ME-B</td><td>S35MC</td><td>S42MC</td></tr><tr><td></td><td>S50ME-C</td><td>S55ME-B</td><td></td><td></td></tr></table> *PRODUCT No. ④ USE TO S25/40ME-B S46/50MC-C. S50ME-C ENG.	*I"	M16x1.5	M18x1.5	G1/4"	G3/8"	ENG. TYPE	S46/50MC-C	S46ME-B	S35MC	S42MC		S50ME-C	S55ME-B													
*I"	M16x1.5	M18x1.5	G1/4"	G3/8"																														
ENG. TYPE	S46/50MC-C	S46ME-B	S35MC	S42MC																														
	S50ME-C	S55ME-B																																
1-3		SINGLE OPEN ENDED SPANNER		TOOL STEEL	1		1																											
1-4		+ DRIVER			1		1																											
1-5		MALE COUPLER		STEEL	1		1																											
1-6		DISC		COPPER	6		6																											
1-20		COUPLING		STEEL	1		1	<table><tr><td></td><td>DIM. (D)</td><td>ENG.</td></tr><tr><td>①</td><td>M24x1.5</td><td>S35MC, 42MC, S55ME-B</td></tr><tr><td></td><td>M36x2</td><td>40ME-B, 46MC-C, 50MC-C/ME-C</td></tr><tr><td>②</td><td>M12x2</td><td>60MC-C, 60ME-C, 70MC-C, K80MC-C, K90MC-C, K98MC/ME-C</td></tr><tr><td></td><td>M48x3</td><td>S80MC, S80MC-C, S90MC-C, S90ME-C</td></tr></table>		DIM. (D)	ENG.	①	M24x1.5	S35MC, 42MC, S55ME-B		M36x2	40ME-B, 46MC-C, 50MC-C/ME-C	②	M12x2	60MC-C, 60ME-C, 70MC-C, K80MC-C, K90MC-C, K98MC/ME-C		M48x3	S80MC, S80MC-C, S90MC-C, S90ME-C											
	DIM. (D)	ENG.																																
①	M24x1.5	S35MC, 42MC, S55ME-B																																
	M36x2	40ME-B, 46MC-C, 50MC-C/ME-C																																
②	M12x2	60MC-C, 60ME-C, 70MC-C, K80MC-C, K90MC-C, K98MC/ME-C																																
	M48x3	S80MC, S80MC-C, S90MC-C, S90ME-C																																
1-21		SPRING HOUSING		STEEL	2		2	<table><tr><td>NO SUPPLY</td><td>ø46x65L</td><td>ø46x70L</td></tr><tr><td>40ME-B</td><td>S50MC</td><td>S80MC</td></tr><tr><td>35/42MC-M7</td><td>S60MC</td><td>K60/K90MC-C</td></tr><tr><td>35/42MC</td><td>S60MC-C</td><td>K60/S80MC-C</td></tr><tr><td>S35ME-B</td><td>S60MC-C</td><td>S80ME</td></tr><tr><td>S35ME-C</td><td>S70MC-C</td><td>K98MC/ME-C</td></tr><tr><td>S46MC</td><td></td><td>K90ME</td></tr><tr><td>S50MC</td><td></td><td></td></tr></table>	NO SUPPLY	ø46x65L	ø46x70L	40ME-B	S50MC	S80MC	35/42MC-M7	S60MC	K60/K90MC-C	35/42MC	S60MC-C	K60/S80MC-C	S35ME-B	S60MC-C	S80ME	S35ME-C	S70MC-C	K98MC/ME-C	S46MC		K90ME	S50MC				
NO SUPPLY	ø46x65L	ø46x70L																																
40ME-B	S50MC	S80MC																																
35/42MC-M7	S60MC	K60/K90MC-C																																
35/42MC	S60MC-C	K60/S80MC-C																																
S35ME-B	S60MC-C	S80ME																																
S35ME-C	S70MC-C	K98MC/ME-C																																
S46MC		K90ME																																
S50MC																																		



HANMI HYDRAULIC MACHINERY CO., LTD.

DWG.NO:M12-7112-0.5

Similar no.:					Ship no.:					Scale: NONE					Mass. (kg):						
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:															R	
					*																6
091012	KHT	OJS	YGS	*	TOOL NO.1-20 SKETCH ADDED&1-21 TEXT TABLE MODIFIED															4	
090324	CRS	OJS	SJR	*	DWG. CORRECTED															3	
080930	KHT	OJS	RSH	*	DWG. CORRECTED															2	
080317	KHT	OJS	RSH	*	DWG. CORRECTED															1	
070713	RFS	AJY	YSC	*	Replacement for Ident.no.:															0	

TOOLS

Type:

HDFD-1100

Info. no.

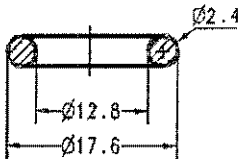
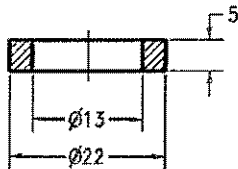
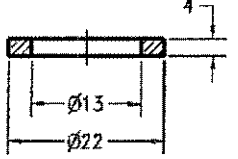
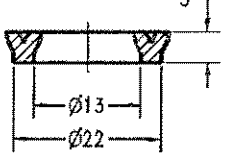
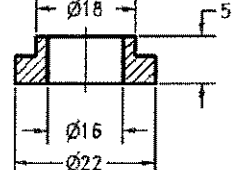
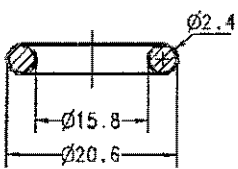
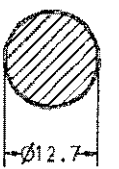
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Description:

FUEL VALVE TEST DEVICE

Ident. no.:

A14-302827-3

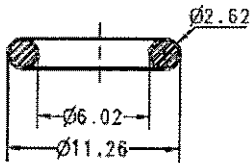
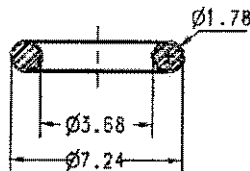
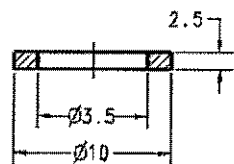
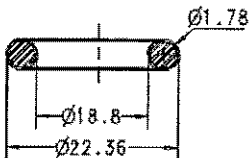
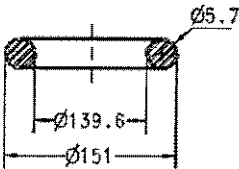
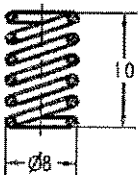
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STANDARD	ADDITION	TOTAL			
1-7		O-RING		N.B.R	1		1	12-1109-0		
1-8		SPACER		BC3	1		1	12-1111-0		
1-9		BACK-UP RING		TEFLON	1		1	12-1112-0		
1-10		PACKING SEAL		URETANE	1		1	12-1113-0		
1-11		SUPPORT RING		BC3	1		1	12-1114-0		
1-12		O-RING		N.B.R	2		2	12-1119-0		
1-13		BALL		STEEL	2		2	12-1121-0		



HANMI HYDRAULIC MACHINERY CO., LTD.

DWG. NO. : 12-1000-M09-0.0 (1/2)

Similar no.:					Ship no.:					Scale: NONE					Mass. (kg):				
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:										R				
				*											5				
				*											4				
				*											3				
				*											2				
040825	JGS	KJM	KYJ	*	TYPE ADDED : H0FD-1100										1				
040629	JGS	KJM	KYJ	*	Replacement for Ident.no.:										0				
SPARES					Type: VTU-1100N/H0FD-1100														
Info. no. 000000					Description: FUEL VALVE TEST DEVICE										Ident.no.: A14-253884-6				

TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STAND- -ARD	ADDI- -TION	TOTAL			
1-14		O-RING		N.B.R	2		2	12-1131-0		
1-15		O-RING		N.B.R	2		2	12-1132-0		
1-16		WASHER		Bc3	2		2	12-1133-0		
1-17		O-RING		N.B.R	8		8	12-1145-0		
1-18		O-RING		N.B.R	1		1	12-1148-0		
1-19		SPRING		SUP10	2		2	12-1164-0		



HANMI HYDRAULIC MACHINERY CO., LTD.

DWG. NO.: 12-1000-M09-0.0(2/2)

Similar no.: 12-1000-M09-0 Ship no.: Scale: NONE Mass. (kg):

Date	Des.	Chk.	Appd.	A.G	Replaced by Ident.no.:	
				*		5
				*		4
				*		3
				*		2
040825	JGS	KJM	KYJ	*	TYPE ADDED :HDFD-1100	1
040629	JGS	KJM	KYJ	*	Replacement for Ident.no.:	0

SPARES

Type:

VTU-1100N/HDFD-1100

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

Info. no.

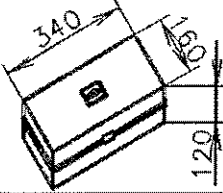
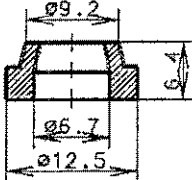
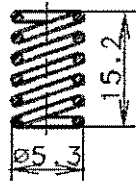
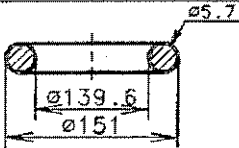
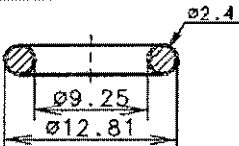
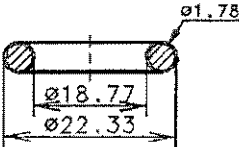
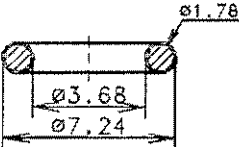
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Description:

FUEL VALVE TEST DEVICE

Ident. no.:

A14-253885-8

TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STANDARD	ADDITION	TOTAL			
1		BOX		PLASTIC	1		1			
1-1		PACKING SEAL		UHMWPE	2		2	10-6117-0		
1-2		SPRING		SUS304	4		4	10-2124-0		
1-3		BALL		STEEL	4		4	10-2139-0		
1-4		O-RING		N.B.R	1		1	10-2142-0		
1-5		O-RING		N.B.R	2		2	10-6143-0		
1-6		O-RING		N.B.R	8		8	10-2147-0		
1-7		O-RING		N.B.R	2		2	10-2148-0		



HANMI HYDRAULIC MACHINERY CO., LTD.

DWG. NO: AHP3500-M10-6107-0.0

Similar no.: Ship no.: Scale: NONE Mass. (kg):

Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R
				*		5
				*		4
				*		3
				*		2
				*		1
				*		0

041223 JGS KJM KYJ * Replacement for Ident.no.:

SPARE

Type:

AHP-3500

Info. no.

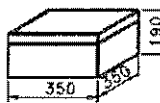
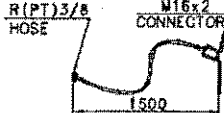
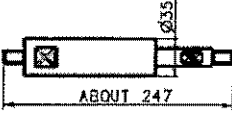
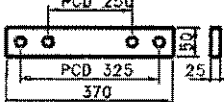
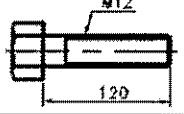
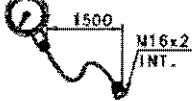
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Description:

AIR DRIVEN HIGH PRESSURE PUMP

Ident. no.:

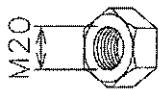
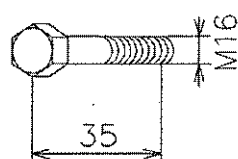
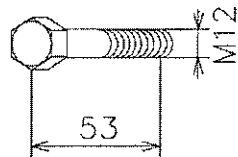
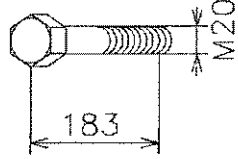
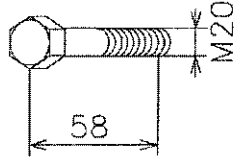
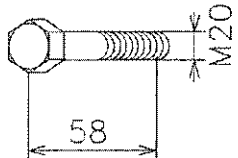
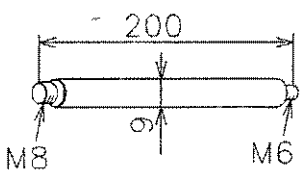
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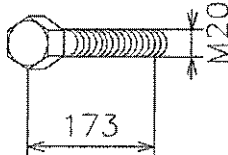
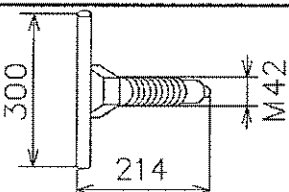
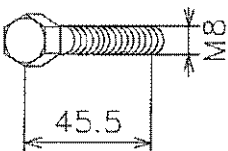
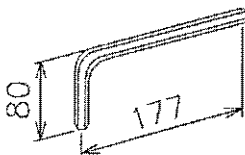
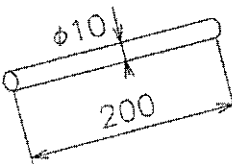
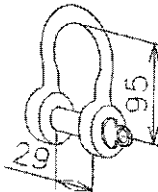
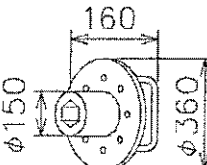
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP		DRAWING NO.	REMARK (WEIGHT)KG	KIT NO.	BOX NO.
					STAND-ARD	TOTAL				
1		TOOL BOX		STEEL	1	1				
1-1		FILLING HOSE WITH CONNECTOR			1	1		11.2 X 1 MAX. PRESSURE 70Kg/Cm²		
1-2		BARRIER FLANGE JIG			2	2		0.1 X 1 2.6 X 2		
1-3		TORQUE BAR			2	2		0.1 X 2		
1-4		PISTON INSTALLATION JIG			1	1		3.6 X 1		
1-5		INSTALLATION JIG BOLT WITH NUT			2	2		0.6 X 2		
1-6		INSTALLATION JIG BOLT			2	2		0.2 X 2		
1-7		N2 GAS REGULATOR WITH HOSE			1	1		PRESSURE GAUGE RANGE: 0-40Kg/Cm²		
1-8		PRESSURE GAUGE WITH HOSE			1	1		2.2 X 1 PRESSURE GAUGE RANGE: 0-60Kg/Cm²		
1-9		SOLENOID VALVE			1	1		0.4 X 1 MAX. PRESSURE 34bar		
1-10		COIL			1	1		1.2 X 1 220V/8W		
								0.7 X 1		

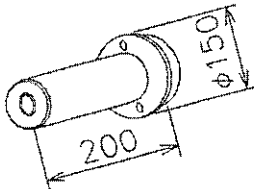
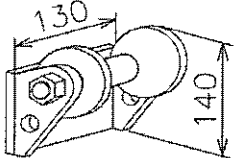
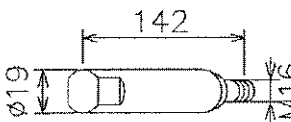
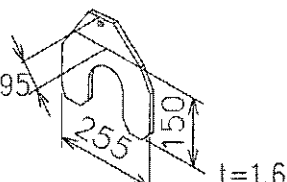
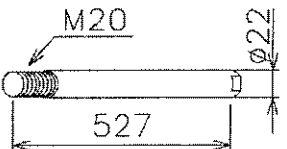
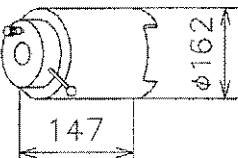
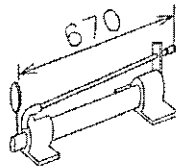


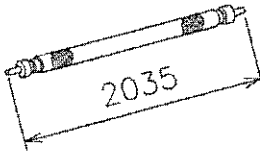
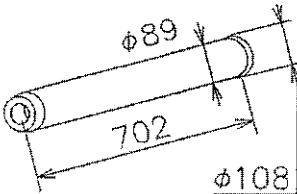
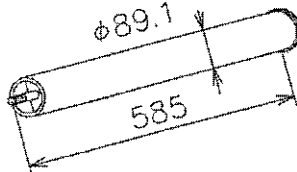
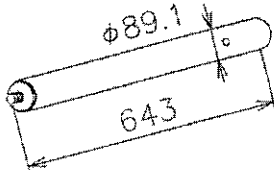
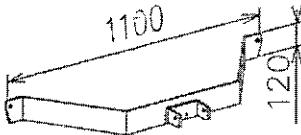
Green & Clean Technology Co., Ltd.

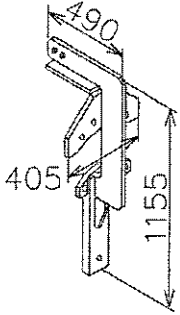
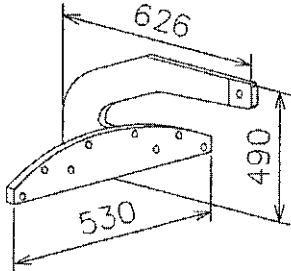
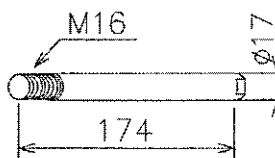
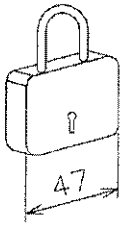
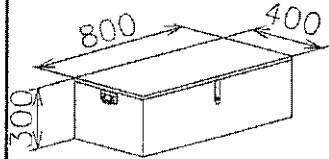
Similar no.:					Ship no.:					Scale: NONE					Mass. (kg):				
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:														
				*															
				*															
				*															
				*															
110222	JHL	KHC	PBS	*	MOD. #1-1														
091008	JHL	KNH	PBS	*	Replacement for Ident.no.:														
TOOLS					Type: AIR-OIL CUSHION 300 (ON-OFF TYPE)										HYUNDAI HEAVY INDUSTRIES CO., LTD.				
Info. no. 981000					Description: HYDRAULIC TOP BRACING										Ident. no.: A14-371958-1				

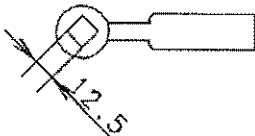
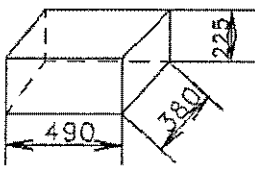
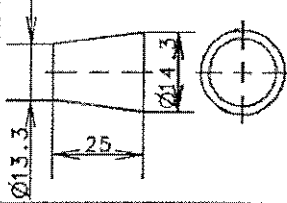
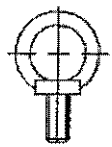
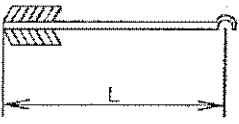
TOOLS				PAGE		T60		
Exhaust-gas Turbocharger MET71MB ()				SHIP NO.				
				BOX NO.				
NO.	NAME	SKETCH	MATERIAL	SUPPLY PER SHIP		DRAWING		REMARKS (Kg)
				WORK- ING	SPARE	NO.	PART NO.	
1	Hex. Nut M20 六角ナット		Rolled Steel (SS400)	1		1150-022-520-1	T-1	0.06
2	Hex. Bolt M16 × 25 六角ボルト		Rolled Steel (SS400)	1		1101-516-025-1	T-12	0.08
3	Hex. Bolt M12 × 45 六角ボルト		Rolled Steel (SS400)	3		1101-512-045-1	T-13	0.06
4	Hex. Bolt M20 × 170 六角ボルト		Rolled Steel (SS400)	1		1101-520-170-1	T-14	0.51
5	Hex. Bolt M20 × 45 六角ボルト		Rolled Steel (SS400)	6		1101-520-045-1	T-15	0.19
6	Hex. Bolt M20 × 45 六角ボルト		Rolled Steel (SS400)	2		1101-520-075-1	T-16	0.19
7	Threaded Bar ねじ棒		Rolled Steel (SS400)	2		N36-980-5006-1	T-21	0.22
MFR'S NAME & ADDRESS				NAGASAKI SHIPYARD & MACHINERY WORKS. MITSUBISHI HEAVY INDUSTRIES, LTD				

TOOLS				PAGE		T61		
Exhaust-gas Turbocharger MET71MB ()				SHIP NO.				
				BOX NO.				
NO.	NAME	SKETCH	MATERIAL	SUPPLY PER SHIP		DRAWING		REMARKS (Kg)
				WORK-ING	SPARE	NO.	PART NO.	
8	Starting Bolt M20×160 押上ボルト		Rolled Steel (SS400)	4		N36-119-0006-1	T-22	0.47
9	Starting Bolt M42 押上ボルト		Rolled Steel (SS400)	1		N36-Y09-5081-A	T-23	2.74
10	Starting Bolt M8×40 押上ボルト		Rolled Steel (SS400)	2		N36-119-0008-1	T-24	0.02
11	Hexagon Headed Spanner 17 六角棒スパナ		Cr-Mo Steel (SCM435)	1		525-298-017	T-29	0.43
12	Handle ハンドル		Cr-Mo Steel (SCM435)	1		N36-989-4002	T-32	0.12
13	Shackle MBC 2 シャックル		Carbon Steel (S25C-N)	2		N36-655-102	T-39	1.16
14	Locking Box ロッキングボックス		Carbon Steel (S45C)	1		N36-Y08-5218-A	T-43	17.8
MFR'S NAME & ADDRESS		NAGASAKI SHIPYARD & MACHINERY WORKS. MITSUBISHI HEAVY INDUSTRIES, LTD						

TOOLS				PAGE		T62		
Exhaust-gas Turbocharger MET71MB ()				SHIP NO.				
				BOX NO.				
NO.	NAME	SKETCH	MATERIAL	SUPPLY PER SHIP		DRAWING		REMARKS (Kg)
				WORK-ING	SPARE	NO.	PART NO.	
15	Draw-out tube 引 抜 管		Carbon Steel Pipe (SGP)	1		N36-Y08-5216-A	T-46	3.63
16	Roller support ローラ支え台		Rolled Steel (SS400)	1		N36-Y08-1054-A	T-47	4.2
17	Guide bar ガイド棒 (油圧ジャッキ用) (for Hydraulic jack)		Rolled Steel (SS400)	1		N36-980-3019-1	T-48	0.31
18	Stopper ストッパー		Zinc-Coated Steel (SECC)	1		N36-988-5042-1	T-49	0.36
19	Guide bar ガイド棒 (サポート用) (for support)		Rolled Steel (SGD290-D)	2		N36-988-3045-1	T-52	1.12
20	Hydraulic jack 油圧ジャッキ		Cr-Mo Steel (SCM435)	1		N36-Y00-0015-A	T-60	20.0
21	Hydraulic Pump 油圧ポンプ		Cr-Mo Steel (SCM435)	1		N36-Y00-0016-A	T-61	9.0
MFR'S NAME & ADDRESS		NAGASAKI SHIPYARD & MACHINERY WORKS. MITSUBISHI HEAVY INDUSTRIES, LTD						

TOOLS				PAGE		T63		
Exhaust-gas Turbocharger MET71MB ()				SHIP NO.				
				BOX NO.				
NO.	NAME	SKETCH	MATERIAL	SUPPLY PER SHIP		DRAWING		REMARKS (Kg)
				WORK-ING	SPARE	NO.	PART NO.	
22	Rubber Hose ゴム管		Rubber Pipe	1		N36-Y00-0016-17	T-62	0.4
23	Rotor Guide Tube ロータガイド管		PVC	1		N36-Y08-5246-A	T-63	1.87
24	Pulling Out Tube ロータ拔出管		Carbon Steel Pipe (SGP)	1		N36-Y08-5195-A	T-65	6.38
25	Pulling Out Tube ロータ拔出管		Carbon Steel Pipe (SGP)	1		N36-Y08-5196-A	T-66	6.95
26	Stay ステー		Rolled Steel (SS400)	1		N36-Y08-5238-A	T-67	13.7
MFR'S NAME & ADDRESS		NAGASAKI SHIPYARD & MACHINERY WORKS. MITSUBISHI HEAVY INDUSTRIES, LTD						

TOOLS		PAGE		764				
Exhaust-gas Turbocharger MET71MB ()		SHIP NO.						
		BOX NO.						
NO.	NAME	SKETCH	MATERIAL	SUPPLY PER SHIP		DRAWING		REMARKS (Kg)
				WORK-ING	SPARE	NO.	PART NO.	
27	Slinging Device つり金具		Rolled Steel (SS400)	1		N36-Y08-5209-A	T-76	43.2
28	Slinging Device つり金具		Rolled Steel (SS400)	1		N36-Y08-5237-A	T-85	35.8
29	Guide bar ガイド棒 (ガスラビリンス用) (for Gas labyrinth)		Rolled Steel (SGD290-D)	2		N36-980-3018-2	T-131	0.3
	Pad-Lock 南京錠		Brass (BS)	1		N36-940-0001-1		0.10
	Tools Box 要具箱		Rolled Steel (SS400)	1		N36-501-0002-2		18.79
MFR'S NAME & ADDRESS		NAGASAKI SHIPYARD & MACHINERY WORKS. MITSUBISHI HEAVY INDUSTRIES, LTD						

TOOL NO.	DESCRIPTION	SKETCH	MAT'L	SUPPLY PER SHIP				PLATE/DRAWING		REMARKS	BOX NO.
				WORKING	STANDARD	ADDITION	TOTAL	NO.	PART NO.		
AT-01	TUBE EXPANDER		STEEL		1		1				
AT-02	HANDLE		STEEL		1		1				
AT-03	TOOL BOX		STEEL		1		1				
AT-04	TUBE PLUG		HSn62-1		120		120				
AT-05	EYE BOLT	 M20/M24	STEEL		8		8				
AT-06	TUBE BRUSH WITH PIN	 L=1100	STEEL NYLON		1		1				

Similar no.: Ship no.: Scale: Mass.(kg):

Date	Des.	Chk.	Appd.	A.G	Replaced by Ident.no.:	
				*		8
				*		5
				*		4
				*		3
				*		2
090221	AJY	RSH	SJR	*	DRAWING UPDATED.	1
060425	AJY	OGY	YDY	*	Replacement for Ident.no.:	0

TOOLS

Type:

LKM x 2sets



Info. no.

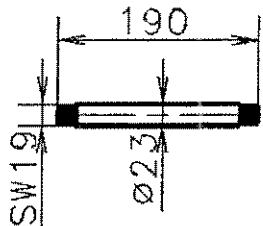
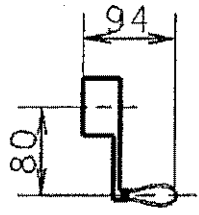
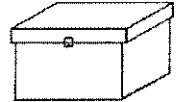
093000

Description:

AIR COOLER TOOL (GEA)

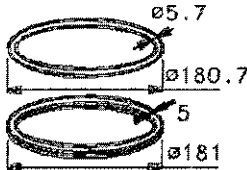
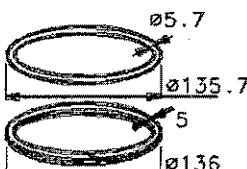
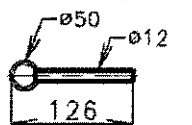
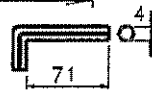
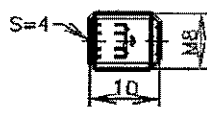
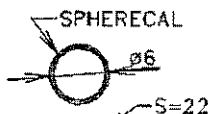
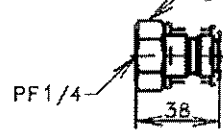
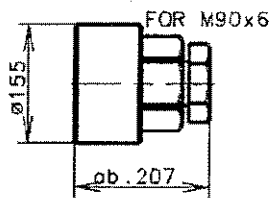
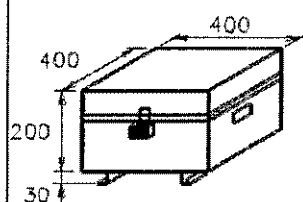
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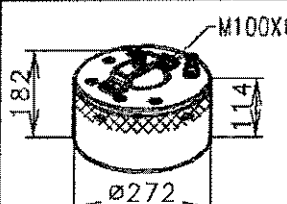
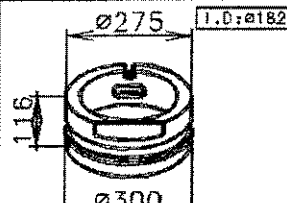
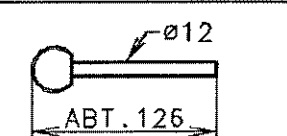
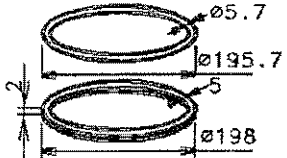
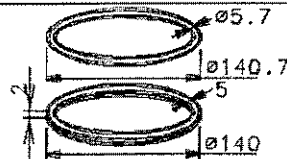
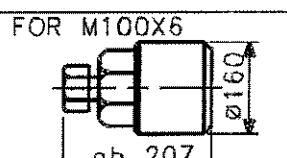
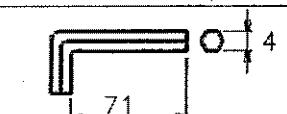
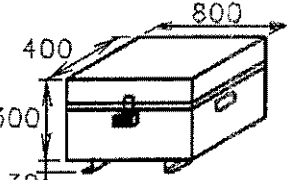
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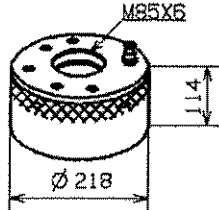
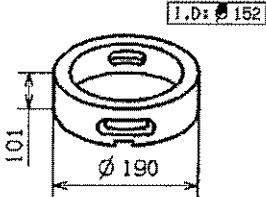
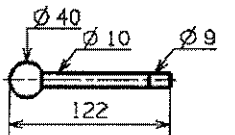
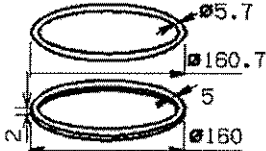
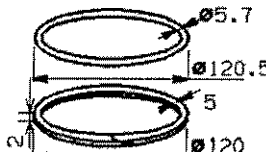
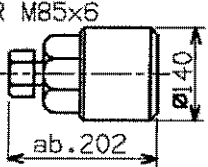
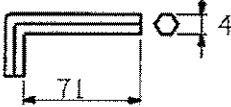
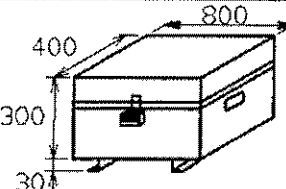
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STANDARD	ADDITION	TOTAL			
001		FILTERKERZEN-SCHLUESSEL KEY FOR UNSCREWING FILTER ELEMENT FROM HOLDER		STEEL	1		1		Z112543 CODE NO: 6700379	
002		HANDKURBEL CRANK HANDLE FOR MANUAL OPERATION		STEEL	1		1		CODE NO: 2300808	
003		TOOL BOX KEY, HANDLE FOR OIL FILTER		STEEL	1		1		SUPPLY FOR MAKER.	

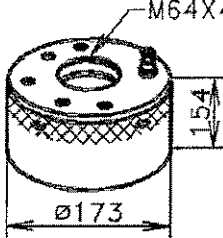
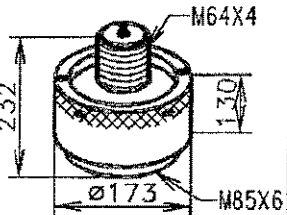
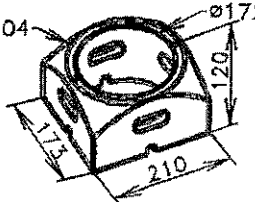
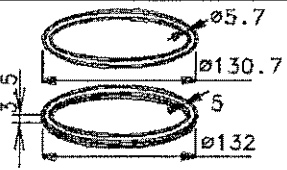
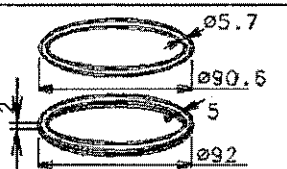
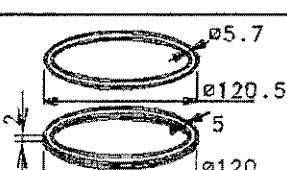
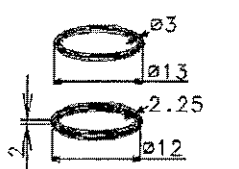
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Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:										R				
				*											5				
				*											4				
				*											3				
				*											2				
100515	LHY	OYS	LGH	*	ADD IN TOOL BOX										1				
090925	HA	OYS	LGH	*	Replacement for Ident.no.:										0				
TOOLS				Type: ME/ME-C															
Info. no.				Description:												Ident. no.:			
913000				BOLL & KIRCH FILTERBAU GMBH												A14-365348-0			

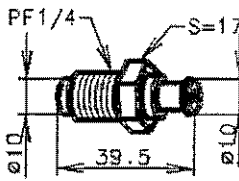
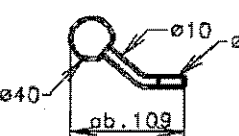
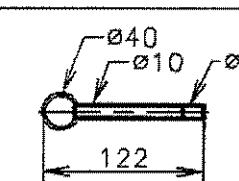
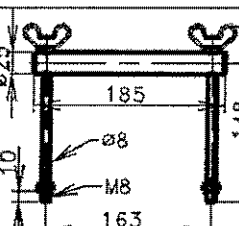
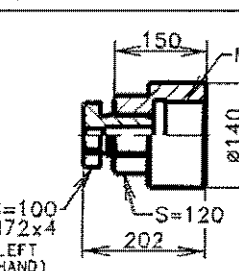
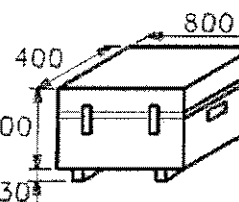
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.
					STAND- -ARD	ADDI- -TION	TOTAL			
900	S	CYL. COVER TIGHTENING TOOL ASS'Y	ø89.1 ø110 ø1630 2753 ø76.3 PCD1390 * (QTY) Included in cyl. cover tightening tool ass'y (Dwg. no.: A11-361082-3) WORKING PRESSURE 2200 BAR				A11-361082-3	5100936-1	KIT : A19-266205-0	
							(1) A11-262581-6	Balancing ring upper part		
							(1) A11-262583-0	Balancing ring lower part		
							(8) A12-378130-1	Spring balance		
							(8) A10-361084-7	Hydr. jack M90x6 ø240x132(251)		
							(8) A14-361089-6 (A12-361090-5)	Spacer ring ø230xø182x130		
							(8) A14-246902-1	Quic coupling -Female		
							(2) A19-244014-2 (A13-297912-4)	Hose steel with 2 unions-1.5M		
							(4) A19-244019-1 (A13-297912-4)	Hose steel with 2 unions-3.0M		
							(2) A14-244020-1 (A13-297912-4)	Hose steel with 2 unions-5.0M		
							(16) 221.R6.112055	Bolt M12x55		
							(16) 256.R1.312000	Self locking Nut M12		
640 X 1										
Similar no.:		Ship no.:		Scale: NONE		Mass. (kg):				
Date	Des.	Chk.	Appd.	A.C.	Replaced by Ident.no.:					
				*						
				*						
				*						
				*						
				*						
				*						
090929JGS/SLK/YSC		* Replacement for Ident.no.:								
TOOLS		Type:		S90ME-C		HYUNDAI HEAVY INDUSTRIES CO., LTD.				
Info. no.		Description:		901001 CYLINDER COVER TIGHT TOOL (M90X6)		Ident. no.:		A14-361037-5		

TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.	
					STAND-ARD	ADDI-TION	TOTAL				
023		TOOL AND SPARE PARTS FOR CYL. COVER HYDR JACK		RUBBER /	8		8	A19-229196-7 (A11-246892-6)	3312215-3 SPARE O-RING WITH BACK-UP RING	KIT : A19-266205-0	
035			POLYAMIDE	8		8	A19-229362-2 (A11-246913-9)	3312164-8 SPARE O-RING WITH BACK-UP RING			
059			STEEL PVC	2		2	A14-246942-3 (A14-188085-6)	3100931-9 (A19-245367-2) BALL HANDLE			
047			STEEL	2		2	727V1204000	EN549A4 HEX. WRENCH KEY			
072			MAKER	4		4	204DP408010	EN63Q810 HEX. SOCKET SET SCREW			
084			MAKER	4		4	A14-185691-0	1162635-7 STEEL BALL-SOLID			
106			STEEL	4		4	A14-246891-4	3180373-4 QUICK COUPLING MALE			
096			STEEL	1		1	A19-229432-0 (A12-226336-2)	3101250-6 STUD SETTER			
202				STEEL WOOD	1		1	A19-227035-0 (A13-139530-2)	18.2 X 1 STEEL BOX MODEL: 44-20		
									10.0 X 1		
Similar no.:			Ship no.:		Scale: NONE		Mass. (kg):				
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
				*							5
				*							4
				*							3
				*							2
				*							1
090929 JGS SLKIYSC				*	Replacement for Ident.no.:						0
TOOLS		Type: S90ME-C				HYUNDAI HEAVY INDUSTRIES CO., LTD.					
Info. no. 901001		Description: CYLINDER COVER TIGHT TOOL (M90x6)				Ident. no.: A14-361038-7					

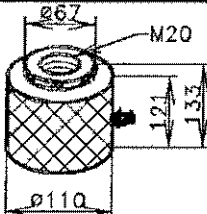
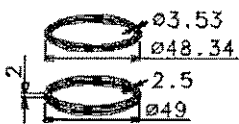
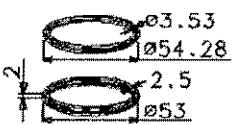
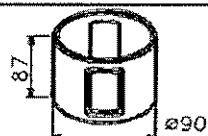
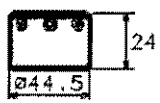
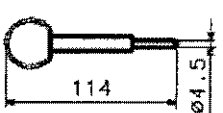
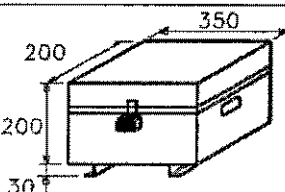
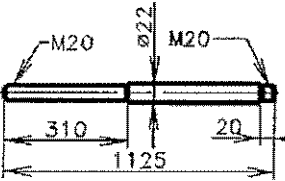
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					STANDARD	ADDITION	TOTAL			
90461-0071 028		HYDR. JACK FOR CONNECTING ROD BOLT		CR-MO STEEL RUBBER POLYAMIDE	2		2	A19-235117-3 (A10-262610-0)	5010594-5.0	KIT : A19-239851-0
									38.5 X 2	
90461-0071 030		SPACER RING		CR-MO STEEL	2		2	A19-235118-5 (A11-262614-8) (A12-262615-0)	5010900-2.0	
									30.3 X 2	
90461-0071 041		TOMMY BAR		STEEL PVC	1		1	A19-186481-0 (A14-254024-0) (A14-188085-6)	3100931-9.1	
									0.17 X 1	
90461-0071 053		SPARE O-RING WITH BACK-UP RING		RUBBER / POLYAMIDE	4		4	A19-229213-2 (A11-246892-6)	3312233-2.0	
90461-0071 065					4		4	A19-229366-0 (A11-246913-9)	3312169-7.0	
									0.037 X 4	
									0.026 X 4	
90461-0071 100		STUD SETTER		STEEL	1		1	A19-229434-4 (A12-226336-2)	0938890-3.2	
									20.91 X 1	
90461-0071 089		HEX. WRENCH KEY		ALLOY STEEL	1		1	727V1 204000	EN549A4	
									0.011 X 1	
90461-0071 207	S	STEEL BOX FOR HYDR. JACK		STEEL	2		2	A19-239841-5 (A13-263463-8)	MODEL NO. : 48-30	
									19.9 X 2	
Similar no.:		Ship no.:			Scale: NONE			Mass. (kg):		
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:					R
				*						5
				*						4
				*						3
				*						2
050613	PNG	YGS	KBY	*	BOX NO. MODIFIED & PLATE NO. ADDED & TOOL NO. 041 DWG. NO. MODIFIED					1
041222	JGS	KJ	MIKYJ	*	Replacement for Ident.no.:					0
TOOLS		Type:			S90ME-C			HYUNDAI HEAVY INDUSTRIES CO., LTD.		
Info. no.		Description:			Ident. no.:					
904001		HYDR. JACK FOR CONNECTING ROD			A14-261593-1					

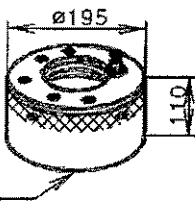
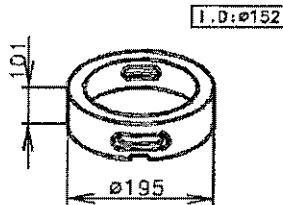
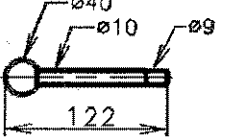
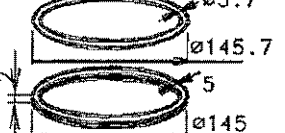
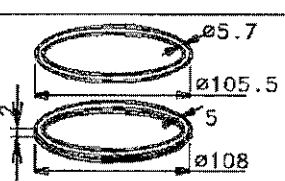
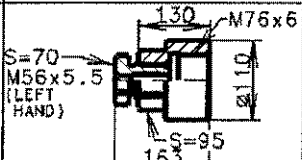
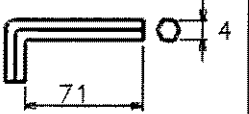
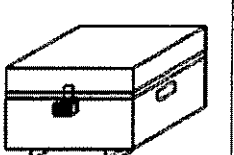
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STAND- -ARD	ADDI- -TION	TOTAL			
90464-0009 024		HYDR. JACK FOR CROSSHEAD MOMENT COMPENSATOR CHAIN TIGHTENER		CR-MO STEEL RUBBER POLYAMIDE	4		4	A19- 235114-8 (A10-262603-0)	5011006-9.1 24.3 X 4	KIT : A19-239850-9
90464-0009 036		SPACER RING		CR-MO STEEL	4		4	A19- 235439-1 (A14-262607-8) (A12-262608-0)	5011093-0.0 (5011095-4.0) 7.3 X 4	
90464-0009 048		TOMMY BAR		STEEL PVC	2		2	A19- 166489-9 (A14-246928-3) (A14-151395-3)	3100930-7.1 0.944 X 2	
90464-0009 050		SPARE O-RING WITH BACK-UP RING		RUBBER / POLYAMIDE	4		4	A19- 229175-4 (A11-246892-6)	3312192-3.0 0.030 X 4	
90464-0009 061					4		4	A19- 229346-9 (A11-246913-9)	3312147-0.0 0.023 X 4	
90464-0009 107		STUD SETTER		STEEL	1		1	A19- 229431-9 (A12-226336-2)	0984517-9.1 15.79 X 1	
90464-0009 085		HEX. WRENCH KEY		ALLOY STEEL	1		1	727V1 204000	EN549A4 0.01 X 1	
90464-0009 203		STEEL BOX FOR HYDR. JACK		STEEL	2		2	A19- 239853-4 (A13-263464-0)	MODEL NO. :48-30 15.3 X 2	
Similar no.:		Ship no.:			Scale: NONE			Mass. (kg):		
Date	Des.	Dk.	Appd.	A.C	Replace for Ident.no.:			Replace by Ident.no.:		
20100825	SJS	PNG	KPJ		TOOL NO.024 DESCRIPTION MODIFIED					
20050613	PNG	YGS	KBY	*	BOX NO.MOD.& PLATE NO.ADD.& TOOL NO.048/203 MOD.					
20041231	KMO	JGS	KYJ	*	DWG.REPL.:048(A14-246931-6->A14-151395-1),ADD.:203(A19-235458-6)					
20041222	JGS	KJM	KYJ	*						
TOOLS		Type:			S90ME-C					
Info. no.		Description:			HYDR. JACK FOR CROSSHEAD			Ident.no.:		
904001								A14-261594-3		

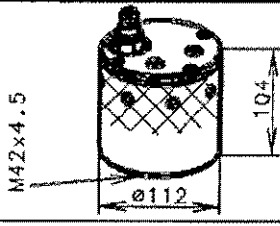
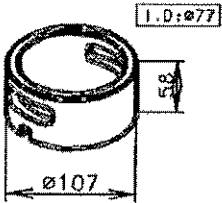
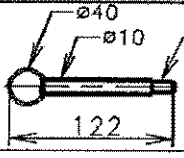
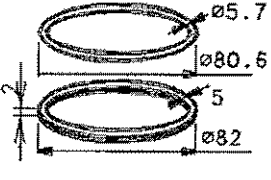
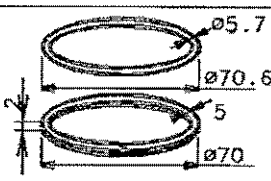
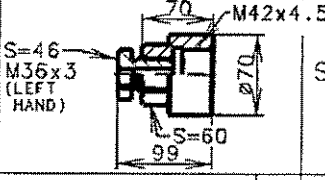
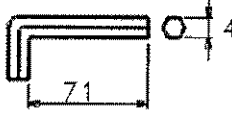
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.	
					STANDARD	ADDITION	TOTAL				
021		HYDR. JACK FOR MAIN BRG. -UPPER		CR-MO STEEL RUBBER POLYAMIDE	4		4	A19-235139-8 (A10-262618-5)	5010024-3.0 20.1 X 4	KIT : A19-234403-0	
033		HYDR. JACK FOR MAIN BRG. -LOWER		CR-MO STEEL RUBBER POLYAMIDE	4		4	A19-235440-0 (A12-262622-0)	5010028-0.0 20.94 X 4		
045		SPECIAL HYDR. NUT FOR MAIN BRG		STEEL	4		4	A19-235441-2 (A14-262628-0) (A11-262629-2)	5010033-8.0 14.2 X 4		
057		SPARE O-RING WITH BACK-UP RING		RUBBER / POLYAMIDE	8		8	A14-262620-6	5010318-0.0 0.025 X 8		
070					4		4	A19-229318-6 (A11-246913-9)	3312117-1.0 0.016 X 4		
069					4		4	A19-229346-9	3312147-0.0 0.025 X 4		
082					4		4	A14-252529-5	1271789-3.1 0.001 X 4		
Similar no.:					Ship no.:			Scale:			Mass. (kg):
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						
				*							
				*							
				*							
				*							
				*							
041222	JGS	KJMKYJ		*	Replacement for Ident.no.:						
TOOLS		Type:			S90ME-C						
Info. no.		Description:			HYDR. JACK FOR MAIN BEARING			Ident.no.:			
905000								A14-261595-5			

TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STAND-ARD	ADDI-TION	TOTAL			
094		HYDRAULIC COUPLING		STEEL	2		2	A13-252527-1	3134791-5.1	KIT : A19-234403-0
									0.04 X 2	
104		BALL HANDLE		STEEL PLASTIC	2		2	A19-218022-0 (A14-236225-3) (A14-155270-1)	3102326-8.1	
									0.12 X 2	
116		BALL HANDLE		STEEL PLASTIC	2		2	A19-166489-9 (A14-151395-1) (A14-151396-3)	3100930-7.1	
									0.944 X 2	
128		HEX. WRENCH KEY		ALLOY STEEL	2		2	727V1 204000	EN549A4	
									0.01 X 2	
130		HANDLE COMPLETE FOR HYDRAULIC JACK		STEEL	2		2	A19-235140-7 (A14-263439-2)	5011080-9.0	
									0.85 X 2	
141		STUD SETTER		STEEL	1		1	A19-229431-9 (A12-226336-2)	0908451-7.1	
									15.8 X 1	
200	S	STEEL BOX FOR HYDR. JACK		STEEL	2		2	A19-235467-4 (A13-263465-1)	MODEL NO. 48-30	
Similar no.:					Ship no.:			Scale:		
Date	Des.	Chk.	Appd.	A.G	Replaced by Ident.no.:					R
				*						5
				*						4
				*						3
				*						2
041231	KMO	JCS	KYJ	*	DWG. REPL.: 116(A14-246928-3->A14-151395-1). ADDED: 200(A19-235467-4)					1
041222	JCS	KJ	JKYJ	*	Replacement for Ident.no.:					0
TOOLS		Type:		S90ME-C						
Info. no.		Description:		HYDR. JACK FOR MAIN BEARING				Ident. no.:		
905000								A14-261596-7		

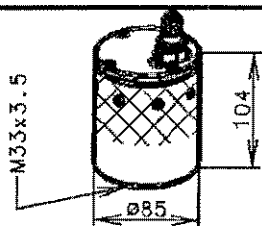
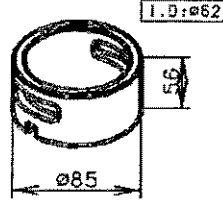
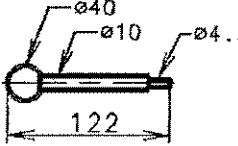
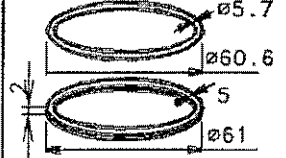
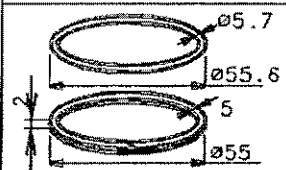
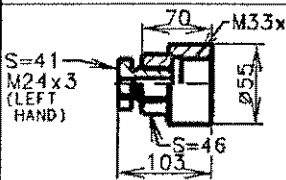
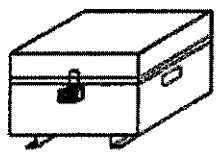
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.	
					STAND- -ARD	ADDI- -TION	TOTAL				
020		HYDR. JACK FOR CHAIN TIGHTENING -AFT SIDE		CR-MO STEEL RUBBER POLYAMIDE	2		2	A19- 235141-9 (A11-262635-0)	3.9 x 2	KIT : A19-337435-3	
055		SPARE O-RING WITH BACK-UP RING		RUBBER / POLYAMIDE	8		8	A14- 262638-6	5013790-2.0 0.01 x 8		
080		HEX. WRENCH KEY		ALLOY STEEL	1		1	727.VI.204000	EN549A4 0.01 x 1		
031		SPACER RING		Cr-Mo STEEL	2		2	A13- 398606-8	1.0 x 2		
210		HYDRAULIC NUT M24		STEEL	2		2	A14- 309272-0	0.4 x 2		
042		BALL HANDLE		STEEL	1		1	A14- 309273-1	0.09 x 1		
258	S	STEEL BOX FOR HYDR. JACK		STEEL	1		1	A19- 337436-5	STEEL BOX MODEL 23-20 8.5 x 1		
209	S	STUD-THREAD BOTH ENDS		STEEL	2		2	A19- 337437-7 A13- 424643-2	9.9 x 2		
				STEEL	2		2	A13- 424644-4	8.9 x 2		
Similar no.:				Ship no.:			Scale: NONE		Mass. (kg):		
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
				*							5
				*							4
				*							3
				*							2
				*							1
110929	CRS	YGS	KBY	*	Replacement for Ident.no.:						0
TOOLS		Type:			6S90ME-C9.2			HYUNDAI HEAVY INDUSTRIES CO., LTD.			
Info. no.		Description:			HYDR. JACK FOR CHIAN TIGHTENING-AFT			Ident.no.:			
906000								A14-424645-6			

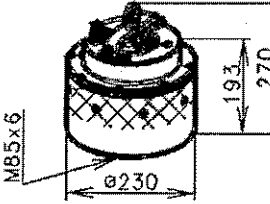
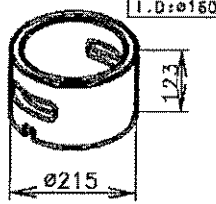
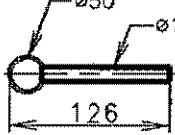
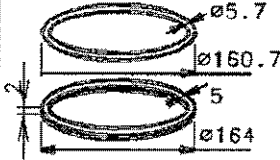
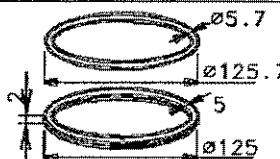
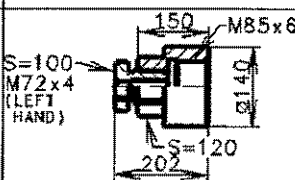
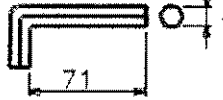
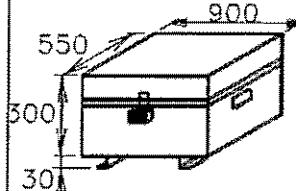
TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STAND- ARD	ADDI- TION	TOTAL			
029		HYDR. JACK FOR CHAIN TIGHTENING -FORE SIDE		CR-MO STEEL RUBBER POLYAMIDE	2		2	A19- 331869-3 A11- 309277-9 (A19-250212-6)	7.6 x 2	KIT : A19-250211-4
101		SPARE O-RING WITH BACK-UP RING		RUBBER / POLYAMIDE	4		4	A19- 235746-5 (A11-262544-0)	0.004 x 4	
102		SPARE O-RING WITH BACK-UP RING		RUBBER / POLYAMIDE	4		4	A19- 235750-0 (A11-262544-0)	0.004 x 4	
150		HEX. WRENCH KEY		ALLOY STEEL	1		1	727.VI.204000	0.01 x 1	
030		SPACER RING		Cr-Mo STEEL	2		2	A13- 287396-5	2.65 x 2	
042		HYDRAULIC NUT M20		STEEL	2		2	A14- 287395-3	0.23 x 1	
149		BALL HANDLE		STEEL	1		1	A19- 193707-2 (A14-356655-5)	0.09 X 1	
200	S	STEEL BOX FOR HYDR. JACK		STEEL	1		1	A19- 331868-1 (A19- 250173-6)	8.5 x 1	
054	S	STUD-THREAD BOTH ENDS		STEEL	2		2	A13- 287394-1	5069444-7.0	7.354x2
Similar no.:		Ship no.:			Scale: NONE			Mass.(kg):		
Date	Des.	Chk.	Appd.	A.G	Replaced by Ident.no.:					R
				*						5
				*						4
				*						3
				*						2
110929	CRS	YGS	KBY	*	PART No. CORRECTED.					1
071123	KPJ	PJK	KBY	*	Replacement for Ident.no.:					0
TOOLS		Type:			6S90ME-C					
Info. no.		Description:			HYDR. JACK FOR MOMENT COMPENSATOR-FORE			Ident.no.:		
906000								A14-309285-0		

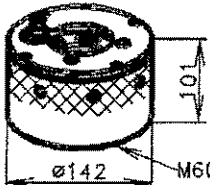
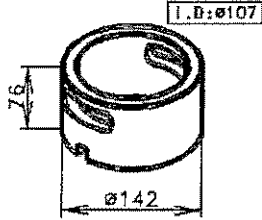
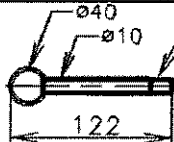
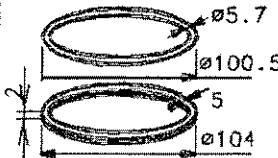
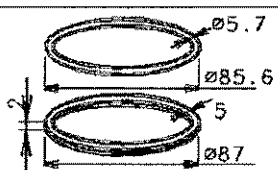
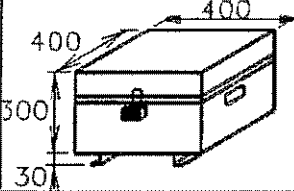
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT)KG	BOX NO.	
					STAND- -ARD	ADDI- -TION	TOTAL				
028		HYDR. JACK FOR EXHAUST VALVE		CR-MO STEEL RUBBER POLYAMIDE	4		4	A19- 235142-0 (A10-262650-2)	5010378-9 19.26X4	KIT : A19-235457-9	
030		SPACER RING		CR-MO STEEL	4		4	A19- 166554-8 (A14-252548-4) (A12-176631-9)	3127136-3 (3180235-7) 8.5x4		
041		BALL HANDLE		STEEL PVC	1		1	A19- 166489-9 (A14-246928-3) (A14-151396-3)	3100930-7 0.1X 1		
053		SPARE O-RING WITH BACK-UP RING		RUBBER / POLYAMIDE	4		4	A19- 229371-6 (A11-246913-9)	3312174-4 0.027X4		
065					4		4	A19- 229334-0	3312147-0 0.020X4		
100		STUD SETTER		STEEL	1		1	A19- 229428-6 (A12-226336-2)	0937028-5 7.48x1		
089		HEX. WRENCH KEY		ALLOY STEEL	1		1	727.VI.204000	EN549A4 0.01 X 1		
207		STEEL BOX FOR HYDR. JACK		STEEL	2		2	A19- 235458-0 (A13-310763-9)	MODEL NO. : 48-20 20 X 2		
Similar no.:		Ship no.:			Scale: NONE			Mass. (kg):			
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
				*							S
				*							4
				*							3
071029	CRS	OJS	KBY	*	DWG. CORRECTED.						2
041229	KMO	JGS	KYJ	*	030(A19-165548-3->A19-166554-8), 041(A14-246931-6->A14-151395-1), 207(A19-235458-0), KIT(A19-234404-2->A19-235457-9)						1
041221	JGS	KJM	KYJ	*	Replacement for Ident.no.:						0
TOOLS		Type:			S90ME-C						
Info. no.		Description:			HYDR. JACK FOR EHAUST VALVE			Ident.no.:			
908000								A14-261598-0			

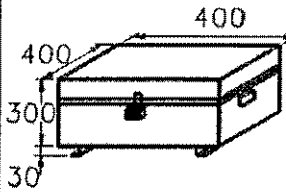
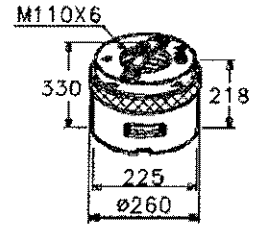
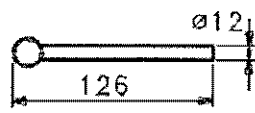
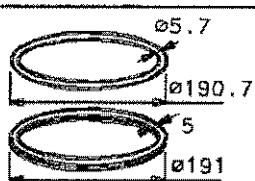
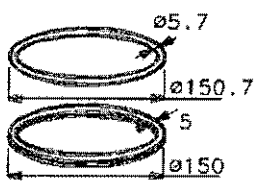
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STAND- -ARD	ADDI- -TION	TOTAL			
124		HYDR. JACK FOR PRESSURE BOOSTER FOR A.V. DAMPER FOR HYD. PIPE		CR-MO STEEL RUBBER POLYAMIDE	2		2	A19- 235143-2 (A10-262654-0)	1270543-1	KIT : A19-324886-7
									6.75 X 2	
136		SPACER RING		CR-MO STEEL	2		2	A19- 235447-3 (A14-262659-9) (A12-262660-8)	1270547-9 (1270548-0)	
									1.64 X 2	
185		BALL HANDLE		STEEL PVC	1		1	A19- 225186-7 (A14-151395-1) (A14-161737-3)	3100929-7	
									0.095 X 1	
161		SPARE O-RING WITH BACK-UP RING		RUBBER / POLYAMIDE	4		4	A19- 229308-0 (A11-246913-9)	3312106-3	
150					4		4	A19- 229296-1	3312092-8	
									0.013 X 4	
207		STUD SETTER		STEEL	1		1	A19- 229416-7 (A12-226336-2)	0984619-8	
									1.81 X 1	
090		HEX. WRENCH KEY		ALLOY STEEL	1		1	727V1 204000	EN549A4	
									0.01 X 1	

Similar no.:					Ship no.:					Scale: NONE					Mass. (kg):				
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:														
				*															
				*															
				*															
				*															
				*															
1109301KHT10JSIKSI					* Replacement for Ident.no.:														
TOOLS					Type: S90ME-C (LOW FORCE)														
Info. no. 908000					Description: HYDR. JACK FOR PRESS. BOOSTER/A.V. DAMPER/HYD. PIPE					Ident. no.: A14-439660-9									

TOOL NO.	PANEL NO.	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.	
					STANDARD	ADDITION	TOTAL				
220		HYDR. JACK FOR EXH. VALVE OIL CYLINDER EXH. VALVE ACTUATOR HCU BLOCK		CR-MO STEEL RUBBER POLYAMIDE	2		2	A19-234876-2 (A10-252565-0)	3180378-3	KIT : A19-324886-7	
232		SPACER RING		CR-MO STEEL	2		2	A19-235448-5 (A14-252570-6) (A12-252571-8)	3180382-9 (3180383-0)		
281		BALL HANDLE		STEEL PVC	1		1	A19-164363-5 (A14-252572-0) (A14-161745-5)	3100928-5		
256		SPARE O-RING WITH BACK-UP RING		RUBBER / POLYAMIDE	4		4	A19-229287-8 (A11-246913-9)	3312083-3		
268					4		4	A19-229281-7	3312076-2		
303		STUD SETTER		STEEL	1		1	A19-229412-0 (A12-226336-2)	0993890-2		
207		STEEL BOX FOR HYDR. JACK		STEEL	1		1	A19-235460-1 (A13-252598-1)	MODEL NO. : 46-30		
									20X1		
Similar no.:		Ship no.:			Scale: NONE			Mass. (kg):			
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
				*							5
				*							4
				*							3
				*							2
				*							1
110930	KHT	QJS	KSL	*	Replacement for Ident.no.:						0
TOOLS		Type: S90ME-C (LOW FORCE)			HYUNDAI HEAVY INDUSTRIES CO., LTD.						
Info. no. 908000		Description: HYDR. JACK FOR EXH. V/V OIL CYL./ACTUATOR/HCU BLOCK			Ident. no.: A14-439661-0						

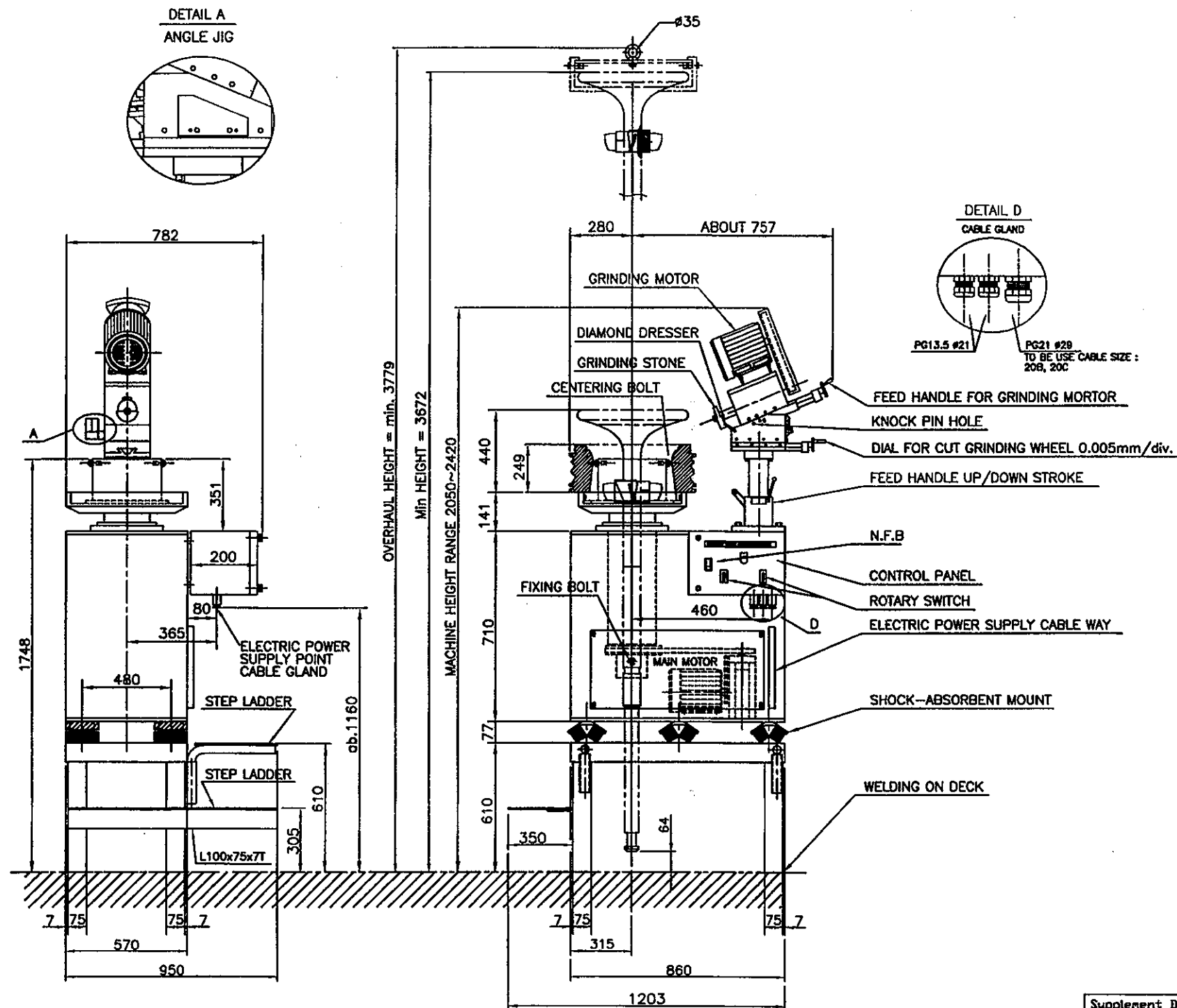
TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.		
					STAND- -ARD	ADDI- -TION	TOTAL					
023		HYDR. JACK FOR STAY BOLT		CR-MO STEEL RUBBER POLYAMIDE	2		2	A19- 235144-4 (A10-263446-2)	5010877-4.0 39.8x2	KIT : A19-234407-8		
035		SPACER RING		CR-MO STEEL	2		2	A19- 235449-7 (A14-262674-0) (A12-181977-0)	3053659-9.3 (3041066-4.3) 14.0x2			
047		BALL HANDLE		STEEL PVC	1		1	A19- 186481-0 (A14-143628-7) (A14-188085-6)	3100931-9.1 0.169x1			
059		SPARE O-RING WITH BACK-UP RING		RUBBER / POLYAMIDE	2		2	A19- 229179-1 (A11-246892-6)	3312196-0.0 0.03x2			
060					2		2	A19- 229351-5 (A11-246913-9)	3312152-8.0 0.023x2			
106		STUD SETTER		STEEL	1		1	A19- 229431-9 (A12-226336-2)	0984517-9.1 15.8x1			
084		HEX. WRENCH KEY		ALLOY STEEL	1		1	727.V1.204000	EN549A4 0.01 X 1			
202		STEEL BOX FOR HYDR. JACK		STEEL	1		1	A19- 235463-7 (A13-263470-8)	MODEL NO. :59-30 27.5x1			
Similar no.:					Ship no.:			Scale: NONE			Mass. (kg):	
Date	Des.	Chk.	Appd.	A.G.	Replaced by Ident.no.:							R
												S
												A
												S
												2
041230	KMO	JGS	KYJ	*	DWG. REPL. : 047(A14-246742-3/A14-164906-5-->A14-143628-7/A14-188085-6), ADDED: 202(A19-235463-7)							T
041223	JGS	KJM	KYJ	*	Replacement for Ident.no.:							G
TOOLS		Type:			S90ME-C							
Info. no.		Description:			912000 HYDRAULIC JACK FOR STAY BOLT				Ident. no.:			
									A14-261599-2			

TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATE- RIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.	
					STAND- -ARD	ADDI- -TION	TOTAL				
025		HYDR. JACK FOR HOLDING DOWN BOLT FOR SIGMENT STOPPER		CR-MO STEEL RUBBER POLYAMIDE	2		2	A19- 235145-6 (A10-263452-0)	5011165-0.0 JACK AREA: 38.38Cm² 9.22x2	KIT : A19-234408-0	
037		SPACER RING		CR-MO STEEL	2		2	A19- 235450-6 (A14-263456-8) (A12-263457-0)	5011166-2.0 (5011198-5.0) 3.57x2		
049		BALL HANDLE		STEEL PVC	2		2	A19- 166489-9 (A14-151395-1) (A14-151396-3)	3100930-7.1 0.944X 2		
050		SPARE O-RING WITH BACK-UP RING		RUBBER / POLYAMIDE	4	1	5	A19- 229330-2 (A11-246913-9)	3312130-1.0 0.019X4		
062					4	1	5	A19- 229313-7	3312111-0.0 0.015x4		
086		HEX. WRENCH KEY		ALLOY STEEL	1		1	727.V1.204000	EN549A4 0.01 X 1		
204	S	STEEL BOX FOR HYDR. JACK		STEEL	1		1	A19- 235464-9 (A13-263472-1)	MODEL NO. : 44-30 12.2x1		
Similar no.:			Ship no.:			Scale: NONE		Mass. (kg):			
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						R
				*							5
				*						4	
				*						3	
				*						2	
041230	KMO	JGS	KYJ	*	DWG. REPL. : 049(A14-246931-6->A14-151395-1), ADDED: 204(A19-235464-9)					1	
041223	JGS	KJM	KYJ	*	Replacement for Ident.no.:					0	
TOOLS		Type:			S90ME-C						
Info. no.		Description:			ENGINE SEATING-HOLDING DOWN BOLT			Ident. no.:			
924000								A14-261600-1			

TOOL NO	PANEL NO	DESCRIPTION	SKETCH	MATERIAL	SUPPLY PER SHIP			DRAWING NO.	REMARK (WEIGHT) KG	BOX NO.
					STANDARD	ADDITION	TOTAL			
132	S	STEEL BOX FOR HYDR. JACK		STEEL	1		1	A19-266829-6 (A13-188455-8)	MODEL NO. : 44-30	KIT : A19-266829-6
120		HYDR. JACK FOR END CHOCK BOLTS		CR-MO STEEL RUBBER POLYAMIDE	1		1	A19-266830-5 (A13-340763-7)	AREA: 132.58cm ² PRESS: 2200bar 57.47X1	
345		BALL HANDLE		STEEL	2		2	A19-232123-0 A14-143628-7 (A14-188085-6)		
107		SPARE O-RING WITH BACK-UP RING		RUBBER POLYAMIDE	8		8	A19-229206-2 (A11-246892-6)	33122610 0.019 X4	
097					8		8	A19-229376-5 (A11-246913-9)	1209836-2 0.038 X4	

Simitor no.:					Ship no.:					Scale: NONE					Mass. (kg):				
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:														
				*															
				*															
				*															
				*															
				*															
091016 LKSYSC SJR					Replacement for Ident.no.:														
TOOLS					Type: S90ME-C														
Info. no. 924000					Description: END CHOCK BOLT					Ident. no.: A14-340765-0									

					S. Page 1	T. Page 4												
PLAN HISTORY			ENGINE TYPE	HYUNDAI - MAN. B&W S90ME/-C														
* NOTE The item marked with "S" in this list are to be arranged at the hull side and the steel box for storing them are not supplied.			MESSER.															
			RULE															
			SHIP No.															
			ENG. No.															
TITLE : GRINDING MACHINE CONTENTS <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 5%;">No.</th> <th style="width: 25%;">DWG. No.</th> <th style="width: 70%;">DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td>A10-268269-8.1</td> <td>GRINDING MACHINE-VALVE SEAT+SPINDLE</td> </tr> <tr> <td style="text-align: center;">2</td> <td>A13-268258-0.0</td> <td>CONTROL PANEL FOR GRINDING MACHINE</td> </tr> <tr> <td style="text-align: center;">3</td> <td>A13-268259-2.0</td> <td>CIRCUIT DIAGRAM - CONTROL PANEL FOR GRIND. MACHINE</td> </tr> </tbody> </table>							No.	DWG. No.	DESCRIPTION	1	A10-268269-8.1	GRINDING MACHINE-VALVE SEAT+SPINDLE	2	A13-268258-0.0	CONTROL PANEL FOR GRINDING MACHINE	3	A13-268259-2.0	CIRCUIT DIAGRAM - CONTROL PANEL FOR GRIND. MACHINE
No.	DWG. No.	DESCRIPTION																
1	A10-268269-8.1	GRINDING MACHINE-VALVE SEAT+SPINDLE																
2	A13-268258-0.0	CONTROL PANEL FOR GRINDING MACHINE																
3	A13-268259-2.0	CIRCUIT DIAGRAM - CONTROL PANEL FOR GRIND. MACHINE																
(4 SHEETS WITH COVER)																		
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:													
				*														
				*														
				*														
				*														
				*														
				*														
Q50909CRSIOJSKBY					* Replacement for Ident.no.: POWER SOURCE : 440V													
Licensor Ident.no.:			Type:		 HYUNDAI HEAVY INDUSTRIES CO., LTD. Ident.no.:													
Info.no.:			S90ME/-C															
Page.no.:			Description:															
1 OF 1			GRINDING MACHINE (VALVE SEAT+SPINDLE)		A14-354110-4													



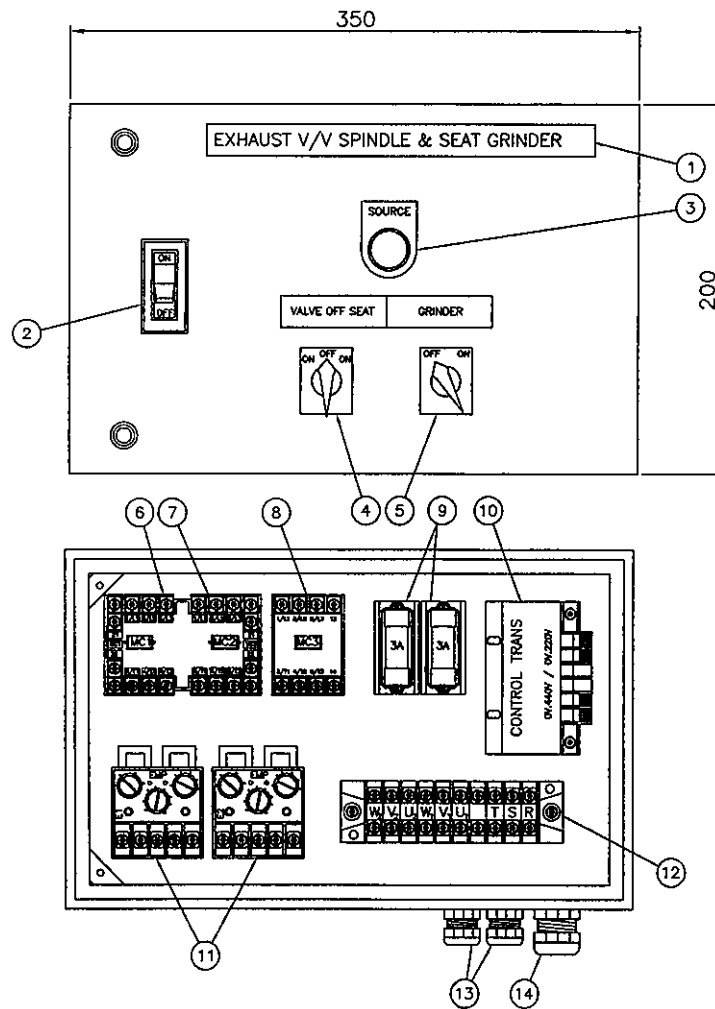
NOTE

1. MAKER : KOKACO CO., LTD.
2. MODEL NO. : NKK 90 BG - ME
3. MAKER DRAWING NO. : KKC-BNKK90ME-0-000 REV.2
4. PAINT COLOR : MUNSELL NO. 7.5BG 7/2
5. DRAWING PROJECTION : 3rd ANGLE
6. CIRCUIT DIAGRAM FOR EXH. VALVE GRINDING MACHINE (VALVE SEAT+SPINDLE)
: DRAWING NO. A13-268259-2
7. CONTROL PANEL FOR EXH. VALVE GRINDING MACHINE (VALVE SEAT+SPINDLE)
: DRAWING NO. A13-268258-0

SPECIFICATION

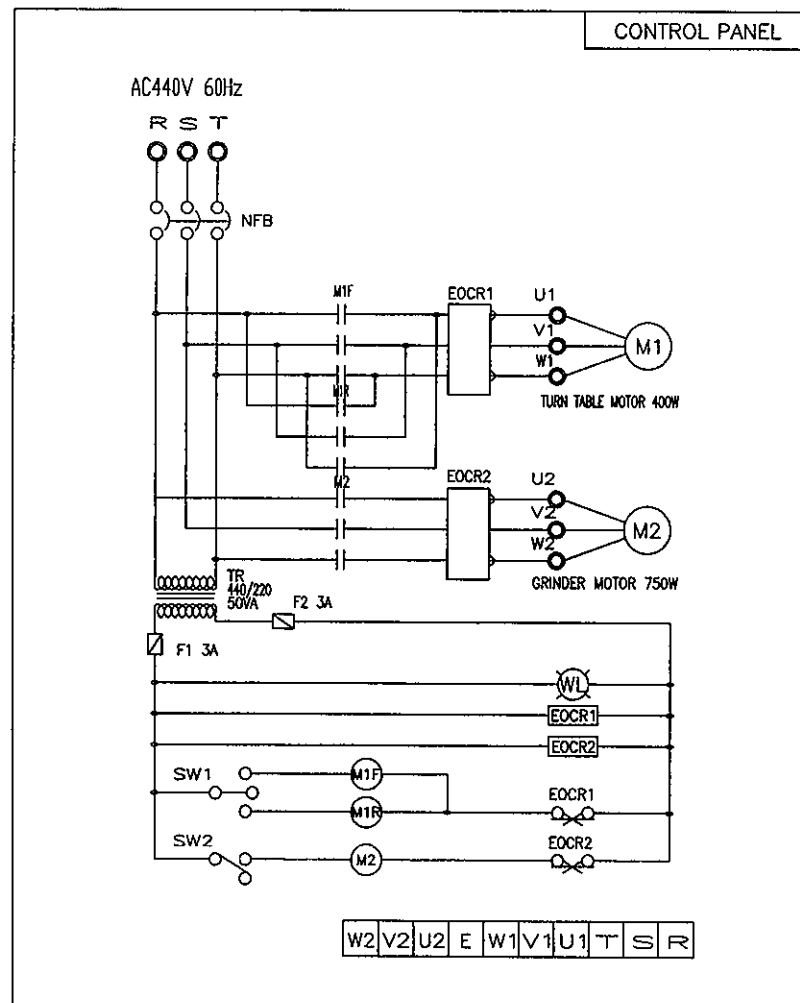
ELECTRIC MAIN POWER SOURCE : AC 440V, 60Hz, $\phi 3$
 MAIN MOTOR :
 AC440V, 60Hz, $\phi 3$, 400W (*JP44, INS. CLASS "B" OR "F")
 * EQUIVALENT TO JP44=IP44.
 AMBIENT TEMP : 50°C
 GRINDING MOTOR :
 AC440V, 60Hz, $\phi 3$, 750W (*JP44, INS. CLASS "B" OR "F")
 TURN TABLE RPM : 3.0 RPM.
 GRINDING RATE : 0.005 mm/div
 WHEEL INCLINING ANGLE RANGE : FIXED TYPE.
 THE INCLINED ANGLE : V/V. SPINDLE $\angle 30.7^{\circ} \pm 8.1^{\circ}$
 V/V. SEAT $\angle 30^{\circ} \pm 8.1^{\circ}$
 WHEEL SIZE : $\phi 100 \times W13 \times \phi 32$
 PAINT COLOR : MAKER STANDARD (7.5BG 7/2)
 MAIN MOTOR : RATING CURRENT 1.2A,
 STARTING CURRENT 5A.
 GRINDING MOTOR : RATING CURRENT 1.45A,
 STARTING CURRENT 8A.

Supplement Dwg no.:					Projection: 		Mass (kg): 580		Material / Blank:			
					Licensor's Ident. no.:		Dist.:		Licensor's Material / Blank:			
Date	Des.	Chk.	Appd.	AC	E	Change / Replacement					CND	
					*	*	Replace by Ident. no.:					9
					*	*						8
					*	*						7
					*	*						6
					*	*						5
					*	*						4
					*	*						3
					*	*						2
071018	CRS	DJS	KBY	*	*	ADDL STEP LADDER, ADDL DIM 305,350,1203, CORRECTED WEIGHT:560->580, NOTE NO.3					1	
051230	CRS	DJS	KBY	*	*						0	
Similar Drawing No.:							Replacement of Ident.No.:					
Scale:		Size:		Type:			Page No.:		 HYUNDAI HEAVY INDUSTRIES CO., LTD.			
NONE		A0		K-L-S90ME/ME-C			01 (01)					
Info. no.:				Description:				Ident.no.:				
000000				EXHAUST VALVE GRINDING MACHINE (VALVE SEAT + SPINDLE)				A10-268269-8				

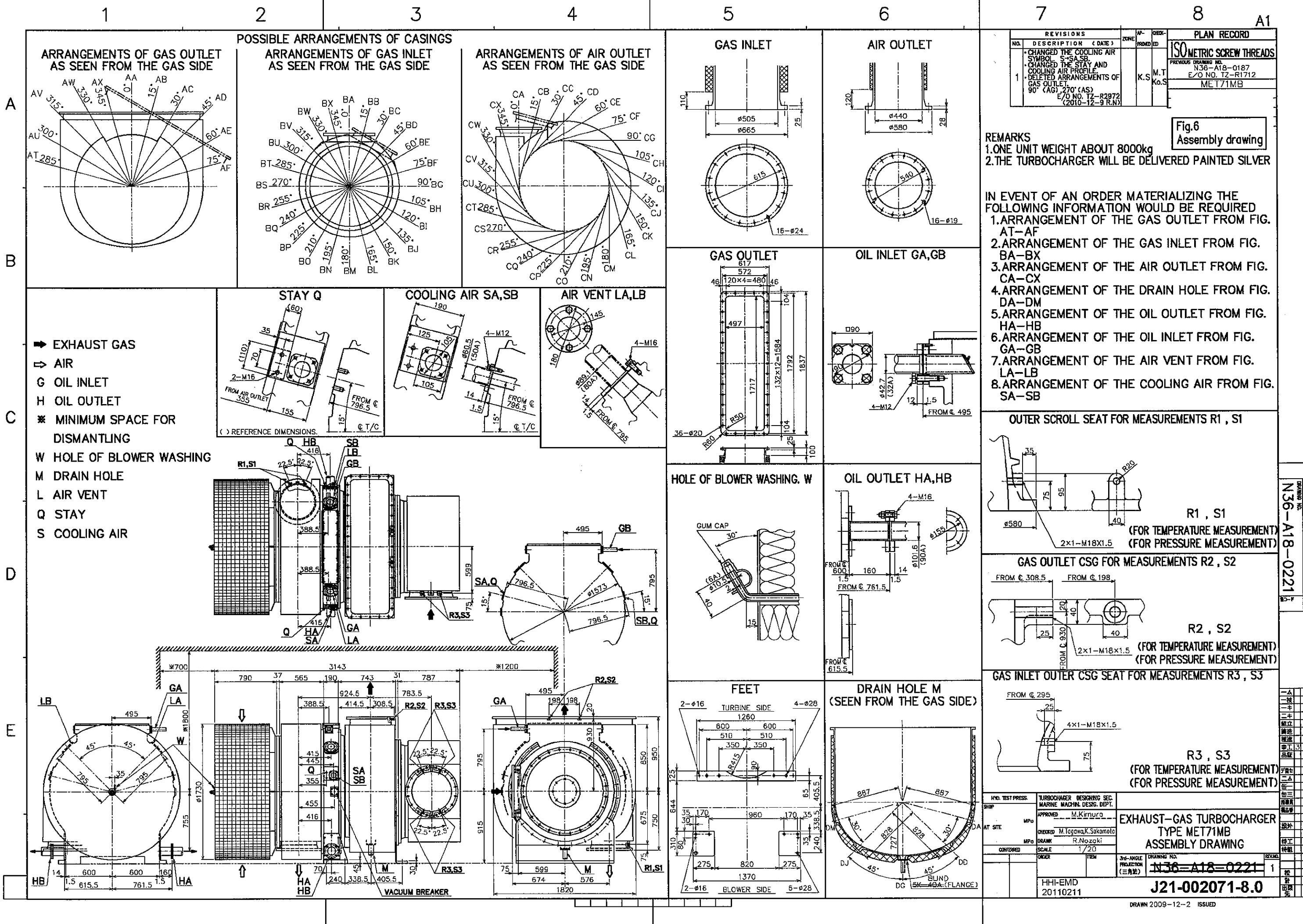


No.	DESCRIPTION	QTY
1	NAME PLATE	1
2	NO FUSE BRAKE	1
3	SOURCE LAMP	1
4	ROTARY SWITCH	1
5	ROTARY SWITCH	1
6	MAGNETIC CONTACTOR(M1F)	1
7	MAGNETIC CONTACTOR(M1R)	1
8	MAGNETIC CONTACTOR(M2)	1
9	FUSE	2
10	TRANSFORMER	1
11	ELEC.OVER CURRENT RELAY	2
12	TERMINAL	1
13	CABLE GLAND	2
14	CABLE GLAND	1

Supplement Dwg. no.		Projection		Mass (kg)		Material / Blank	
		Licensor's Ident. no.		Dist.		Licensor's Material / Blank	
Date	Des.	Chk.	Appd.	A/C	E	Change / Replacement	
						Replace by Ident. no.	
050121	CRS	QJS	KBY				
Similar Drawing No.		Replacement of Ident. No.					
Scale	Size	Type		Page No.		HYUNDAI HEAVY INDUSTRIES CO., LTD.	
NONE	A3	COMMON		01 (01)			
Info. no.	Description		Ident. no.				
000000	NKK-TYPE CONTROL PANEL FOR EXH. VALVE GRINDING MACHINE (VALVE SEAT+SPINDLE)		A13-268258-0				



Supplement Dwg. no.		Projection		Mass (kg)		Material / Blank	
Licensor's Ident. no.		Dist.		Licensor's Material / Blank			
Date	Des.	Eng.	Appd.	AC	C	Change / Replacement	
						Replace by Ident. no.	
						CNE	
						9	
						8	
						7	
						6	
						5	
						4	
						3	
						2	
						1	
						0	
P50121		CRS	DJS	KBY		Replacement of Ident. No.	
Scale: Drawing No.		Type:		Page No.		HYUNDAI HEAVY INDUSTRIES CO., LTD.	
NONE		A3		COMMON		01 (01)	
Info. no.		Description		Ident. no.		A13-268259-2	
000000		NKK-TYPE CIRCUIT DIAGRAM FOR EXH. VALVE GRINDING MACHINE (VALVE SEAT+SPINDLE)					



REVISIONS			PLAN RECORD	
NO.	DESCRIPTION (DATE)	ZONE	APPROVED	CHECKED
1	CHANGED THE COOLING AIR SYMBOL S-SA,SB. CHANGED THE STAY AND COOLING AIR PROFILE. DELETED ARRANGEMENTS OF GAS OUTLET. 90° (AG), 270° (AS) E/O NO. T2-R2972 (2010-12-9 R.N.)	K.S.	M.T.	Ko.S.

REMARKS
1. ONE UNIT WEIGHT ABOUT 8000kg
2. THE TURBOCHARGER WILL BE DELIVERED PAINTED SILVER

IN EVENT OF AN ORDER MATERIALIZING THE FOLLOWING INFORMATION WOULD BE REQUIRED
1. ARRANGEMENT OF THE GAS OUTLET FROM FIG. AT-AF
2. ARRANGEMENT OF THE GAS INLET FROM FIG. BA-BX
3. ARRANGEMENT OF THE AIR OUTLET FROM FIG. CA-CX
4. ARRANGEMENT OF THE DRAIN HOLE FROM FIG. DA-DM
5. ARRANGEMENT OF THE OIL OUTLET FROM FIG. HA-HB
6. ARRANGEMENT OF THE OIL INLET FROM FIG. GA-GB
7. ARRANGEMENT OF THE AIR VENT FROM FIG. LA-LB
8. ARRANGEMENT OF THE COOLING AIR FROM FIG. SA-SB

OUTER SCROLL SEAT FOR MEASUREMENTS R1, S1
R1, S1
(FOR TEMPERATURE MEASUREMENT)
(FOR PRESSURE MEASUREMENT)

GAS OUTLET CSG FOR MEASUREMENTS R2, S2
R2, S2
(FOR TEMPERATURE MEASUREMENT)
(FOR PRESSURE MEASUREMENT)

GAS INLET OUTER CSG SEAT FOR MEASUREMENTS R3, S3
R3, S3
(FOR TEMPERATURE MEASUREMENT)
(FOR PRESSURE MEASUREMENT)

HYD. TEST PRESS.	TURBOCHARGER DESIGNING SEC.	EXHAUST-GAS TURBOCHARGER TYPE MET71MB ASSEMBLY DRAWING	
SHIP	MARINE MACHIN. DESIG. DEPT.		
MPG	APPROVED M. Kimura	DRAWING NO. N36-A18-0221-1	
MPG	CHECKED M. Ito, K. Sakamoto		
CONFIRMED	DRAWN R. Nozaki	J21-002071-8.0	
ORDER	SCALE 1/20		
	ITEM	3rd-ANGLE PROJECTION (三角度)	
		HHI-EMD 20110211	

PLAN HISTORY	ENGINE TYPE	HYUNDAI-MANB&W 6S90ME-C8.2
IMO Tier-II Compliant	MESSRS.	Hyundai Heavy Industry
	RULE	LR
	SHIP NO.	2585/86/87/88/89
	ENG. NO.	AA4624/25/26/27/28

TITLE : Axial Vibration Calculation

(14 SHEETS WITH COVER)

DRAWN	DESIGN	CHECK	APRD	DESCRIPTION	R
					5
					4
					3
					2
	Y. J. Jo		D. I. Choi	- Int. shaft T.S. changed - Turning wheel MOI changed	△
	Sep. 21, 2011		Sep. 21, 2011		
	Y. J. Jo		D. I. Choi	For approval	0
	Aug. 11, 2011		Aug. 11, 2011		

2585/86/87/88/89, 6S90ME-C8.2

SPECIFICATION**1. Main engine**

Engine type	:	HYUNDAI-MAN B&W 6S90ME-C8.2
Max. continuous output	:	30,423 kW
Max. continuous speed	:	75.6 rpm
Cylinder bore	:	900 mm
Stroke	:	3,188 mm
No. of cylinder	:	6
Mean indicated pressure	:	21.2 bar
Ratio of connecting rod	:	0.487
Reciprocating mass	:	17,496 kg/cyl.
Gas harmonic	:	T244837
Firing order	:	1 5 3 4 2 6
2 nd moment compensator	:	Fore + After sides
Crank throw	:	FSB244582 (Dwg. No.: A10-410350-1)

2. Turning wheel (Dwg. No. : A10-433733-0)

Moment of inertia	:	30,110 kgm ² 
Weight	:	9,345 kg

3. Tuning wheel (Dwg. No.: A10-233285-5)

Moment of inertia	:	105,000 kgm ²
Weight	:	31,595 kg

4. Propulsion shafting (Multi Radii Fillet Applied)**Intermediate shaft (Dwg. No.: 3R-2820-201)**

Diameter x length	:	Φ710 mm * 9,344 mm
Weight	:	32,015 kg
Material	:	TS ≥ 700 N/mm ² 

Propeller shaft (Dwg. No.: 3R-2820-201)

Diameter x length	:	Φ820 mm * 10,170 mm
Weight	:	41,281 kg
Material	:	TS ≥ 600 N/mm ²

5. Propeller (Dwg. No.: D14-112719-6- particulars)

Moment of Inertia in water (GD2)	:	1,569,600 kgm ²
Weight	:	76,193 kg
No. of blade	:	4
Diameter	:	10.1 M

6. Axial vibration damper

Damping coefficient	:	8.2 MNs/m
Axial stiffness	:	330 MN/m
Weight	:	3,600 kg

2585/86/87/88/89, 6S90ME-C8.2

CONCLUSION

Axial vibration is calculated with a view of confirming dynamic characteristic of whole propulsion shafting system, whose results are compared to maker's guidance limit.

With axial vibration damper active condition, alternating axial displacements satisfy the guidance limit. But due to torsional vibration calculation, it is necessary to set barred speed range.

- **Barred speed range : 35 ~ 42 rpm (due to TV calculation)**

When inactive condition of axial vibration damper, axial displacements exceed the guidance limit. Therefore, it is necessary to set additional barred speed range for safe running.

- **Additional barred speed range : 35 ~ 42, 51 ~ 63 rpm, above 66 rpm
(due to TV calculation, AV damper failure)**
- **Alarm limit : 2.165 mm (0-Peak, crankshaft free end)**

2585/86/87/88/89, 6S90ME-C8.2
Mass elastic model for AVC

AXIAL VIBRATION ALARM LIMIT : 2.165 mm (0-Peak)
CLASS : LR

2585/86/87/88/89

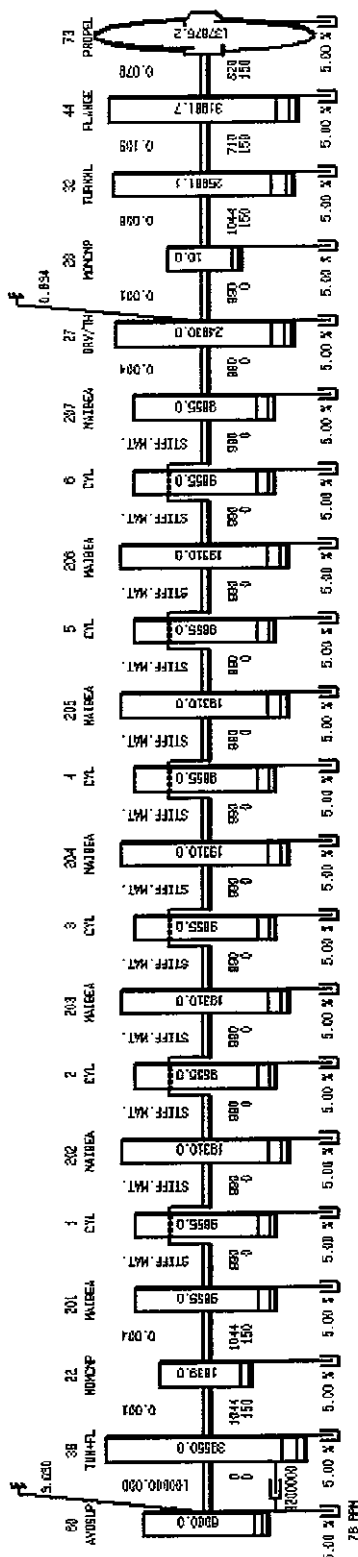
043-IHH

DECODE S90ME-C MARKB_2 : FSB THROW244582
TUNING WHEEL : 105000 KGM2, 31595 KG
TURNING WHEEL : 30110 KGM2, 9345 KG

ENGINE LOAD : kW
Propeller 30423
RPM 78

Gas harmonic components : T244837, R244838

6S90ME-C8.2	
NCR 30423 kW	75.6 r/min
Bore	900 mm
Stroke	3188 mm
Cann rod	3270 mm
Osc mass	17496 kg
Firing order	1 5 3 4 2 6



TXBVBIS 2.3.1 - WIN32

CALCULATION MODEL FOR COUPLED AXIAL AND TORSIONAL VIBRATIONS (AXIAL)

Units:	Mass	kg
	Diameter	mm
	Flexibility	nanom/N
	Damping	Ns/m or % of critical

2585/86/87/88/89, 6S90ME-C8.2

Coupled Axial and Torsional vibration calculation- Damped Natural frequencies

Modal form no. 1,			Cyclic frequency = 24.005 rad/s,		= 229.23 CPM			
Mass ID	Mass name	Mass, axial (kg)	Axial stiffness bef. mass (GN/m)	Mass moment of inertia (kgm ²)	Torsional stiffness bef. mass (GNm/rad)	Rot. speed (RPM)	Axial amplitude (mm)	Torsional amplitude (mrad)
60	AVD-SUPPORT	6000.0	0.000	1.0	0.000	76.	0.0245	1.0156
38	TUN+FLG	39550.0	0.000	107135.0	1000.000	76.	0.0374	1.0156
22	MOMENT COMPNSTR	1839.0	1000.000	6464.0	1000.000	76.	0.0374	1.0155
201	MAINBEARING	9655.0	266.700	15508.2	15.630	76.	0.0374	1.0113
1	CYLINDER	9655.0	1.147	28598.0	6.792	76.	0.0459	1.0000
202	MAINBEARING	19310.0	1.712	31016.5	6.900	76.	0.0400	0.9876
2	CYLINDER	9655.0	1.585	28598.0	7.571	76.	0.0356	0.9731
203	MAINBEARING	19310.0	1.803	31016.5	7.565	76.	0.0276	0.9572
3	CYLINDER	9655.0	1.698	28598.0	7.070	76.	0.0174	0.9364
204	MAINBEARING	19310.0	3.537	31016.5	6.990	76.	0.0357	0.9139
4	CYLINDER	9655.0	3.585	28598.0	7.000	76.	0.0532	0.8887
205	MAINBEARING	19310.0	1.746	31016.5	7.086	76.	0.0364	0.8627
5	CYLINDER	9655.0	1.718	28598.0	7.492	76.	0.0254	0.8353
206	MAINBEARING	19310.0	1.760	31016.5	7.492	76.	0.0083	0.8068
6	CYLINDER	9655.0	1.886	28598.0	7.645	76.	-0.0086	0.7761
207	MAINBEARING	9655.0	2.870	15508.2	7.855	76.	-0.0031	0.7444
27	CAMDRIV.+THRUST	24930.0	273.200	14634.0	15.950	76.	-0.0030	0.7285
28	MOMENT COMPNSTR	10.0	1000.000	6279.0	1000.000	76.	-0.0030	0.7283
32	TURNING WHEEL	25861.1	166.100	31762.8	9.579	76.	-0.0030	0.7010
44	FLANGE	31981.7	9.139	2928.7	0.224	76.	-0.0031	-0.5222
73	MAIN PROPELLER	137876.2	12.700	394110.0	0.407	76.	-0.0031	-1.1939

AVD-SUPPORT Stiffness (axial), ID 60 : 0.330 GN/m
C.DRIV +THRUST Stiffness (axial), ID 27 : 1.577 GN/m

Modal form no. 2,			Cyclic frequency = 53.685 rad/s,		= 512.65 CPM			
Mass ID	Mass name	Mass, axial (kg)	Axial stiffness bef. mass (GN/m)	Mass moment of inertia (kgm ²)	Torsional stiffness bef. mass (GNm/rad)	Rot. speed (RPM)	Axial amplitude (mm)	Torsional amplitude (mrad)
60	AVD-SUPPORT	6000.0	0.000	1.0	0.000	76.	0.8571	0.0119
38	TUN+FLG	39550.0	0.000	107135.0	1000.000	76.	0.8999	0.0119
22	MOMENT COMPNSTR	1839.0	1000.000	6464.0	1000.000	76.	0.9000	0.0119
201	MAINBEARING	9655.0	266.700	15508.2	15.630	76.	0.9006	0.0115
1	CYLINDER	9655.0	1.147	28598.0	6.792	76.	1.0000	0.0120
202	MAINBEARING	19310.0	1.712	31016.5	6.900	76.	1.0424	0.0127
2	CYLINDER	9655.0	1.585	28598.0	7.571	76.	1.0773	0.0121
203	MAINBEARING	19310.0	1.803	31016.5	7.565	76.	1.0684	0.0105
3	CYLINDER	9655.0	1.698	28598.0	7.070	76.	1.0494	0.0124
204	MAINBEARING	19310.0	3.537	31016.5	6.990	76.	1.0433	0.0151
4	CYLINDER	9655.0	3.585	28598.0	7.000	76.	0.9807	0.0099
205	MAINBEARING	19310.0	1.746	31016.5	7.086	76.	0.8623	0.0027
5	CYLINDER	9655.0	1.718	28598.0	7.492	76.	0.7280	-0.0162
206	MAINBEARING	19310.0	1.760	31016.5	7.492	76.	0.5773	-0.0354
6	CYLINDER	9655.0	1.886	28598.0	7.645	76.	0.4305	-0.0459
207	MAINBEARING	9655.0	2.870	15508.2	7.855	76.	0.3290	-0.0545
27	CAMDRIV.+THRUST	24930.0	273.200	14634.0	15.950	76.	0.3279	-0.0545
28	MOMENT COMPNSTR	10.0	1000.000	6279.0	1000.000	76.	0.3281	-0.0545
32	TURNING WHEEL	25861.1	166.100	31762.8	9.579	76.	0.3292	-0.0541
44	FLANGE	31981.7	9.139	2928.7	0.224	76.	0.3475	-0.0152
73	MAIN PROPELLER	137876.2	12.700	394110.0	0.407	76.	0.3583	0.0066

AVD-SUPPORT Stiffness (axial), ID 60 : 0.330 GN/m
C.DRIV +THRUST Stiffness (axial), ID 27 : 1.577 GN/m

2585/86/87/88/89, 6S90ME-C8.2

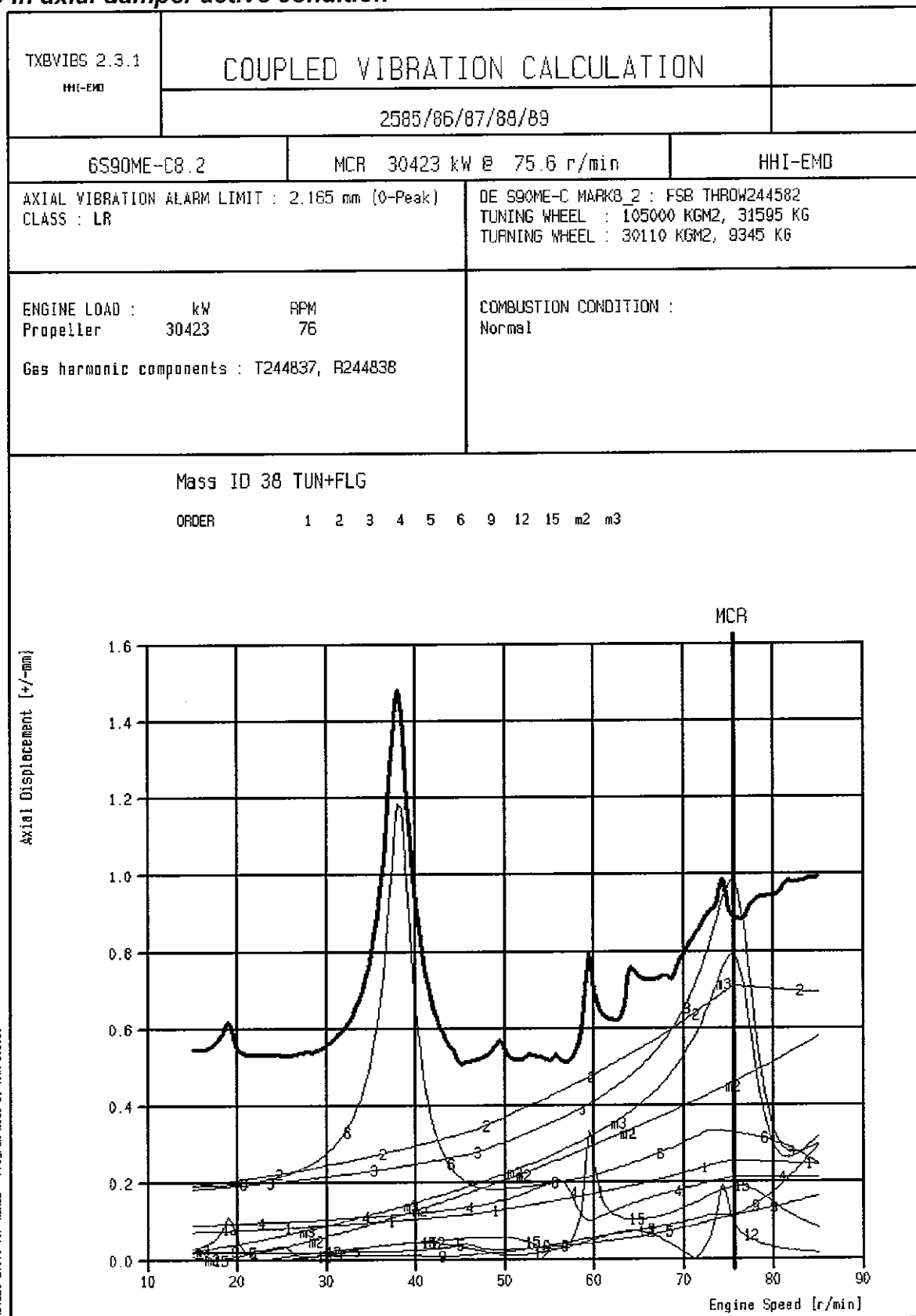
Modal form no. 3, Cyclic frequency = 81.610 rad/s, = 779.32 CPM

Mass ID	Mass name	Mass, axial (kg)	Axial stiffness bef. mass (GN/m)	Mass moment of inertia (kgm ²)	Torsional stiffness bef. mass (GNm/rad)	Rot. speed (RPM)	Axial amplitude (mm)	Torsional amplitude (mrad)
60	AVD-SUPPORT	6000.0	0.000	1.0	0.000	76.	0.9570	0.2081
38	TUN+FLG	39550.0	0.000	107135.0	1000.000	76.	1.0889	0.2081
22	MOMENT COMPNSTR	1839.0	1000.000	6464.0	1000.000	76.	1.0889	0.2080
201	MAINBEARING	9655.0	266.700	15508.2	15.630	76.	1.0888	0.1984
1	CYLINDER	9655.0	1.147	28598.0	6.792	76.	1.0000	0.1628
202	MAINBEARING	19310.0	1.712	31016.5	6.900	76.	0.8654	0.1237
2	CYLINDER	9655.0	1.585	28598.0	7.571	76.	0.7054	0.0722
203	MAINBEARING	19310.0	1.803	31016.5	7.565	76.	0.4944	0.0182
3	CYLINDER	9655.0	1.698	28598.0	7.070	76.	0.2649	-0.0156
204	MAINBEARING	19310.0	3.537	31016.5	6.990	76.	0.1799	-0.0452
4	CYLINDER	9655.0	3.585	28598.0	7.000	76.	0.0747	-0.0764
205	MAINBEARING	19310.0	1.746	31016.5	7.086	76.	-0.1827	-0.1110
5	CYLINDER	9655.0	1.718	28598.0	7.492	76.	-0.4380	-0.1650
206	MAINBEARING	19310.0	1.760	31016.5	7.492	76.	-0.6466	-0.2154
6	CYLINDER	9655.0	1.886	28598.0	7.645	76.	-0.8324	-0.2429
207	MAINBEARING	9655.0	2.870	15508.2	7.655	76.	-0.9075	-0.2644
27	CAMDRIV.+THRUST	24930.0	273.200	14634.0	15.950	76.	-0.9081	-0.2674
28	MOMENT COMPNSTR	10.0	1000.000	6279.0	1000.000	76.	-0.9095	-0.2674
32	TURNING WHEEL	25861.1	166.100	31762.8	9.579	76.	-0.9183	-0.2688
44	FLANGE	31981.7	9.139	2928.7	0.224	76.	-1.0596	-0.0876
73	MAIN PROPELLER	137876.2	12.700	394110.0	0.407	76.	-1.1433	0.0161

AVD-SUPPORT Stiffness (axial), ID 60 : 0.330 GN/m
 C.DRIV +THRUST Stiffness (axial), ID 27 : 1.577 GN/m

2585/86/87/88/89, 6S90ME-C8.2

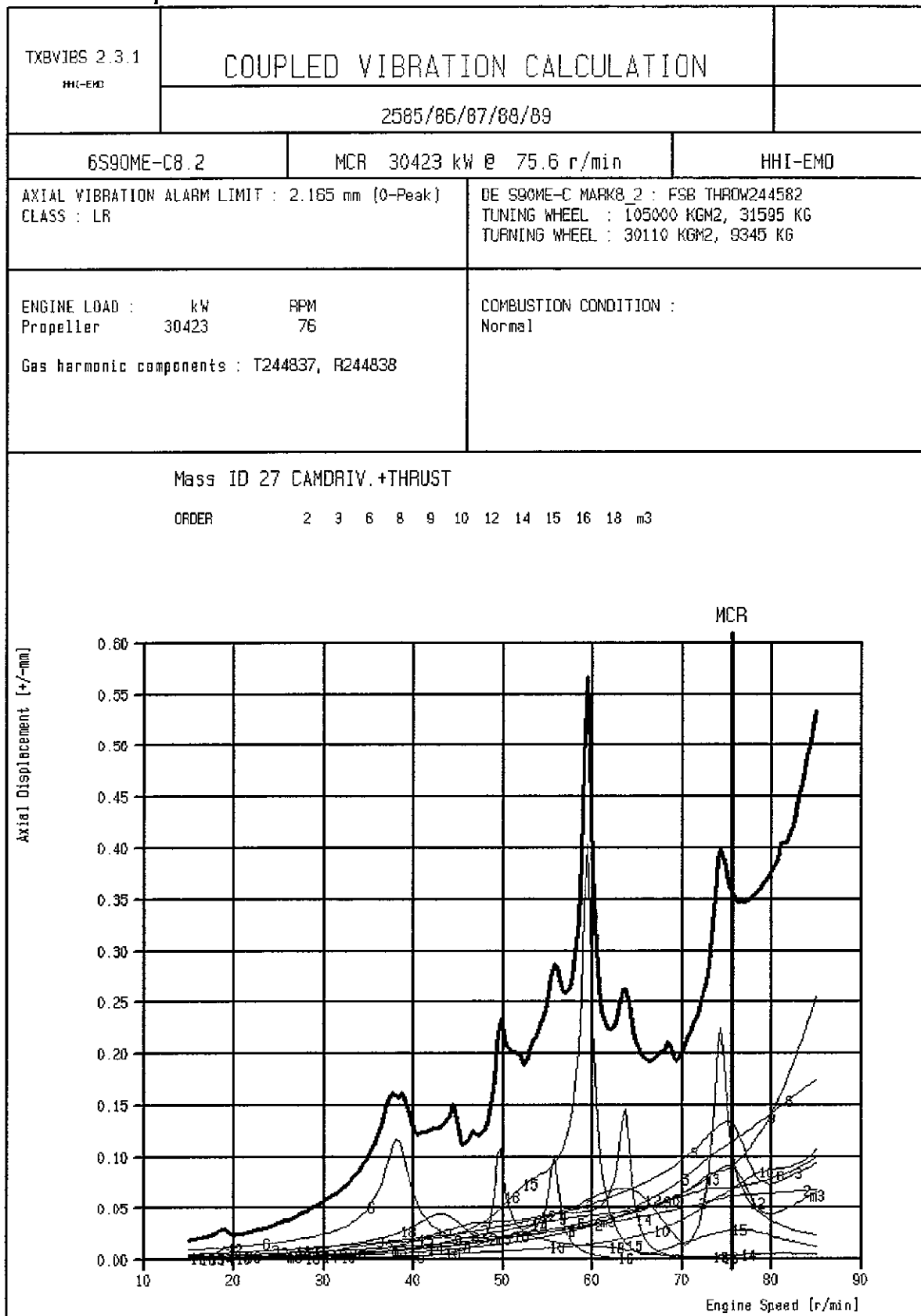
AVC in axial damper active condition



TXBVIBS 2.3.1 for VIB32 - Program made by HHI Diesel

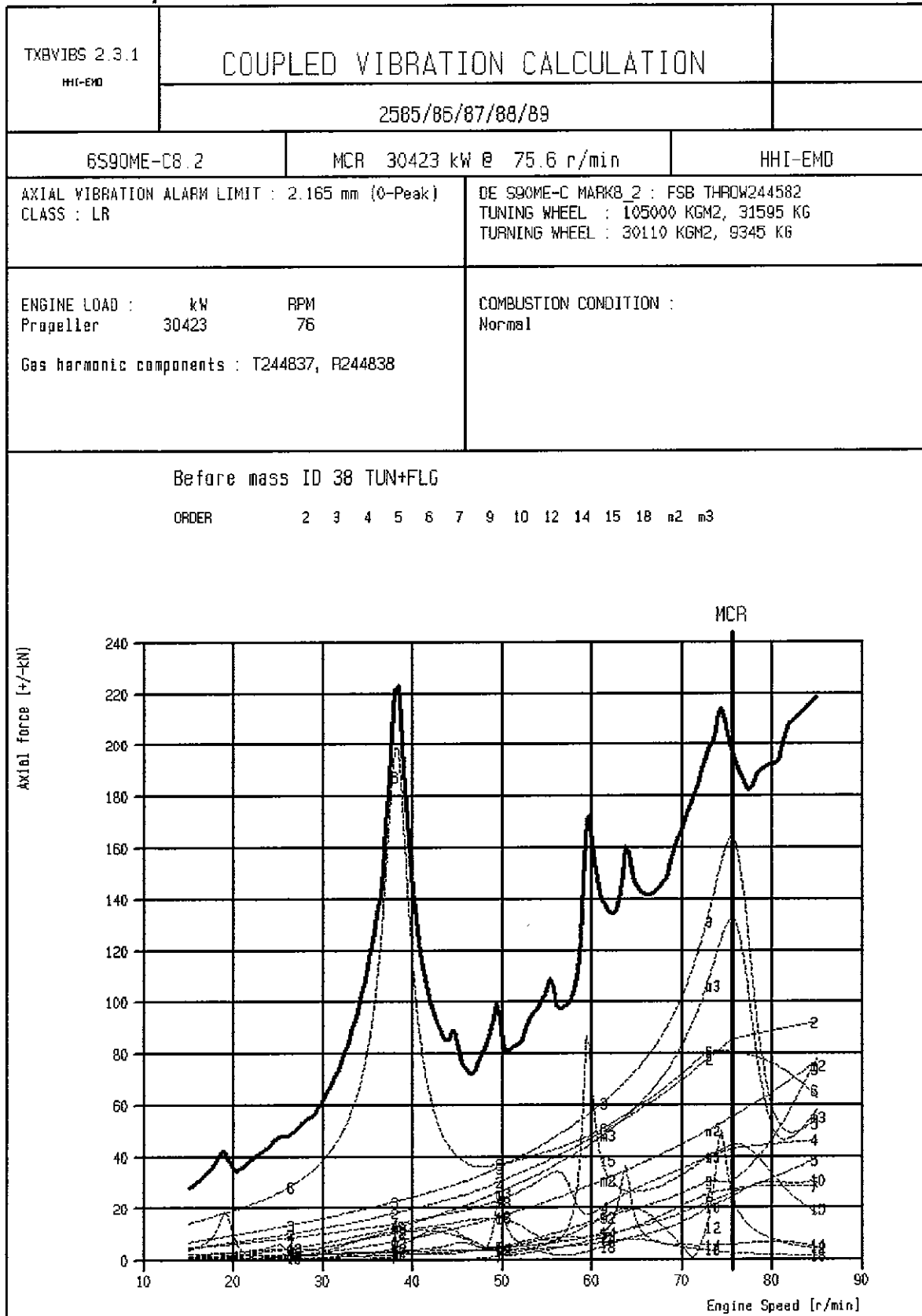
2585/86/87/88/89, 6S90ME-C8.2

AVC in axial damper active condition



2585/86/87/88/89, 6S90ME-C8.2

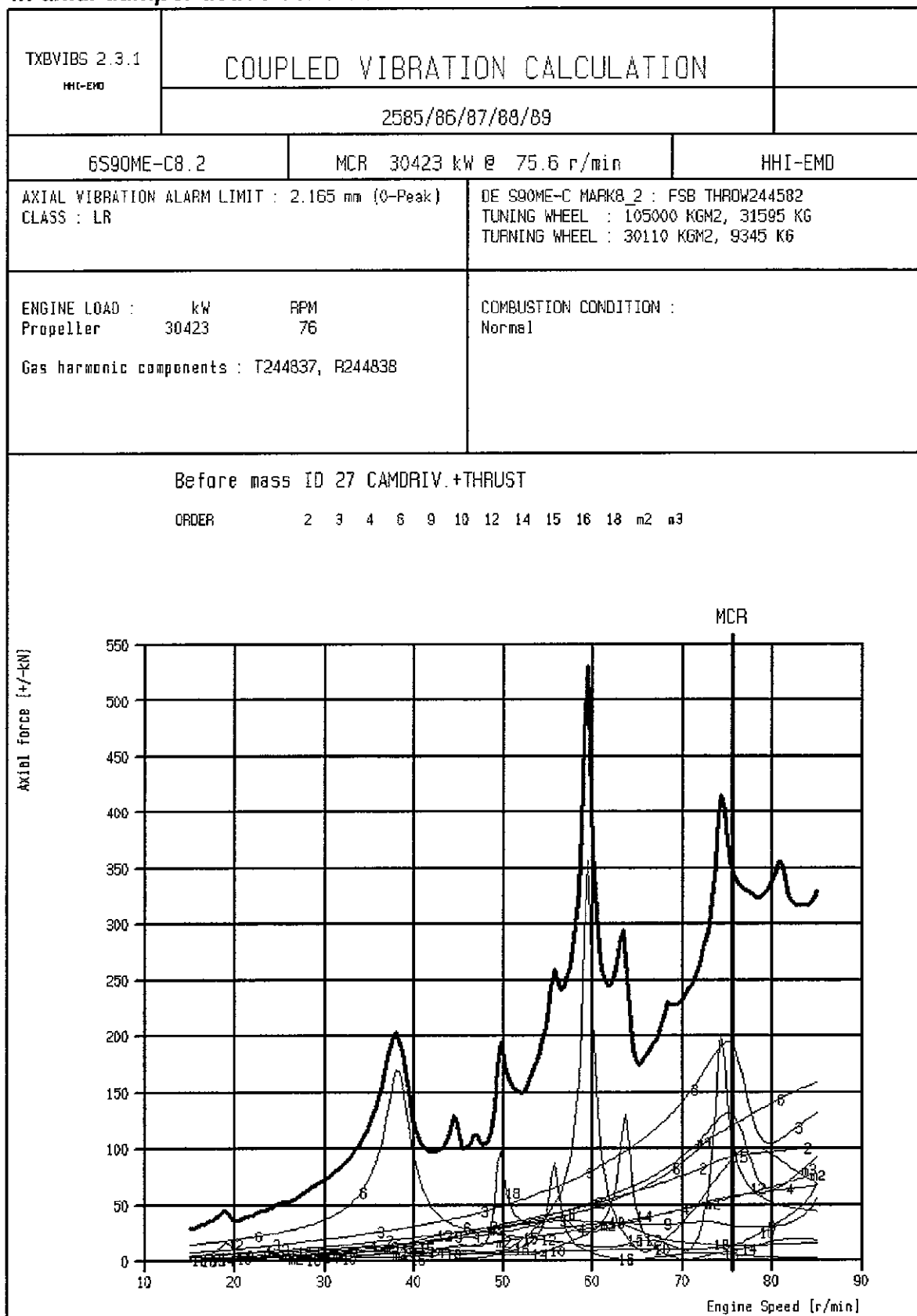
AVC in axial damper active condition



TXBVIBS 2.3.1 for WIN2 - Program made by HHI Diesel

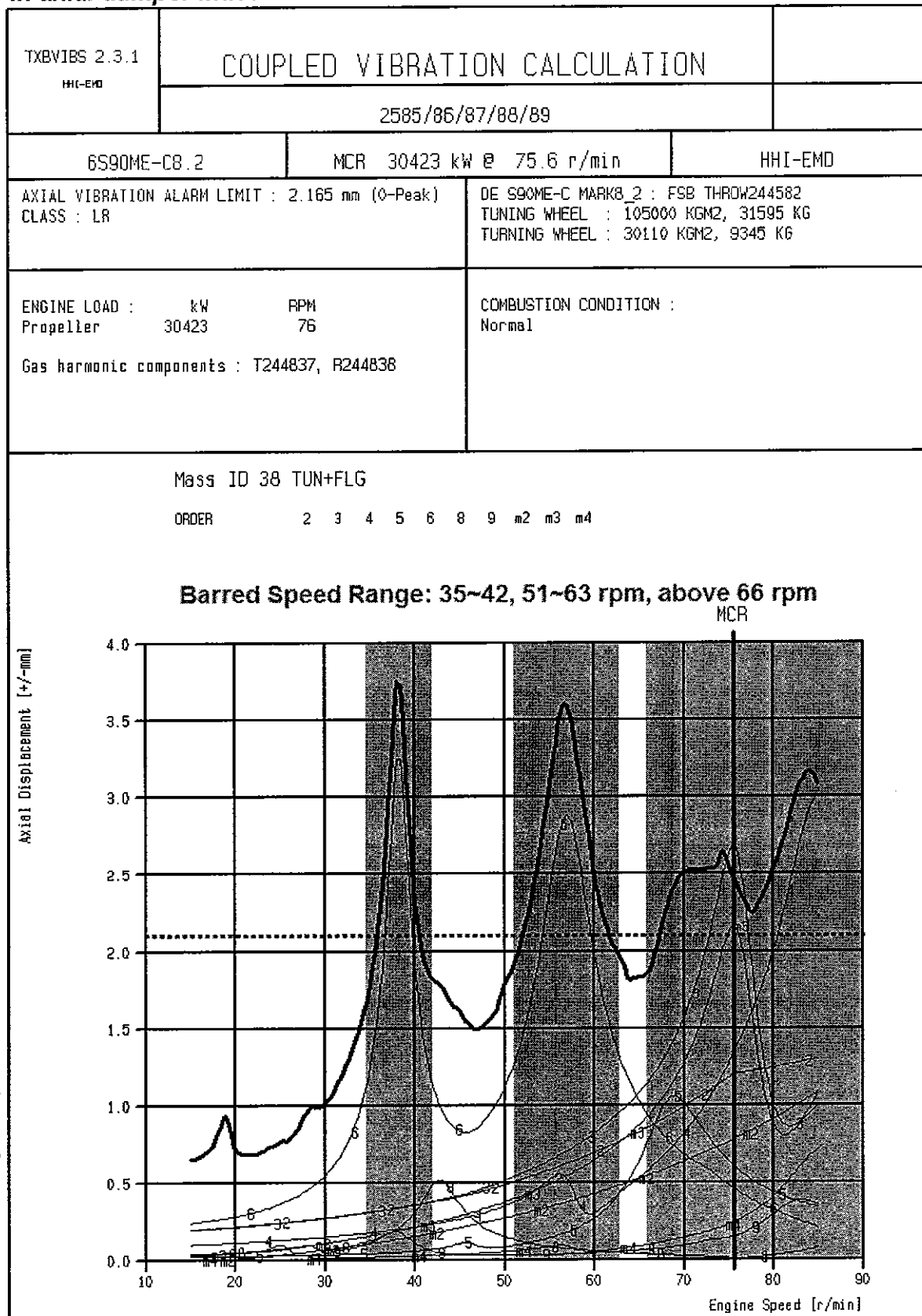
2585/86/87/88/89, 6S90ME-C8.2

AVC in axial damper active condition



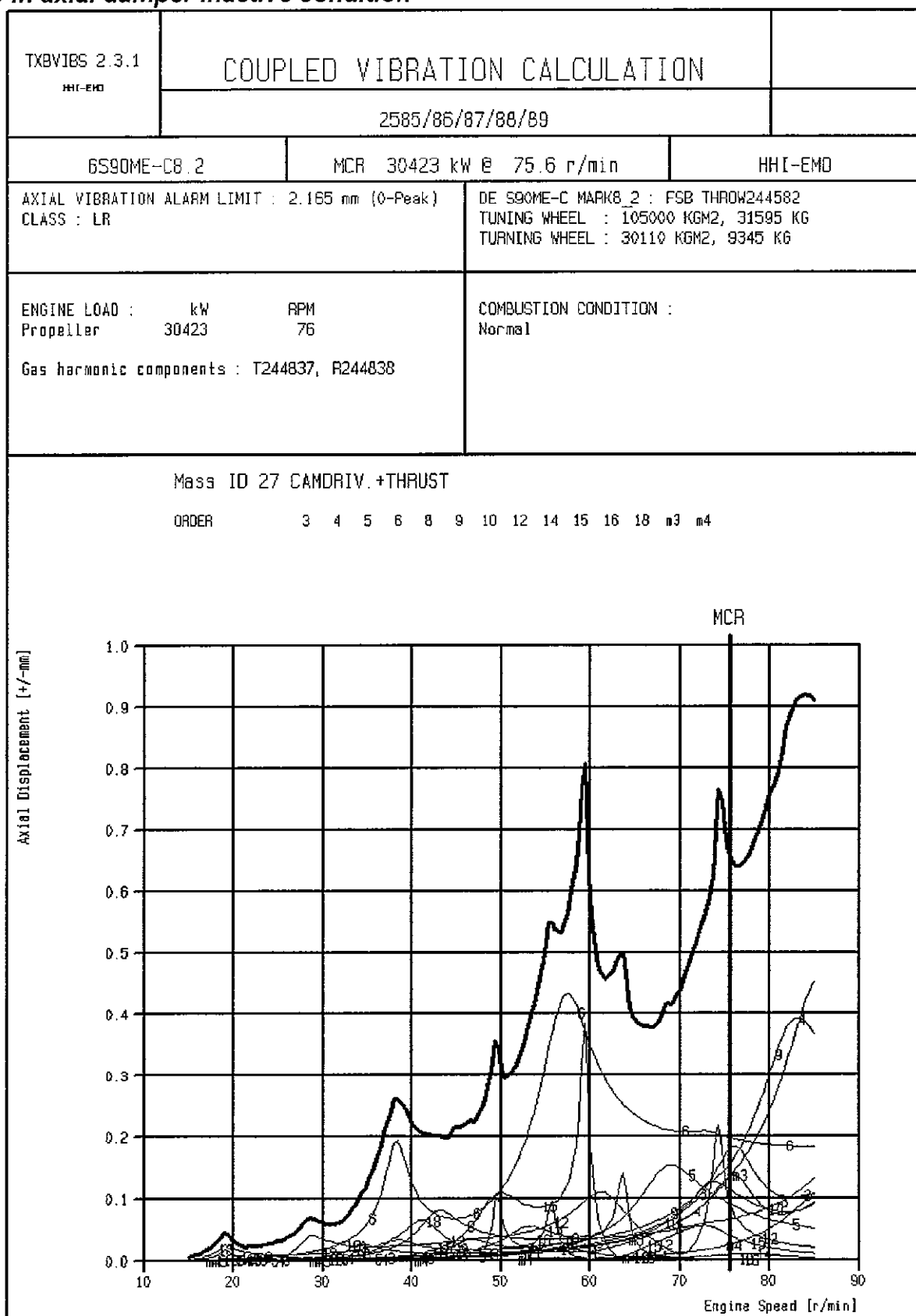
2585/86/87/88/89, 6S90ME-C8.2

AVC in axial damper inactive condition



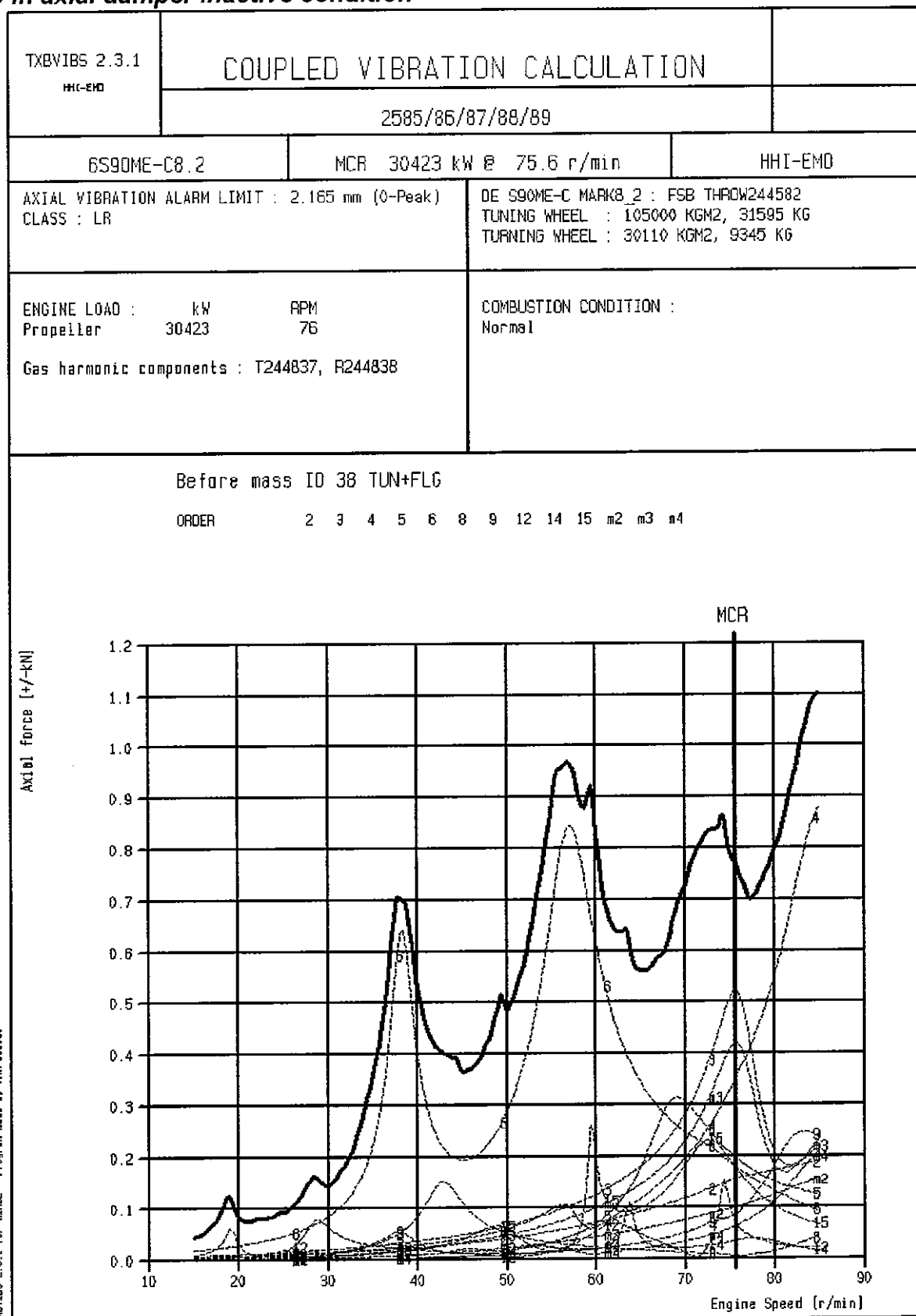
2585/86/87/88/89, 6S90ME-C8.2

AVC in axial damper inactive condition



2585/86/87/88/89, 6S90ME-C8.2

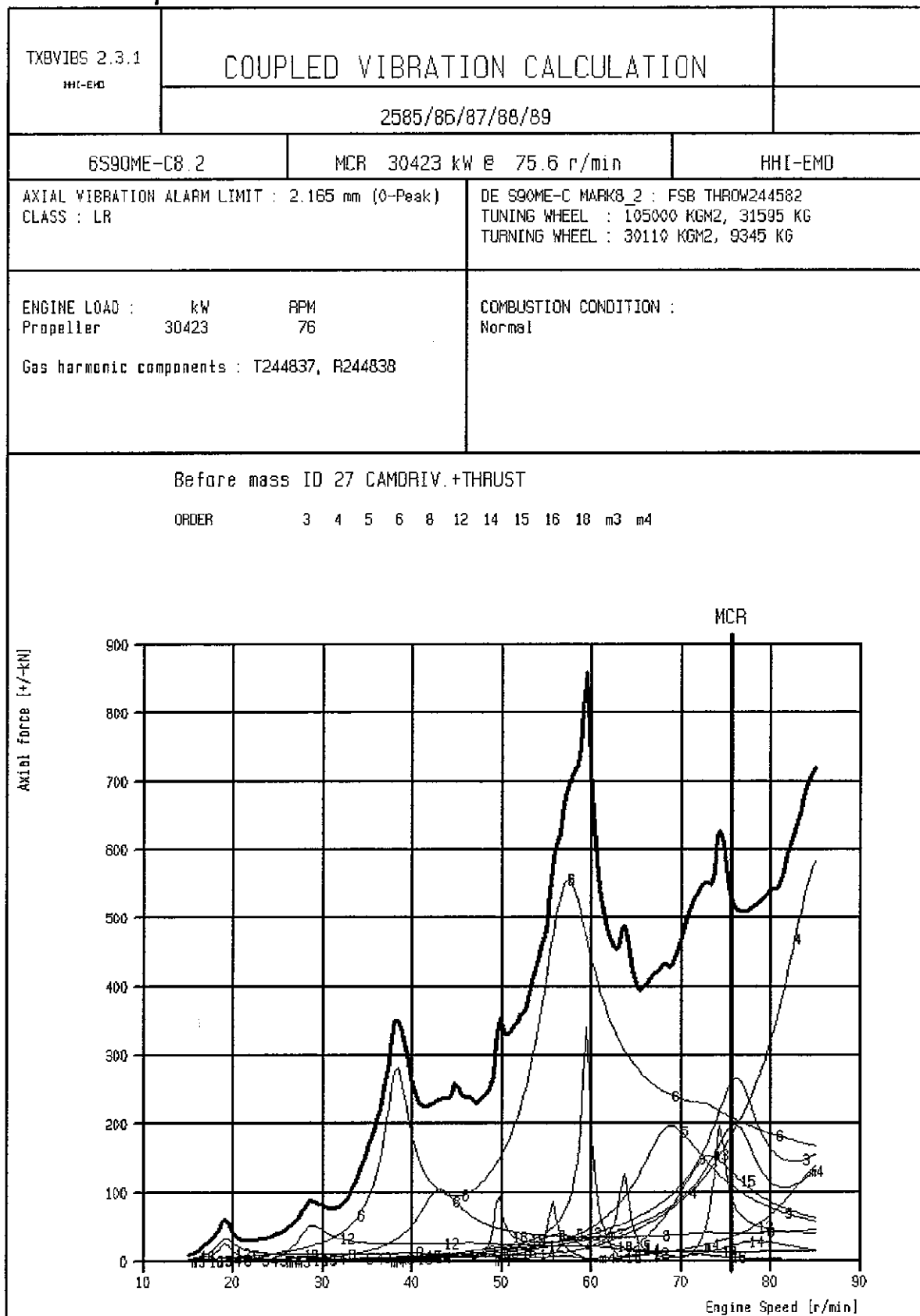
AVC in axial damper inactive condition



TXBVIBS 2.3.1 for KINSE - Program made by MAN Diesel

2585/86/87/88/89, 6S90ME-C8.2

AVC in axial damper inactive condition



TXBVIBS 2.3.1 for WIN32 - Program made by YAN DLESEL

PLAN HISTORY				ENGINE TYPE	HYUNDAI-MANB&W 6S90ME-C8.2
IMO Tier-II compliant				MESSRS.	Hyundai Heavy Industry
				RULE	LR
				SHIP NO.	2585/86/87/88/89
				ENG. NO.	AA4624/25/26/27/28
TITLE : Torsional Vibration Calculation (12 SHEETS WITH COVER)					
DRAWN	DESIGN	CHECK	APRD	DESCRIPTION	R
					5
					4
					3
					2
	Y. J. Jo		D. I. Choi	- Int. shaft T.S. changed - Turning wheel MOI changed	△1
	Sep. 21, 2011		Sep. 21, 2011		
	Y. J. Jo		D. I. Choi	For approval	0
	Aug. 11, 2011		Aug. 11, 2011		
 				DOCUMENT NO. A14-433488-3.1	

2585/2586/2587/2588/2589, 6S90ME-C8.2**SPECIFICATION****1. Main engine**

Engine type	: HYUNDAI-MAN B&W 6S90ME-C8.2
Max. continuous output	: 30,423 kW
Max. continuous speed	: 75.6 rpm
Cylinder bore	: 900 mm
Stroke	: 3,188 mm
No. of cylinder	: 6
Mean indicated pressure	: 21.2 bar
Ratio of connecting rod	: 0.487
Reciprocating mass	: 17,496 kg/cyl.
Gas harmonic	: T244837
Firing order	: 1 5 3 4 2 6
2 nd moment compensator	: Fore + After sides
Crank throw	: FSB244582 (Dwg. No.: A10-410350-1)

**2. Turning wheel (Dwg. No. : A10-433733-0) **

Moment of inertia	: 30,110 kgm ²
Weight	: 9,345 kg

3. Tuning wheel (Dwg. No.: A10-233285-5)

Moment of inertia	: 105,000 kgm ²
Weight	: 31,595 kg

4. Propulsion shafting**Intermediate shaft (Dwg. No.: 3R-2820-201)**

Dimeter x length	: $\Phi 710$ mm * 9,344 mm
Weight	: 32,015 kg
Material	: TS ≥ 700 N/mm ² 

Propeller shaft (Dwg. No.: 3R-2820-201)

Dimeter x length	: $\Phi 820$ mm * 10,170 mm
Weight	: 41,281 kg
Material	: TS ≥ 600 N/mm ²

5. Propeller (Dwg. No.: D14-112719-6- particulars)

Moment of Inertia in water (GD2)	: 1,569,600 kgm ²
Weight	: 76,193 kg
No. of blade	: 4
Diameter	: 10.1 M

2585/2586/2587/2588/2589, 6S90ME-C8.2**CONCLUSION**

Torsional vibration is calculated with a view of confirming dynamic characteristic of whole propulsion shafting system, whose results are compared to relevant limit.

With normal firing condition, alternating torsional stresses satisfy the guidance limit with barred speed range due to 1 node 6th order resonance.

- Barred speed range : 35 ~ 42 rpm

In case of one cylinder misfiring condition, additional barred speed range is necessary due to 1 node 4th order resonance.

**- Barred speed range : 35 ~ 42 rpm, above 54 rpm
(Worst misfiring : No.3 cylinder misfiring)**

2585/2586/2587/2588/2589, 6S90ME-C8.2

Mass elastic model for TVC

NO	NAME	MOMENT OF INERTIA (kgm ²)	TORSIONAL STIFFNESS (MNm/rad)	ABS. DAMP (Nms/rad)	REL. DAMP (Nms/rad)	SPEED RATIO	DIAMETER OUT / IN (mm)
1	TUNINGWH.	105000.00		0.00		1.00	
			100000.00		0.00		990.0 / 495.0
2	FLG+M.C.	8599.00		0.00		1.00	
			4761.90		0.00		990.0 / 495.0
3	CYLINDER1	59614.00		-0.85		1.00	
			3597.12		-1.50		990.0 / 495.0
4	CYLINDER2	59614.00		-0.85		1.00	
			3649.64		-1.50		990.0 / 495.0
5	CYLINDER3	59614.00		-0.85		1.00	
			3521.13		-1.50		990.0 / 495.0
6	CYLINDER4	59614.00		-0.85		1.00	
			3623.19		-1.50		990.0 / 495.0
7	CYLINDER5	59614.00		-0.85		1.00	
			3816.79		-1.50		990.0 / 495.0
8	CYLINDER6	59614.00		-0.85		1.00	
			5235.60		-1.50		990.0 / 495.0
9	C.DRV+M.C.	20913.00		0.00		1.00	
			9615.38		0.00		1044.0 / 150.0
10	TURNINGWH.	31762.80		-0.50		1.00	
			224.30		0.00		710.0 / 0.0
11	FLANGE1	2928.70		0.00		1.00	
			407.20		0.00		820.0 / 0.0
12	PROPELLER	394110.00		-5.50		1.00	

* Minus sign is undimensional damping coefficient (%)

2585/2586/2587/2588/2589, 6S90ME-C8.2
Natural frequency and Holzer tabulation

NODE : 1
 OMEGA : 24.07 rad/s
 FREQUENCY : 229.81 CPM

NO	NAME	ANGLE (rad)	RELATIVE TORQUE (Nm)
1	TUNINGWH.	0.1015E+01	-0.6170E+08
2	FLG+M.C.	0.1014E+01	-0.6675E+08
3	CYLINDER1	0.1000E+01	-0.1013E+09
4	CYLINDER2	0.9718E+00	-0.1348E+09
5	CYLINDER3	0.9349E+00	-0.1671E+09
6	CYLINDER4	0.8874E+00	-0.1978E+09
7	CYLINDER5	0.8329E+00	-0.2265E+09
8	CYLINDER6	0.7735E+00	-0.2532E+09
9	C.DRV+M.C.	0.7252E+00	-0.2620E+09
10	TURNINGWH.	0.6979E+00	-0.2748E+09
11	FLANGE1	-0.5274E+00	-0.2739E+09
12	PROPELLER	-0.1200E+01	0.3126E+02

VECTOR SUMMATION

ORDER	CR1. SPEED (RPM)	REL. AMP. (rad)	PHASE (deg)
3.0	76.6	0.413	0.0
4.0	57.5	0.155	32.5
5.0	46.0	0.042	152.7
6.0	38.3	5.401	0.0
7.0	32.8	0.042	-152.7
8.0	28.7	0.155	-32.5
9.0	25.5	0.413	0.0
10.0	23.0	0.155	32.5
11.0	20.9	0.042	152.7
12.0	19.2	5.401	0.0
13.0	17.7	0.042	-152.7
14.0	16.4	0.155	-32.5
15.0	15.3	0.413	0.0

2585/2586/2587/2588/2589, 6S90ME-C8.2

NODE : 2
 OMEGA : 92.57 rad/s
 FREQUENCY : 883.96 CPM

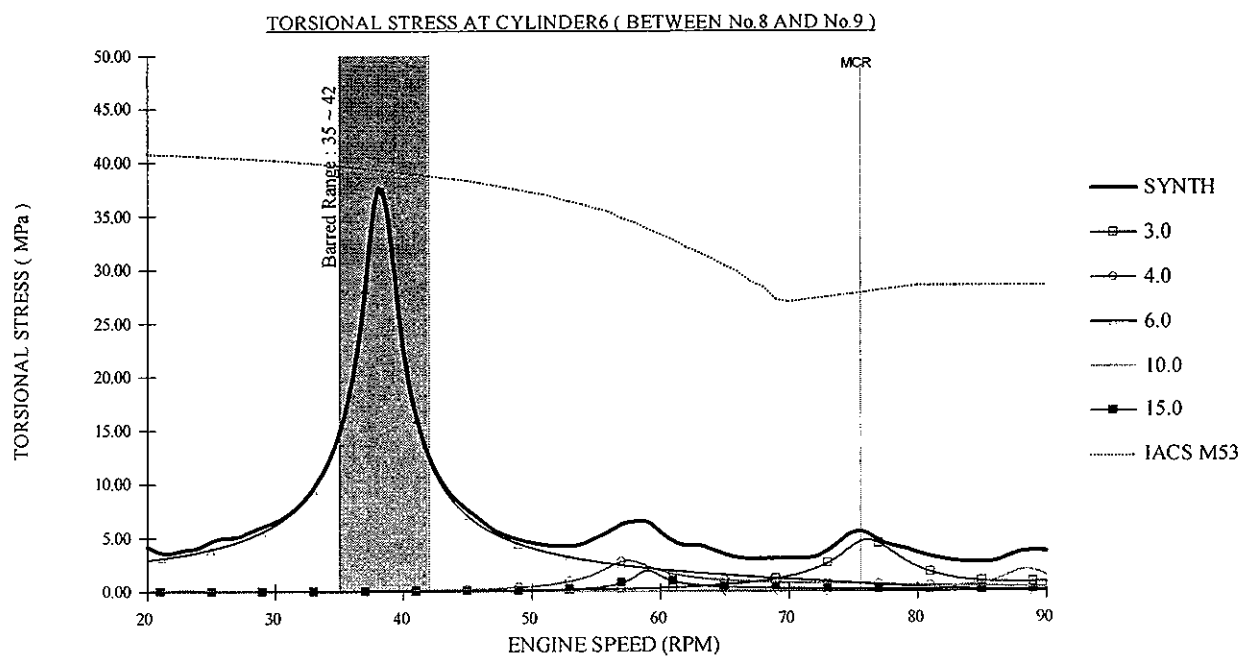
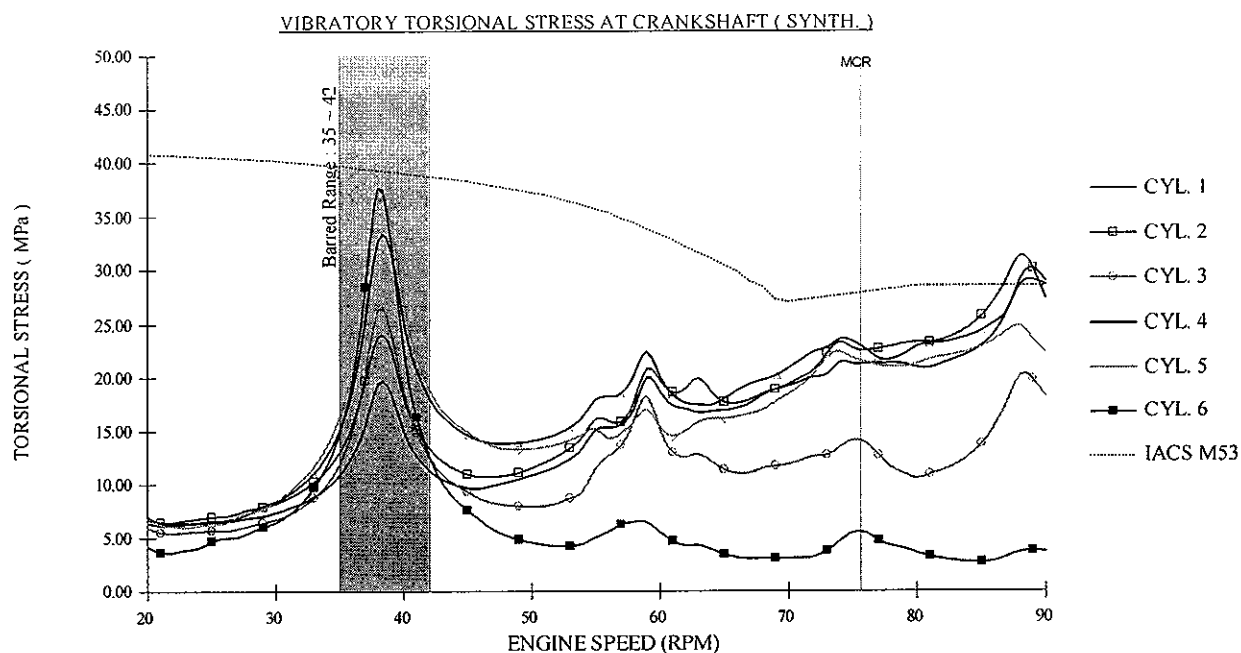
NO	NAME	ANGLE (rad)	RELATIVE TORQUE (Nm)
1	TUNINGWH.	0.1271E+01	-0.1144E+10
2	FLG+M.C.	0.1260E+01	-0.1236E+10
3	CYLINDER1	0.1000E+01	-0.1747E+10
4	CYLINDER2	0.5143E+00	-0.2010E+10
5	CYLINDER3	-0.3646E-01	-0.1991E+10
6	CYLINDER4	-0.6020E+00	-0.1684E+10
7	CYLINDER5	-0.1067E+01	-0.1139E+10
8	CYLINDER6	-0.1365E+01	-0.4416E+09
9	C.DRV+M.C.	-0.1449E+01	-0.1818E+09
10	TURNINGWH.	-0.1468E+01	0.2178E+09
11	FLANGE1	-0.4973E+00	0.2303E+09
12	PROPELLER	0.6819E-01	-0.5742E+04

VECTOR SUMMATION

ORDER	CRI. SPEED (RPM)	REL. AMP. (rad)	PHASE (deg)
9.0	98.2	4.512	0.0
10.0	88.4	1.559	28.1
11.0	80.4	0.263	-56.1
12.0	73.7	1.556	-180.0
13.0	68.0	0.263	56.0
14.0	63.1	1.559	-28.1
15.0	58.9	4.512	0.0
16.0	55.2	1.559	28.1

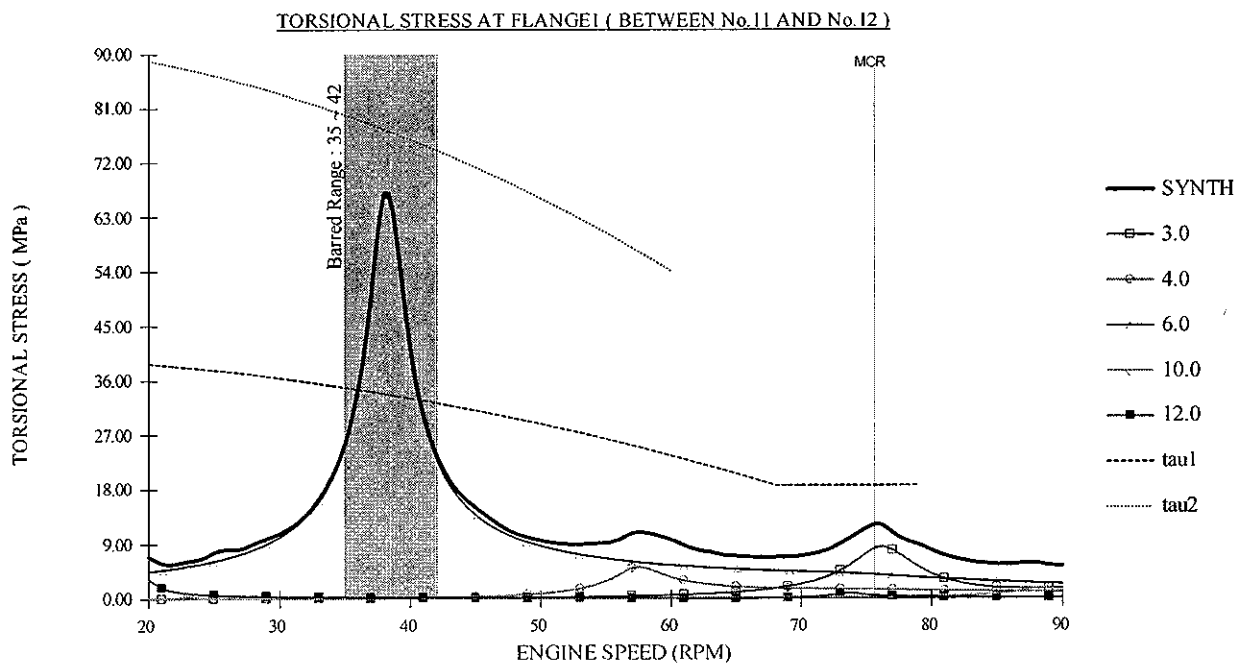
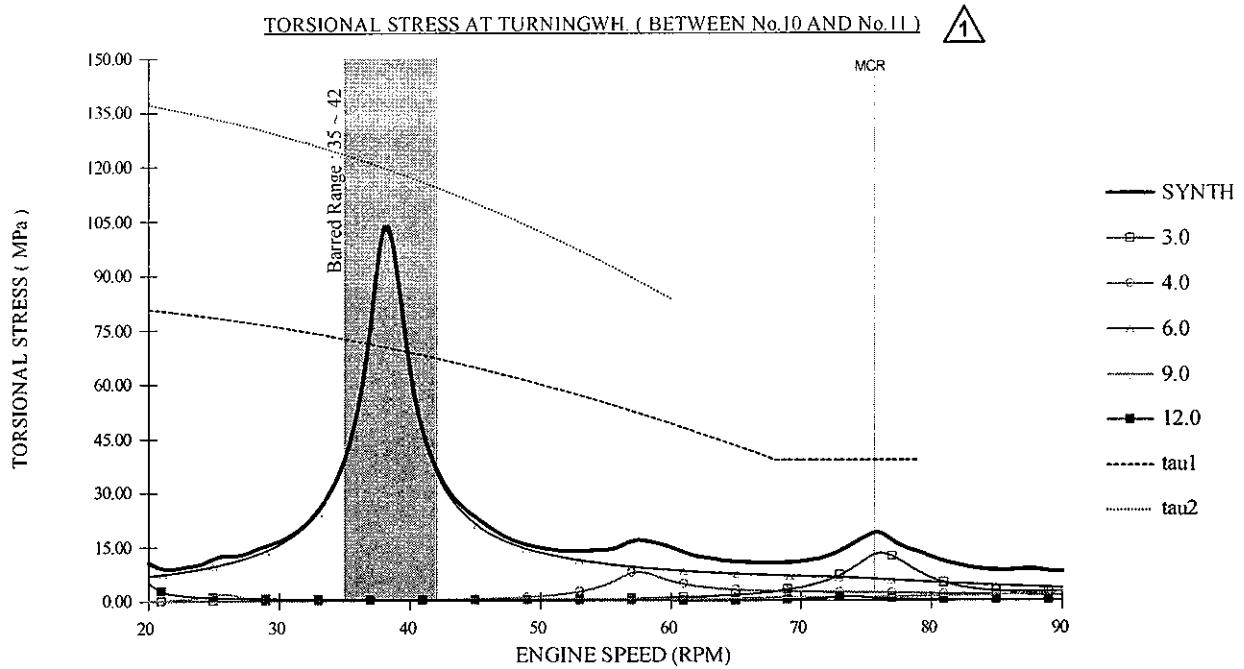
2585/2586/2587/2588/2589, 6S90ME-C8.2

Normal firing



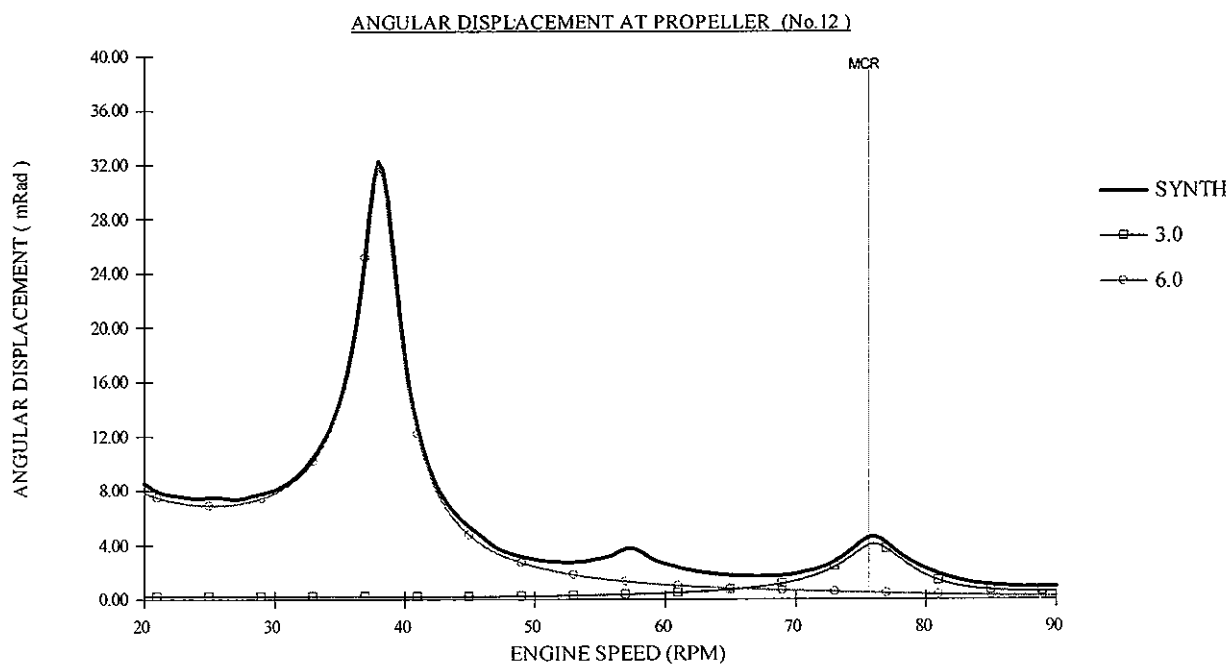
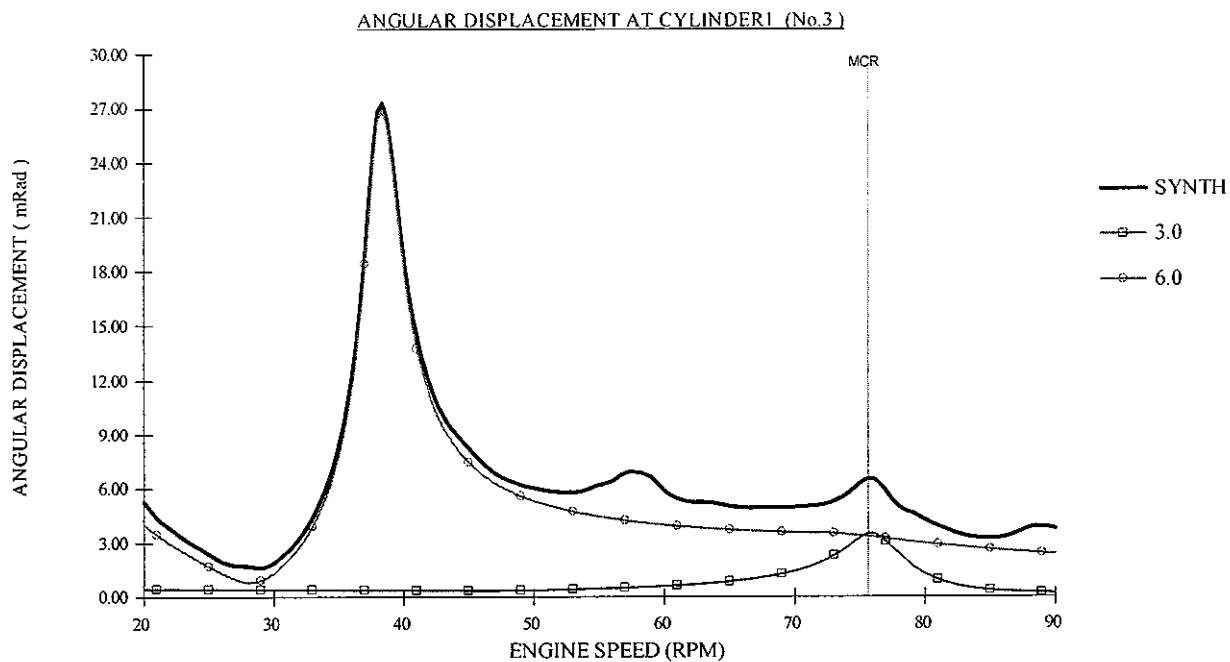
2585/2586/2587/2588/2589, 6S90ME-C8.2

Normal firing



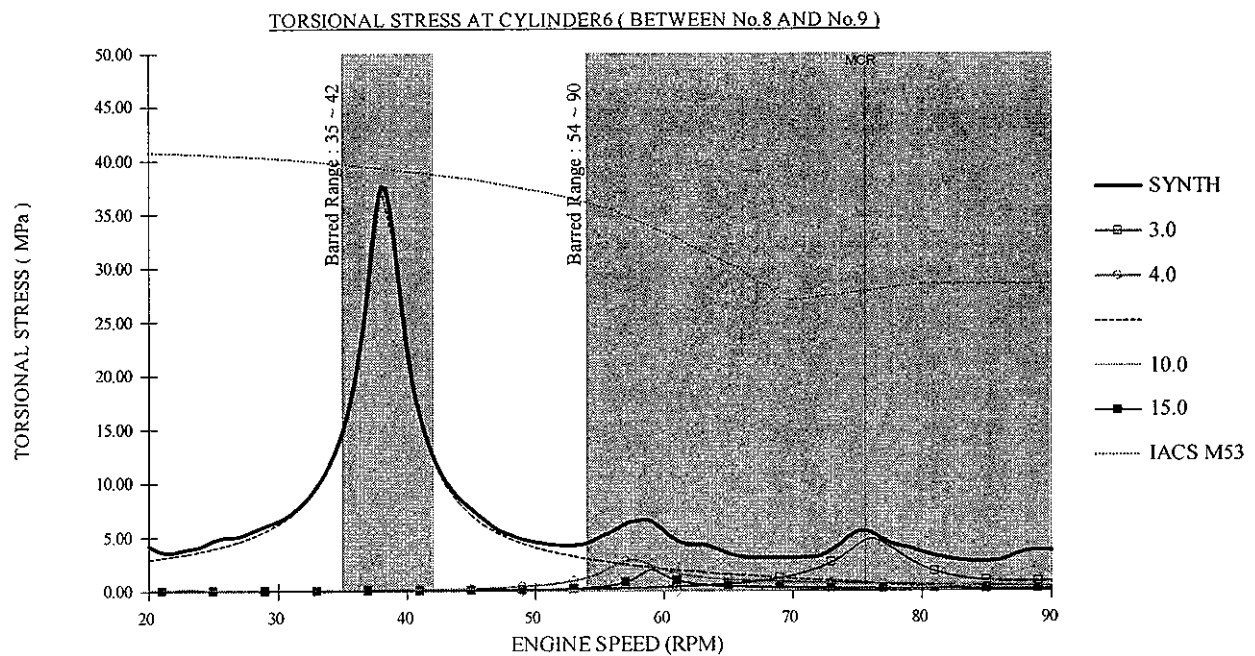
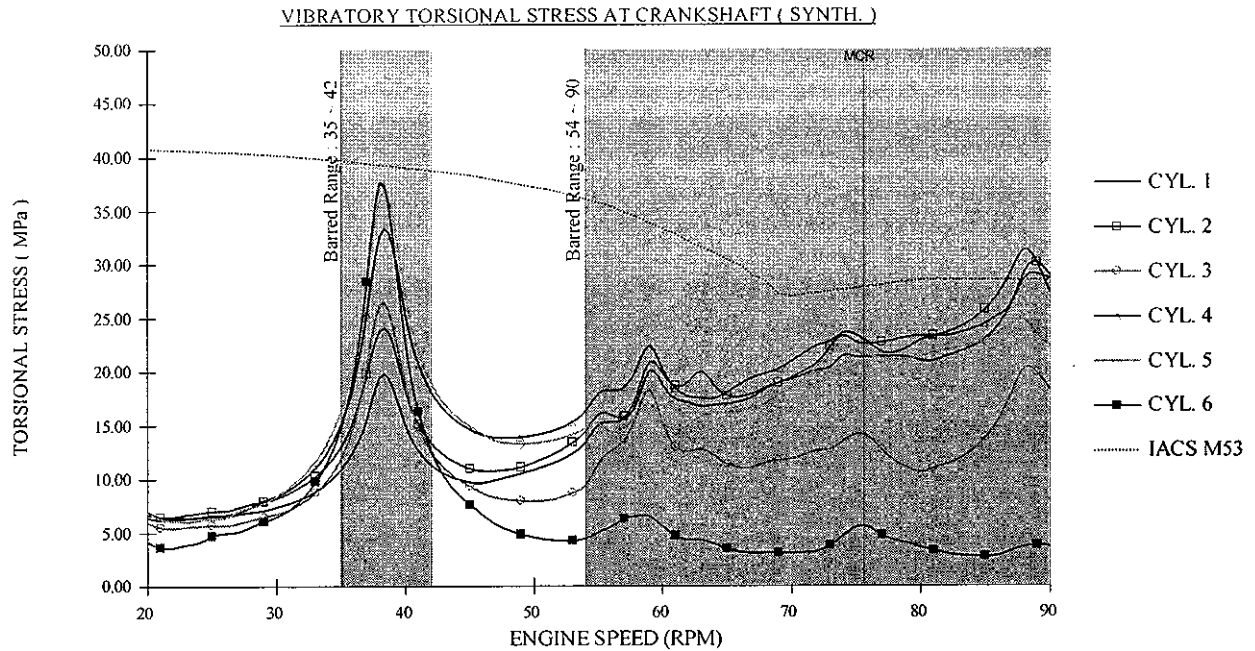
2585/2586/2587/2588/2589, 6S90ME-C8.2

Normal firing



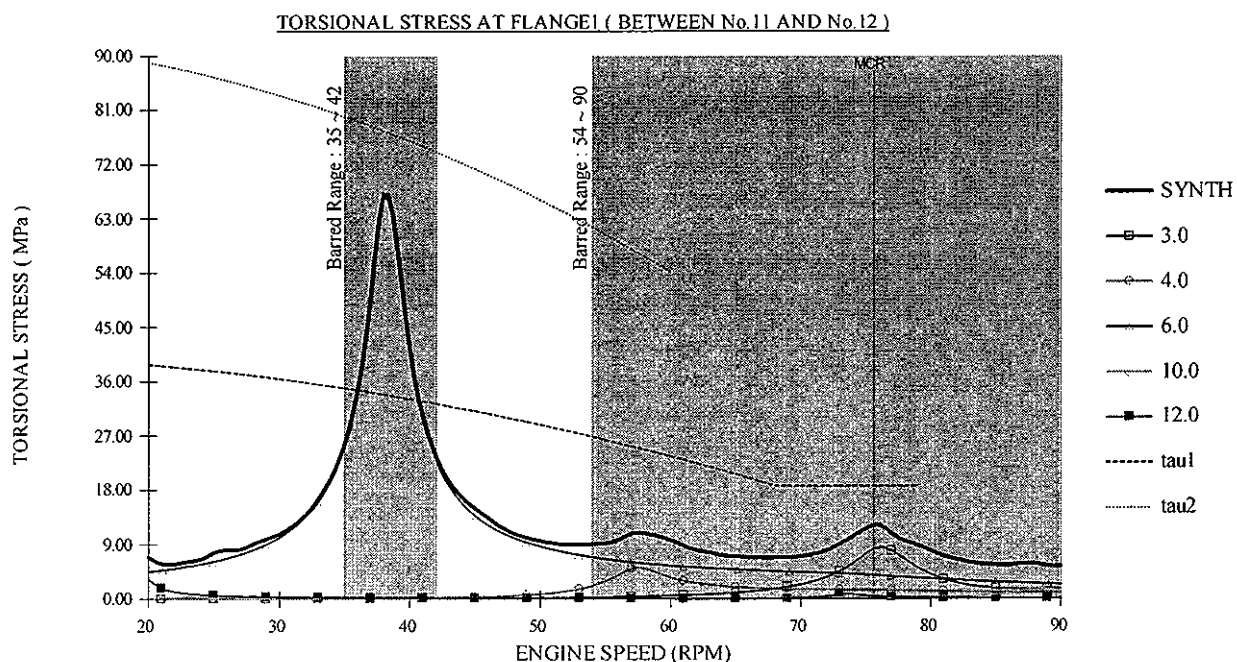
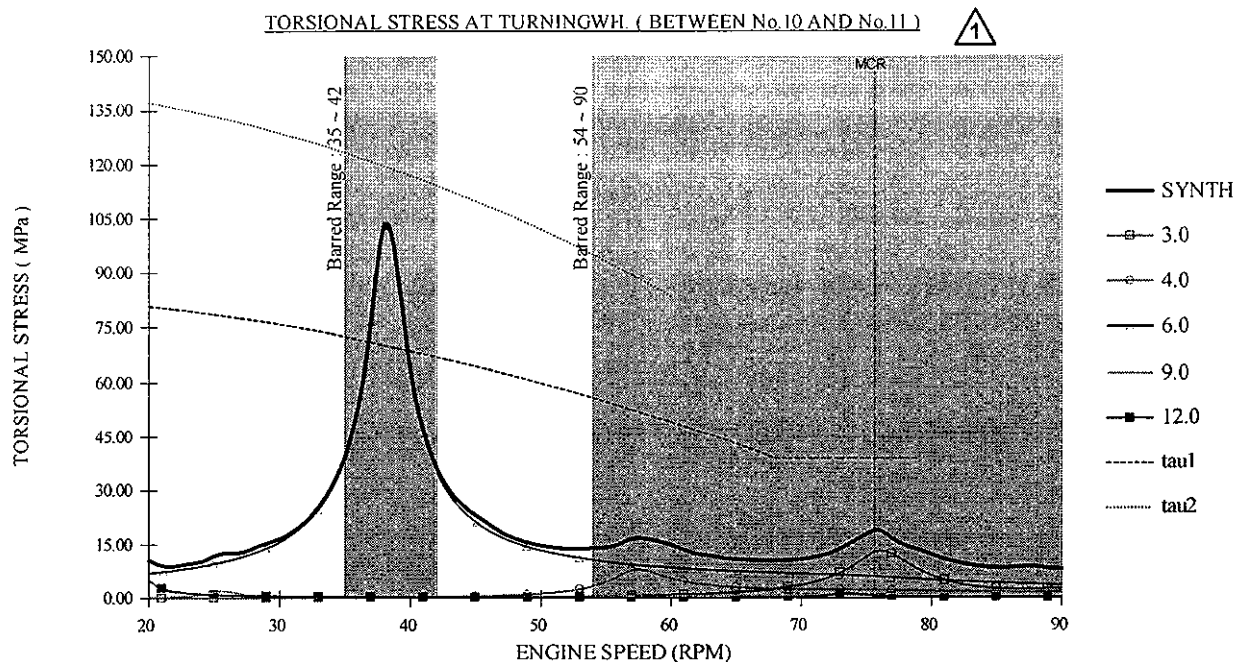
2585/2586/2587/2588/2589, 6S90ME-C8.2

No.3 Cylinder misfiring



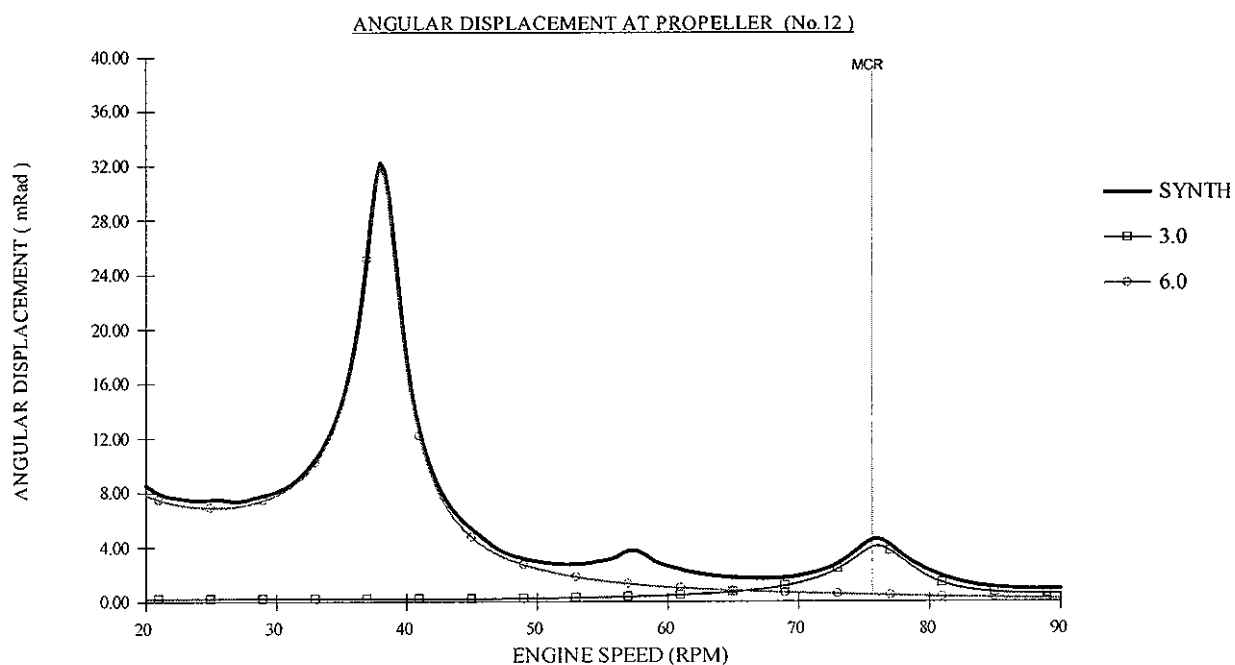
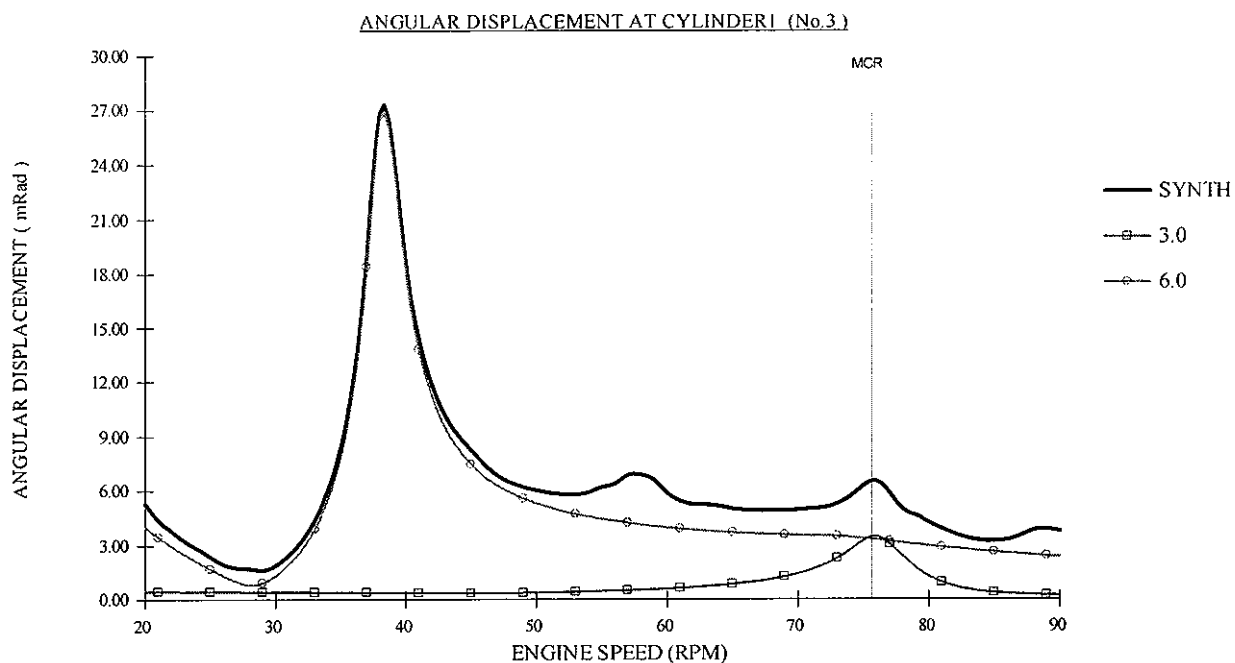
2585/2586/2587/2588/2589, 6S90ME-C8.2

No.3 Cylinder misfiring



2585/2586/2587/2588/2589, 6S90ME-C8.2

No.3 Cylinder misfiring



					S. PAGE	T. PAGE
PLAN HISTORY			ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2		
			MESSRS.	H.H.I.		
			RULE	LR + UMS		
			SHIP NO.	2585/86/87/88/89		
			ENG. NO.	AA4624/25/26/27/28		
TITLE : PNEUMATIC MANOEUVRING SYSTEM						
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	Replacement for Ident.no.:
20110718	BSH	BSH	JCM		FOR WORKING.	
20110215	BSH	BSH	JCM			
Licencee Ident.no.:			Type:			
Info.no.:			Description:		Ident.no.:	
Page.no.:			Security:		PNEUMATIC MANOEUVRING SYSTEM A14-413493-4	
(01) 02			C			

INDEX

NO.	DESCRIPTION	DWG. NO.
1	DESCRIPTION OF ENGINE CONTROL SYSTEM	A14-286702-3
2	DIAGRAM OF MANOEUVRING SYSTEM	A10-286601-7

Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	Replacement for Ident.no.:	R
20110718	BSH	BSH	JCM		FOR WORKING.		I
20110215	BSH	BSH	JCM				O
Licensee Ident.no.:		Type:				6S90ME-C	
Info.no.:		Description:				Ident.no.:	
Page.no.:		Security:				Ident.no.:	
(02) 02		C				A14-413493-4	

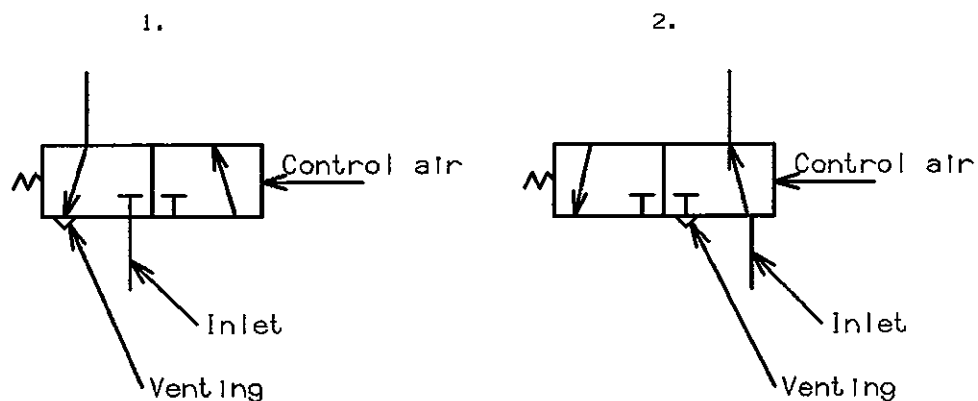


Symbol Description

The Symbols consist of one or more square fields. The number of fields corresponds to the number of valve positions. The connecting lines are connected to the field which represents the valve position at a given moment of the process.

The change of position is conceived to take place by the fields being displaced at right angles to the connecting lines, which are assumed to have a stationary position on the paper. A short crossline on a broken line indicates a closed path.

Example of pressure controlled 2-position valve with spring return :



1. = Initial Position

2. = Changed Position

Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.1	Replacement for Ident.no.1	R
20111118	PIS	PIS	JCM				0
License Ident.no.:		Type: 60/70/80/90ME/ME-C					
Info.no.:		Description: DESCRIPTION OF ME PNEUMATIC SYSTEM				Ident.no.1: A14-443670-5	
Page.no.: (01) 03		Confidential: B					

Pos.1 : Ball valve

For manual cutting-off control air supply.

Pos.2 : Pressure transmitter

For alarm if control air supply pressure is too low.

Alarm point 5.5 bar

For alarm if control air pressure is not vented during
FINISHED WITH ENGINE.

alarm point 0.5 bar

Pos.3 : Ball valve

For manual cutting-off of air to exhaust valve.

Pos.5 : Pressure transmitter

For alarm if control air supply pressure is too low.

Alarm point 5.5 bar

For alarm if control air pressure is not vented during
FINISHED WITH ENGINE.

alarm point 0.5 bar

Pos.6 : Pressure gauge

Indicates control air supply pressure.

Pos.12 : Two-position, five-way valve

Controls main starting valve(open or closed).

Pos.21 : Ball valve

For draining water from manoeuvring system.

Pos.23 : Double non-return valve(Change over valve)

Pos.26 : Two-position, Three-way valve

Prevents air inlet to starting air distributor in the event
of leaking main starting valve.

Allows air to enter during start.

Pos.68 : Two-position, five-way valve

Controls slow turning valve(open or closed).

Pos.74 : Air reservoir 40L

Reduces time logs in the manoeuvring system.

Pos.92 : Two-position, three-way solenoid valve

Controls pilot signal to two-position, five way valve(68).
Slow turning.

Date	Des.	CHK.	Appd.	A.C	Replaced by Ident.no.1	Replacement for Ident.no.1	R	
2011118	PIS	PIS	JCM				0	
Licence Ident.no.1		Type		60/70/80/90ME/ME-C				
Info.no.1		Description		DESCRIPTION OF ME PNEUMATIC SYSTEM				Ident.no.1
Page.no.1 (02) 03		Confidential B						A14-443670-5

Pos.93 : Two-position, three-way solenoid valve

Controls pilot signal to two-position, five way valve(12).
Main starting valve.

Pos.94 : Two-position, three-way solenoid valve

Controls pilot signal to two-position, five way valve(12).
Main starting valve.

Pos.113 : Switch

Gives signal to Main Operating Panel when shut-off valve(118)
is in service position.

Pos.115 : Two-position, five-way valve

Blocks start possibility when turning gear is engaged.

Pos.116 : Switch

Gives Indication on bridge if turning gear is engaged.

Pos.118 : Shut-off valve

For manual cutting-off of control air to starting air
distributor.

Pos.119 : Switch

Gives Indication on bridge when starting air distributor
is blocked.

Pos.121 : Switch

Gives signal to telegraph system/communication system when
main starting valve is blocked.

Pos.122 : Sensor for starting air pressure

Blocked start possibility from bridge if starting air pressure
is too low.
Switch point 15 bar.

Pos.123 : Switch

Gives signal to Main operating Panel to indicate whether main
starting valve is in SERVICE position or BLOCKED position.

Pos.137 : Non-return valve

Prevents back-flow of air from exhaust valve.

Pos.138 : Pressure switch/transmitter

For alarm if pressure is too low.
Set point 5.5 bar.

Pos.139 : Pressure gauge

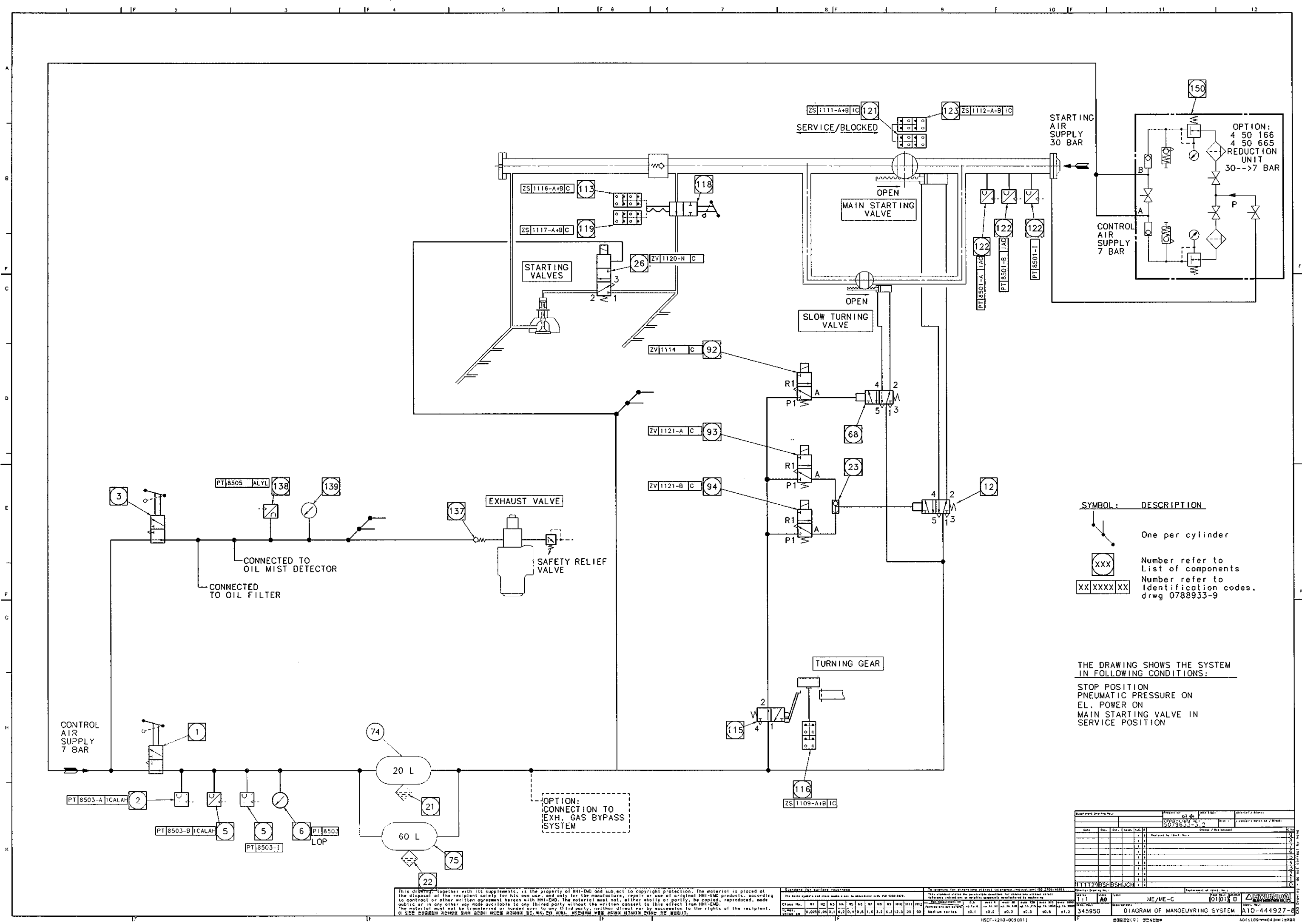
Indicates exhaust valve spring air supply pressure.

Pos.150 : Reduction unit

Reduces starting air pressure to 7 bar.

Date	Des.	Drk.	Appd.	A.C	Replaced by Ident.no.1	Replacement for Ident.no.1	R	
2011118	PIS	PIS	JCM				0	
Licence Ident.no.1		Type:		60/70/80/90ME/ME-C				
Info.no.1		Description:		DESCRIPTION OF ME PNEUMATIC SYSTEM				Ident.no.1
Page.no.1 (03) 03		Confidential: B						A14-443670-5

3D CAD Drawing - do not correct by hand



SYMBOL: DESCRIPTION

One per cylinder

XXX Number refer to List of components

XX XXXX XX Number refer to Identification codes. drwg 0788933-9

THE DRAWING SHOWS THE SYSTEM IN FOLLOWING CONDITIONS:

STOP POSITION

PNEUMATIC PRESSURE ON

EL. POWER ON

MAIN STARTING VALVE IN SERVICE POSITION

Supplement Drawing No.				Projection		Scale		Material / Blank	
				ME		1:1			
2079633-3				2		2		Licensee's Material / Blank	
Date	Rev.	Ch.	Appr.	A.C.	Change / Replacement				Ch.

					S. PAGE	T. PAGE
PLAN HISTORY			ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2		
			MESSRS.	H.H.I.		
			RULE	LR + UMS		
			SHIP NO.	2585/86/87/88/89		
			ENG. NO.	AA4624/25/26/27/28		
TITLE : ELECTRIC CONNECTION DIAGRAM						
Date	Des.	Dkt.	Appd.	A.E.	Replaced by Ident.no.:	Replacement for Ident.no.:
20110718	BSH	BSH	JCM		FOR WORKING.	
20110217	BSH	BSH	JCM			
Licencee Ident.no.:		Type:			6S90ME-C	
Info.no.:		Description:			Ident.no.:	
Page.no.:		Security:			A14-413494-6	
(01) 04		C			ELECTRIC CONNECTION DIAGRAM	



The measuring instruments are identified by a combination of symbols followed by a position number, the symbols represent:

DSA	Density switch for alarm(oil mist)
DS-SDL	Density switch for slow down
E	Electric devices
EV	Solenoid valve
ESA	Electrical switch for alarm
FSA	Flow switch for alarm
FS-SDL	Flow witch for slow down
LSA	Level switch for alarm
PDI	Pressure difference indicator
PDSA	Pressure difference switch for alarm
PDT	Pressure difference transmitter
PI	pressure indicator
PS	Pressure switch
PS-SHD	Pressure switch for shut down
PS-SDL	Pressure switch for slow down
PSA	Pressure switch for alarm
PSC	Pressure switch for controlling
PE	Pressure sensor (analogue)
PEA	Pressure sensor for alarm(analogue)
PEI	Pressure sensor for remote indication(analogue)
PE-SDL	Pressure sensor for slow down(analogue)
SE	Speed sensor(analogue)
SSA	Speed switch for alarm
SS-SHD	Speed switch for shut down
TI	Temperature indicator
TSA	Temperature switch for alarm
TSC	Temperature switch for control
TS-SHD	Temperature switch shut down
TS-SDL	Temperature switch slow down
TE	Temperature sensor(analogue)
TEA	Temperature sensor for alarm(analogue)
TEI	Temperature sensor for remote indication(analogue)
TE-SDL	Temperature sensor for slow down(analogue)
VE	Viscosity sensor(analogue)
VI	Viscosity indicator
ZE	Position sensor
ZS	Position switch
WEA	Vibration signal for alarm(analogue)
WI	Vibration indicator
WS-SDL	Vibration switch for slow down

Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	Replacement for Ident.no.:	R	
20110718	BSH	BSH	JCM		FOR WORKING.		1	
20110217	BSH	BSH	JCM				0	
Licencee Ident.no.:		Type:			6S90ME-C			
Info.no.:		Description:			ELECTRIC CONNECTION DIAGRAM			Ident.no.:
Page.no.:		Security:						A14-413494-6
(02) 04		C						

NOTE

1. (S) : SHIPYARD SUPPLY
2. ----- : MATERIALS & CONSTRUCTION FOR WIRING BY SHIPYARD SUPPLY
3. ----- : MATERIALS FOR WIRING BY ENGINE MAKER SUPPLY
4. SIZE OF CABLE GLAND FOR HULL SIDE ON MAIN JUNCTION BOXES SHOULD BE INFORMED TO ENGINE MAKER
5. THIS DRAWING SHOWS THE SYSTEM IN THE FOLLOWING CONDITIONS;
 - STOP AND AHEAD POSITION
 - CONTROL ROOM CONTROL
 - PNEUMATIC PRESSURE ON
 - ELECTRIC POWER ON
 - MAIN STARTING VALVE IS IN SERVICE POSITION

Date	Des.	Chk.	Appd.	A.C.	Replaced by Ident.no.:	Replacement for Ident.no.:	R
20110718	BSH	BSH	JCM		FOR WORKING.		I
20110217	BSH	BSH	JCM				O

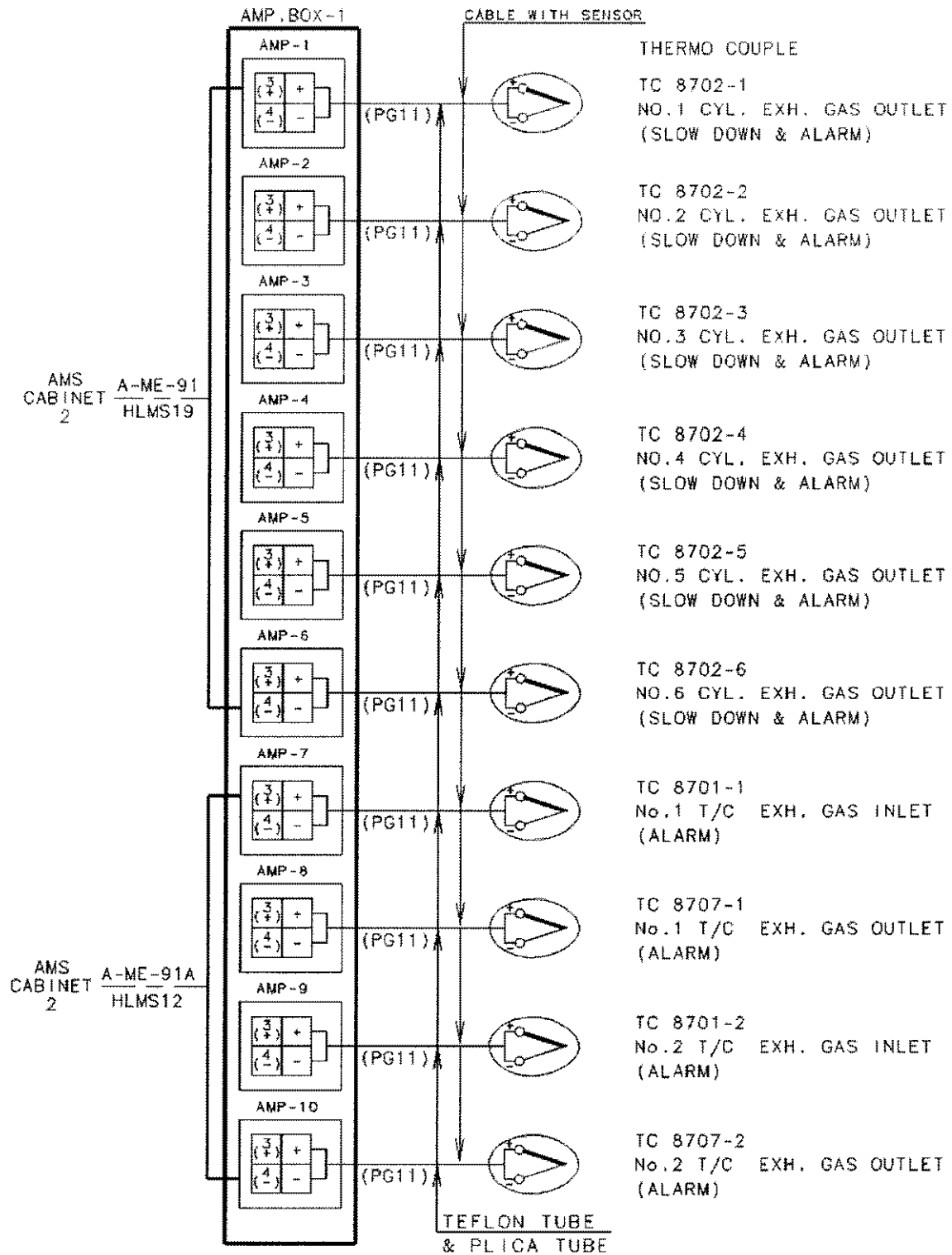
Licensor Ident.no.:		Type:		6S90ME-C			
Info.no.:		Description:		ELECTRIC CONNECTION DIAGRAM		Ident.no.:	
Page.no.:		Security:				A14-413494-6	
(03) 04		C					

INDEX

NO.	DESCRIPTION	DWG. NO.
1	MAIN ENGINE WIRING DIAGRAM	A14-413512-3
2	M/E LIGHTING SYSTEM	A13-413522-9
3	ARR. OF LIGHTING	A11-413520-5
4	ARR. OF MAIN CABLE TRAY	A10-413519-6

Date	Des.	Drk.	Appd.	A.C	Replaced by Ident.no.1	Replacement for Ident.no.1	R
20110718	BSH	BSH	JCM		FOR WORKING.		I
20110217	BSH	BSH	JCM				O
Licensor Ident.no.1		Type		6S90ME-C			
Info.no.1		Description		ELECTRIC CONNECTION DIAGRAM		Ident.no.1	
Page.no.1 (04) 04		Security: C				A14-413494-6	

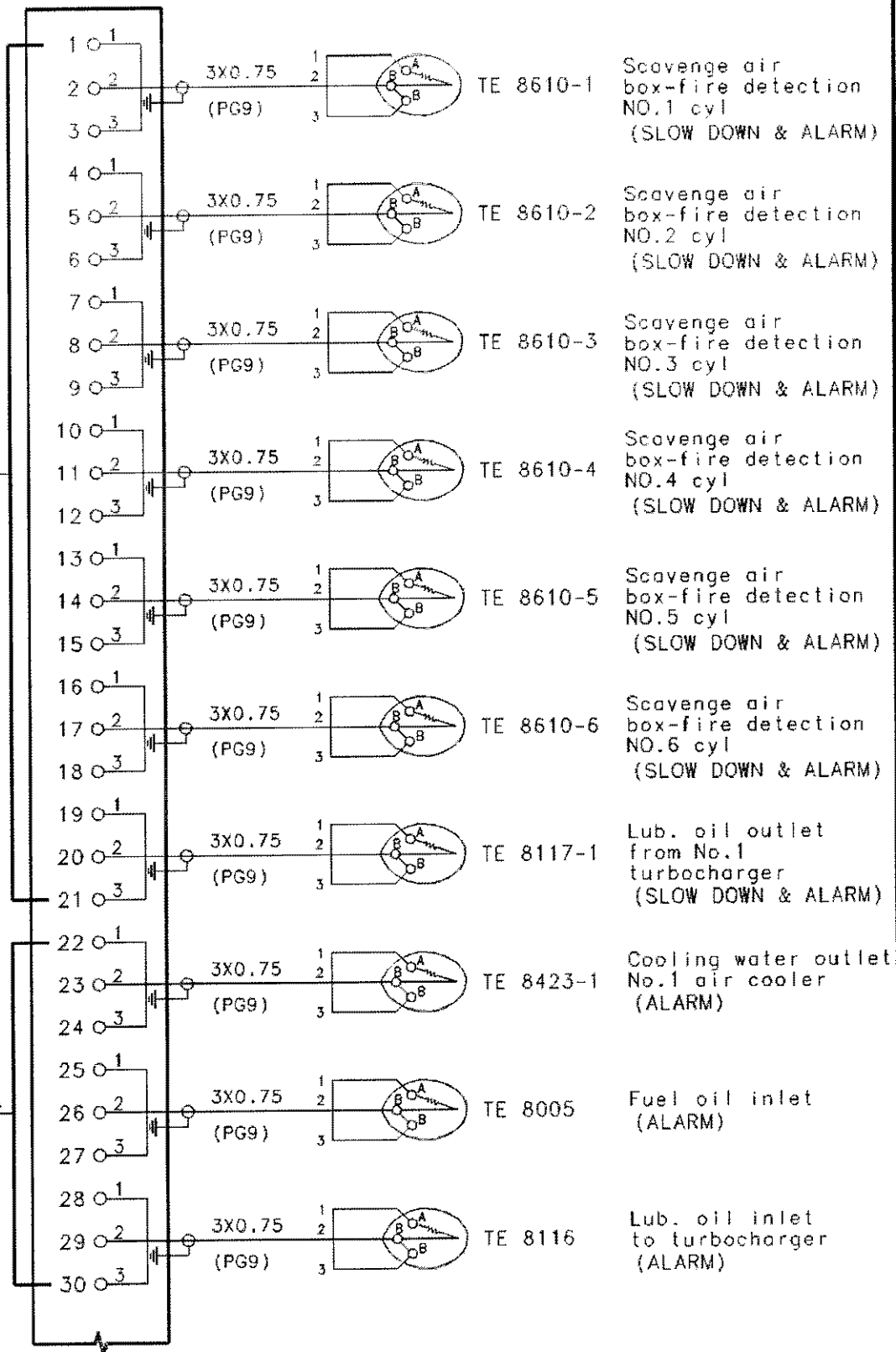
TC AMP BOX



Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R	
				*		5	
				*		4	
110905	BSH	BSH	JCM	*	BWM ADDED.	3	
110809	BSH	BSH	JCM	*	BY SHIPYARD'S COMMENTS.	2	
110408	BSH	BSH	JCM	*	UP TO DATE.	1	
110216	BSH	BSH	JCM	*	Replacement for Ident.no.:	0	
Licensor Ident.no.:				Type:			
Info.no.:				Description:			Ident.no.:
Page.no.:							
338983				6S90ME-C		A14-413512-3	
01 OF 17				TC AMP BOX			

JME-1

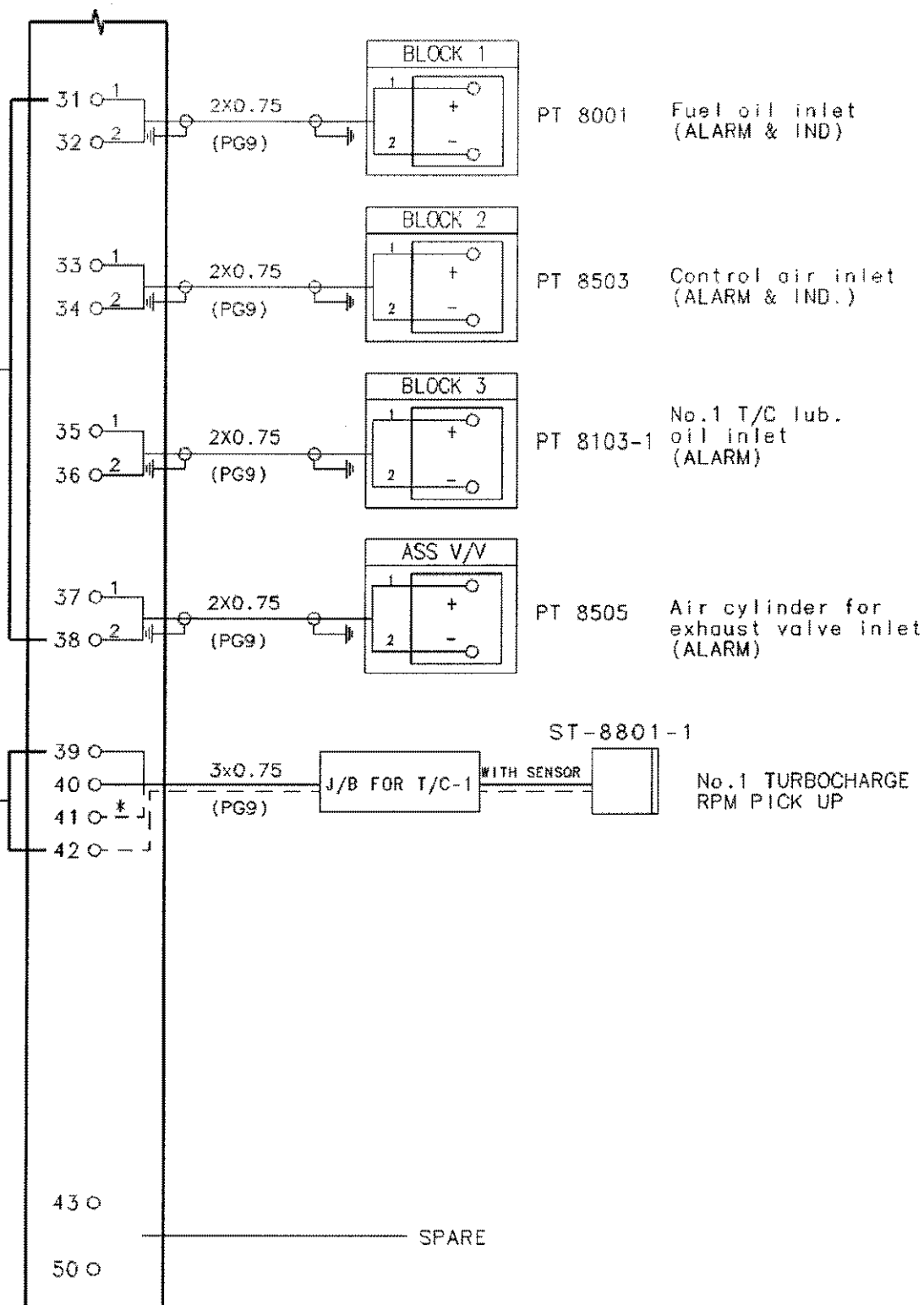
1 OF 2

AMS
CABINET 2 A-ME-92
HLMS27AMS
CABINET 2 A-ME-92A
HLMS12

Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R
				*		6
				*		4
110905	BSH	BSH	JCM	*	BWM ADDED.	3
110809	BSH	BSH	JCM	*	BY SHIPYARD'S COMMENTS.	2
110408	BSH	BSH	JCM	*	UP TO DATE.	1
110216	BSH	BSH	JCM	*	Replacement for Ident.no.:	0
Licensor Ident.no.:					Type:	
1212121-0.0					6S90ME-C	
Info.no.:					Description:	
338983					MAIN ENGINE WIRING DIAGRAM(JME-1)	Ident.no.:
Page.no.:					02 OF 17	A14-413512-3

JME-1

2 OF 2

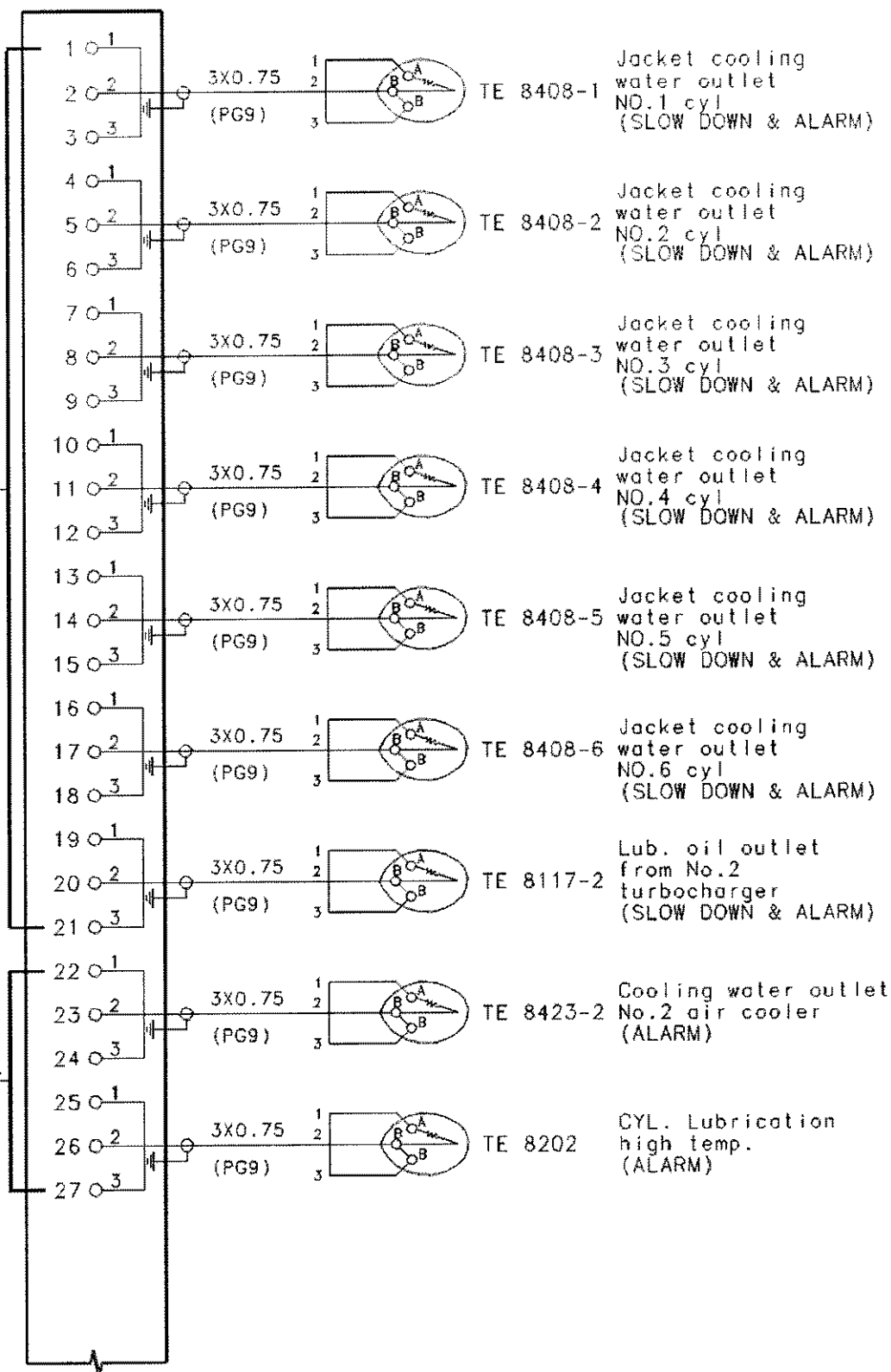
AMS A-ME-101
ST1 HLMS12E.C.C A-RP-9
HLMS4

* FOR MET T/C

Date	Des.	Chk.	Appd.	A.C.	Replaced by Ident.no.:	R
				*		5
				*		4
110905	BSH	BSH	JCM	*	BWM ADDED.	3
110809	BSH	BSH	JCM	*	BY SHIPYARD'S COMMENTS.	2
110408	BSH	BSH	JCM	*	UP TO DATE.	1
110216	BSH	BSH	JCM	*	Replacement for Ident.no.:	0
Licensor Ident.no.:				Type:		
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Info.no.:				Description:		Ident.no.:
338983				MAIN ENGINE WIRING DIAGRAM(JME-1)		A14-413512-3
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JME-2

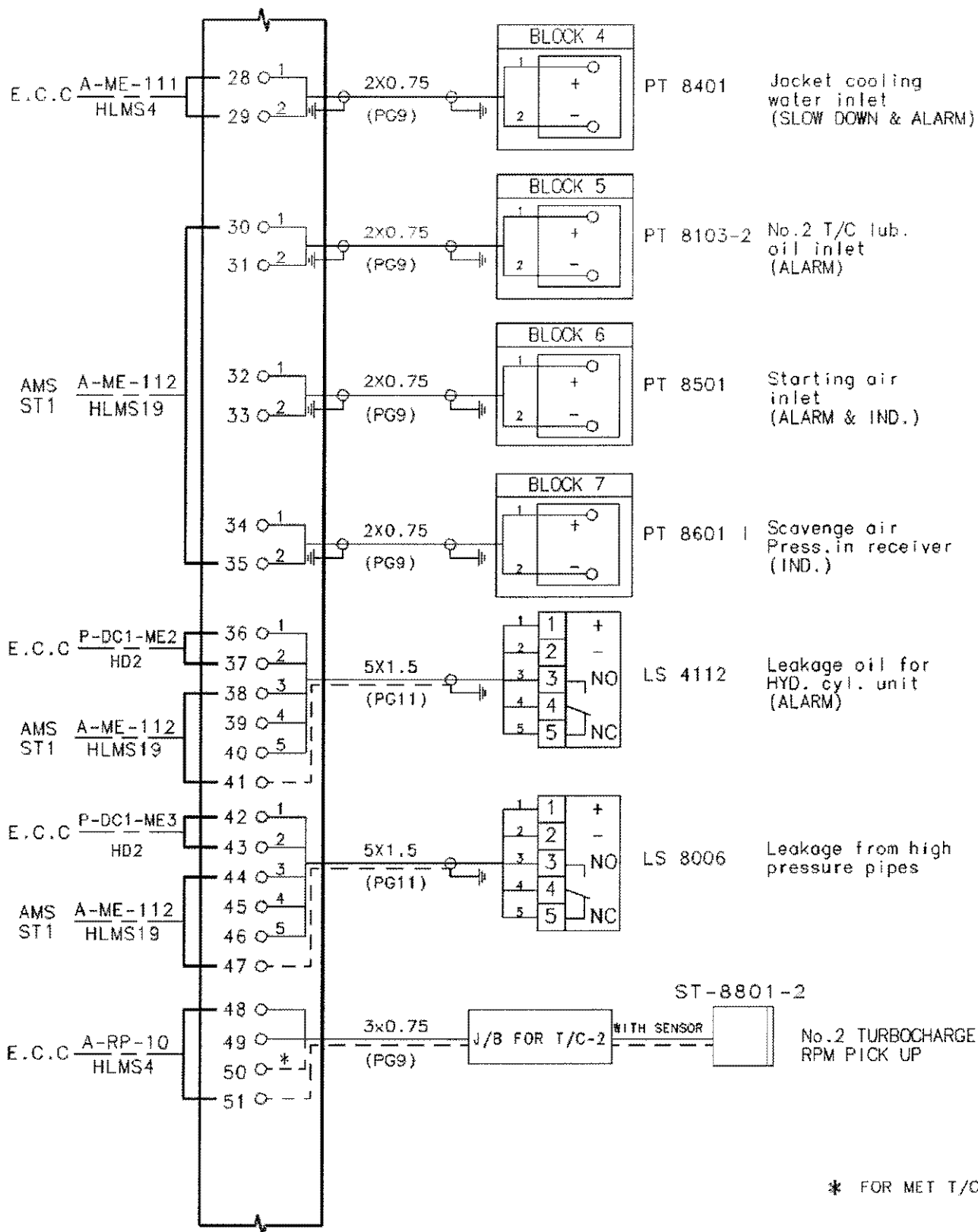
1 OF 3

AMS
CABINET 3
A-ME-102
HLMS27AMS
CABINET 3
A-ME-102A
HLMS12

Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	
				*		
				*		
110905	BSH	BSH	JCM	*	BWM ADDED.	
110809	BSH	BSH	JCM	*	BY SHIPYARD'S COMMENTS.	
110408	BSH	BSH	JCM	*	UP TO DATE.	
110216	BSH	BSH	JCM	*	Replacement for Ident.no.:	
Licensor Ident.no.:				Type:		
1212121-0.0				6S90ME-C		
Info.no.:				Description:		
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Page.no.:				04 OF 17		A14-413512-3

JME-2

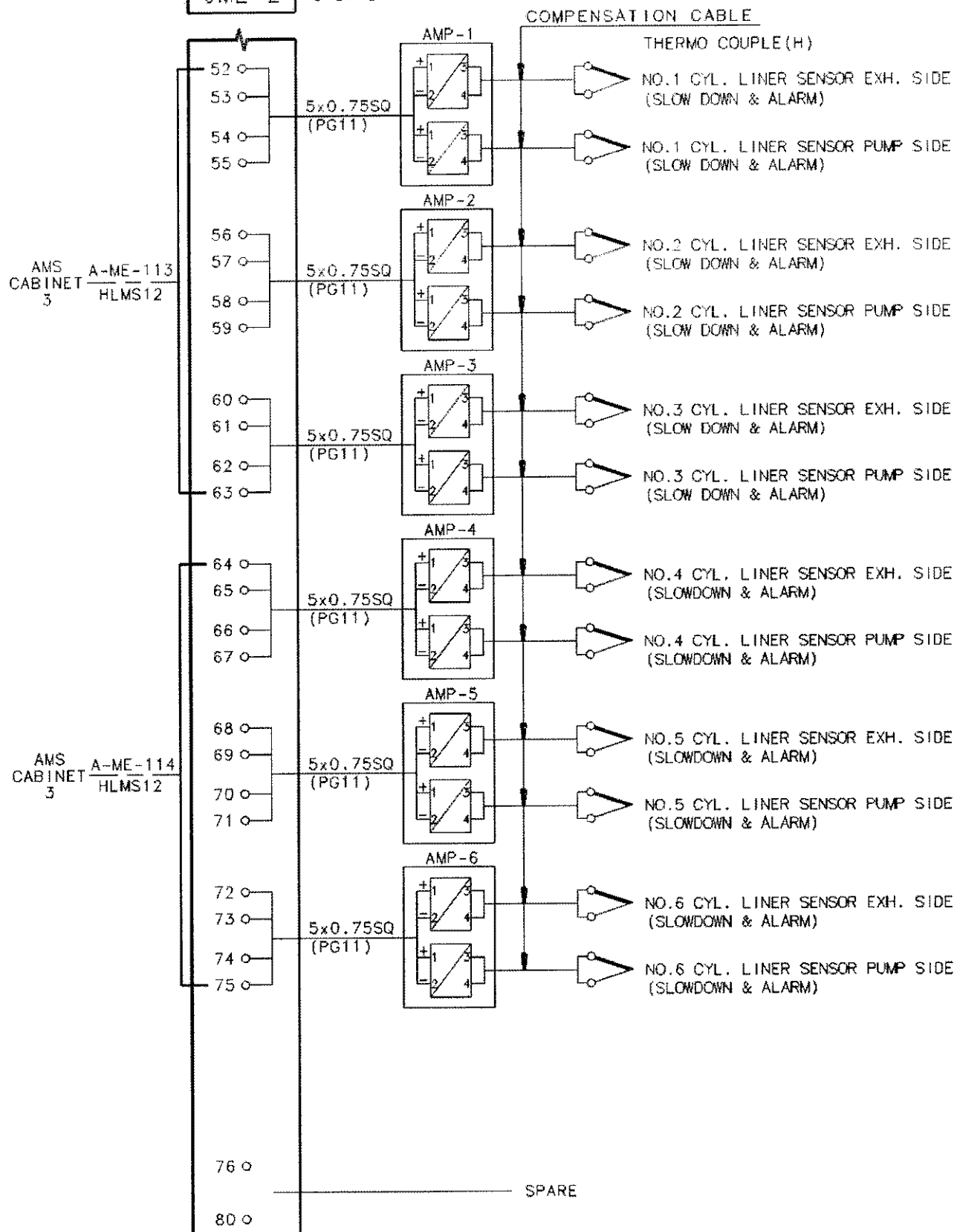
2 OF 3



Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R	
				*		5	
				*		4	
110905	BSH	BSH	JCM	*	BWM ADDED.	3	
110809	BSH	BSH	JCM	*	BY SHIPYARD'S COMMENTS.	2	
110408	BSH	BSH	JCM	*	UP TO DATE.	1	
110216	BSH	BSH	JCM	*	Replacement for Ident.no.:	0	
Licensor Ident.no.:				Type:			
1212121-0.0				6S90ME-C			
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338983				MAIN ENGINE WIRING DIAGRAM(JME-2)			A14-413512-3
Page.no.:				05 OF 17			

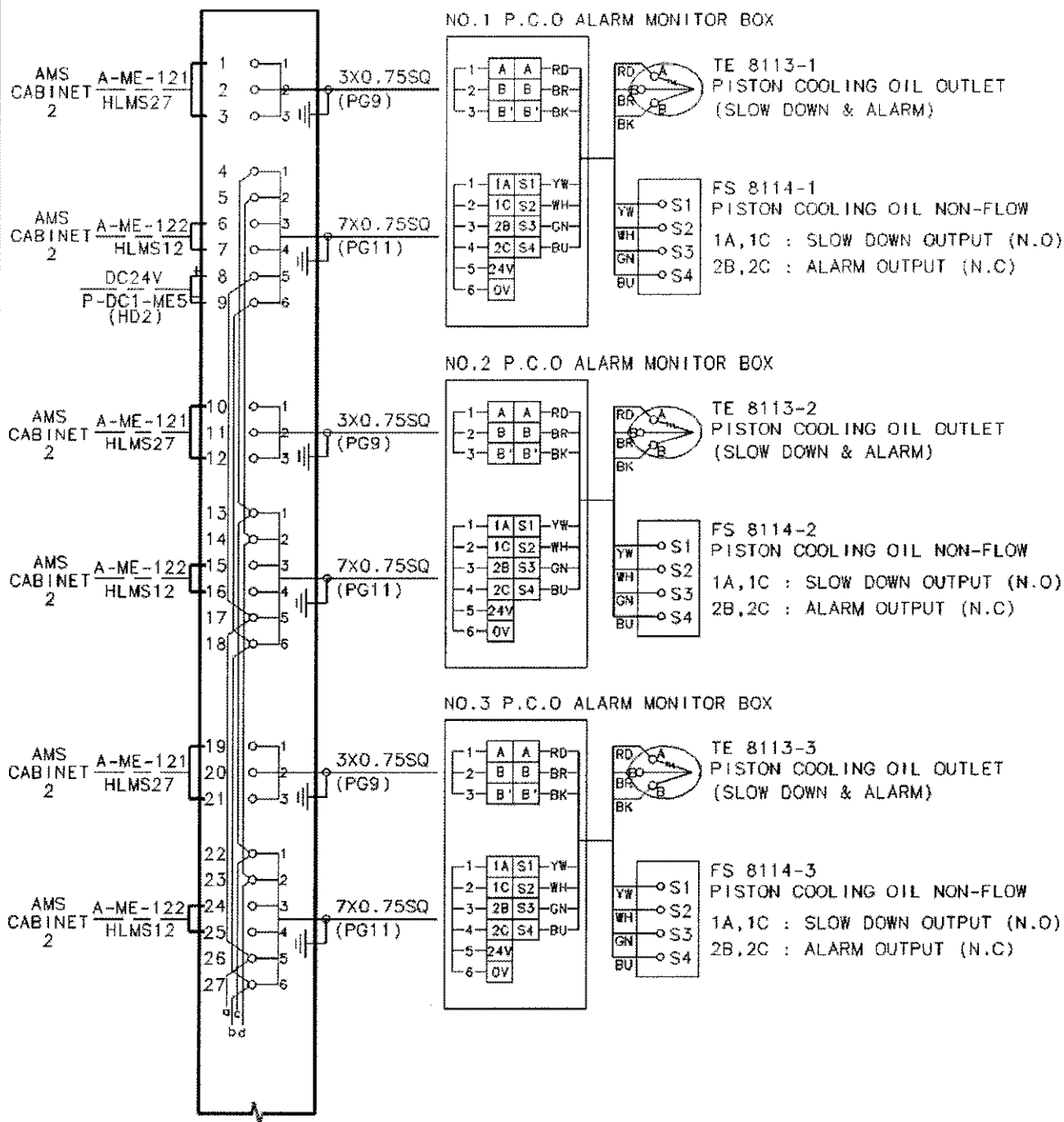
JME-2

3 OF 3



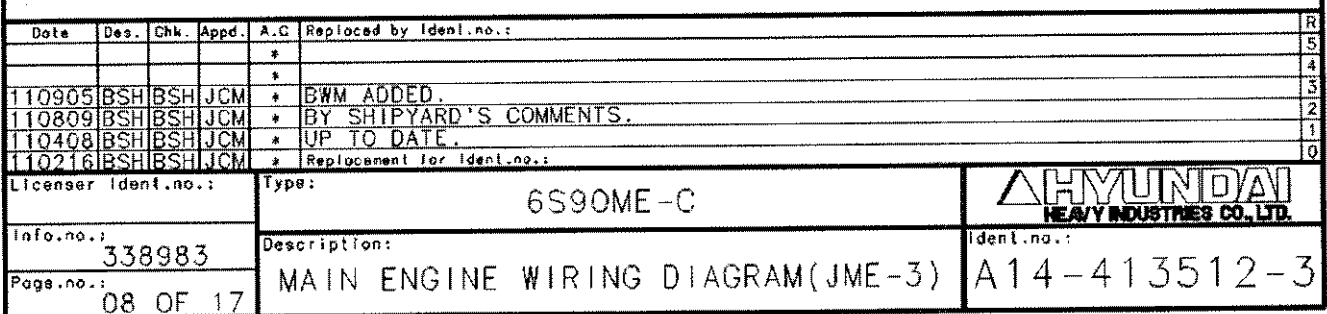
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	
				*		R
				*		5
				*		4
110905	BSH	BSH	JCM	*	BWM ADDED.	3
110809	BSH	BSH	JCM	*	BY SHIPYARD'S COMMENTS.	2
110408	BSH	BSH	JCM	*	UP TO DATE.	1
110216	BSH	BSH	JCM	*	Replacement for Ident.no.:	0
Licensor Ident.no.:				Type:	6S90ME-C	
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338983				MAIN ENGINE WIRING DIAGRAM(JME-2)	A14-413512-3	
Page.no.:						
06 OF 17						

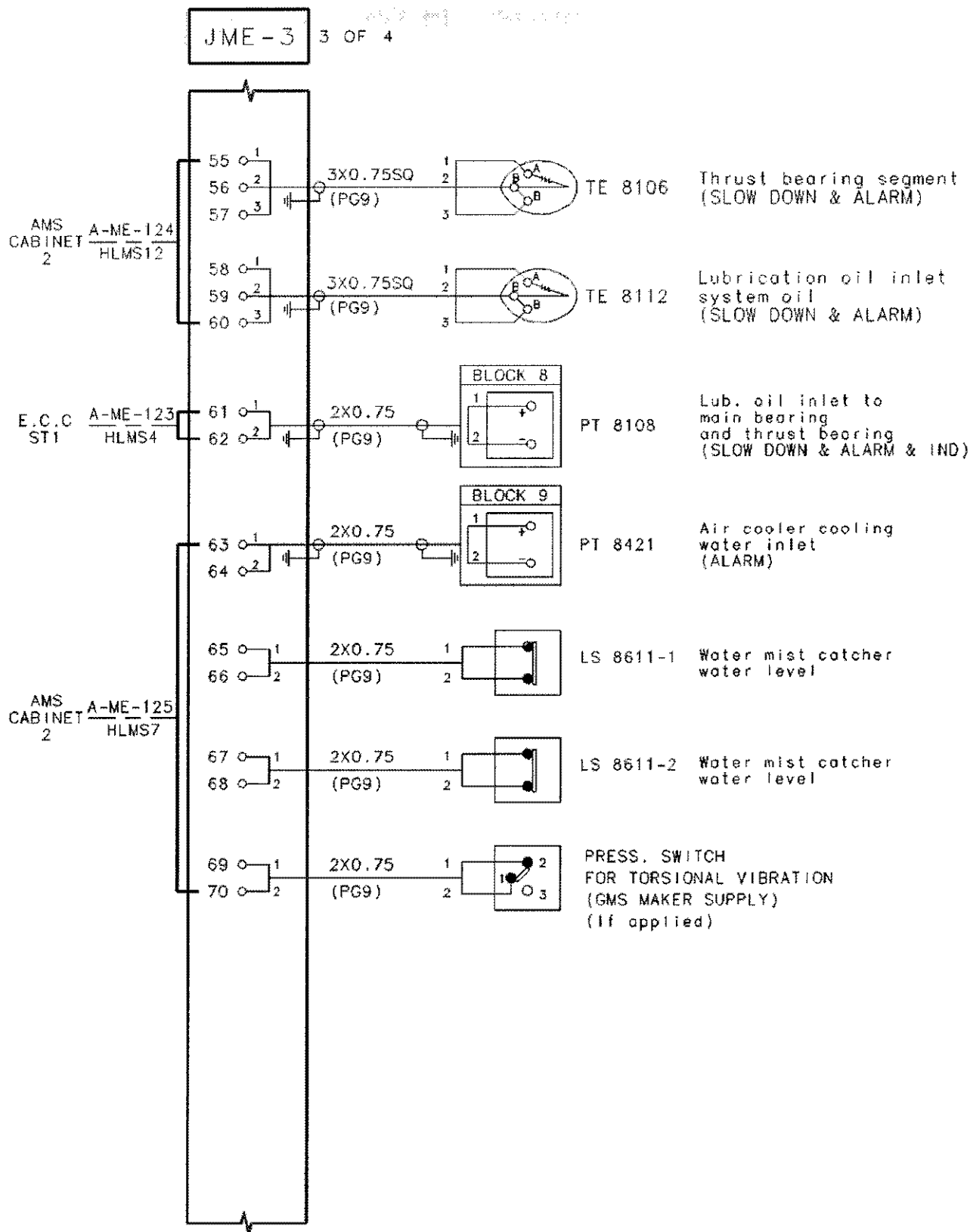
JME-3 1 OF 4



Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	
				*		R
				*		S
				*		4
110905	BSH	BSH	JCM	*	BWM ADDED.	3
110809	BSH	BSH	JCM	*	BY SHIPYARD'S COMMENTS.	2
110408	BSH	BSH	JCM	*	UP TO DATE.	1
110216	BSH	BSH	JCM	*	Replacement for Ident.no.:	0
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Info.no.:		Description:				
Page.no.:		MAIN ENGINE WIRING DIAGRAM(JME-3)				
338983		6S90ME-C				
07 OF 17		IDENT. NO.:				
		A14-413512-3				

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

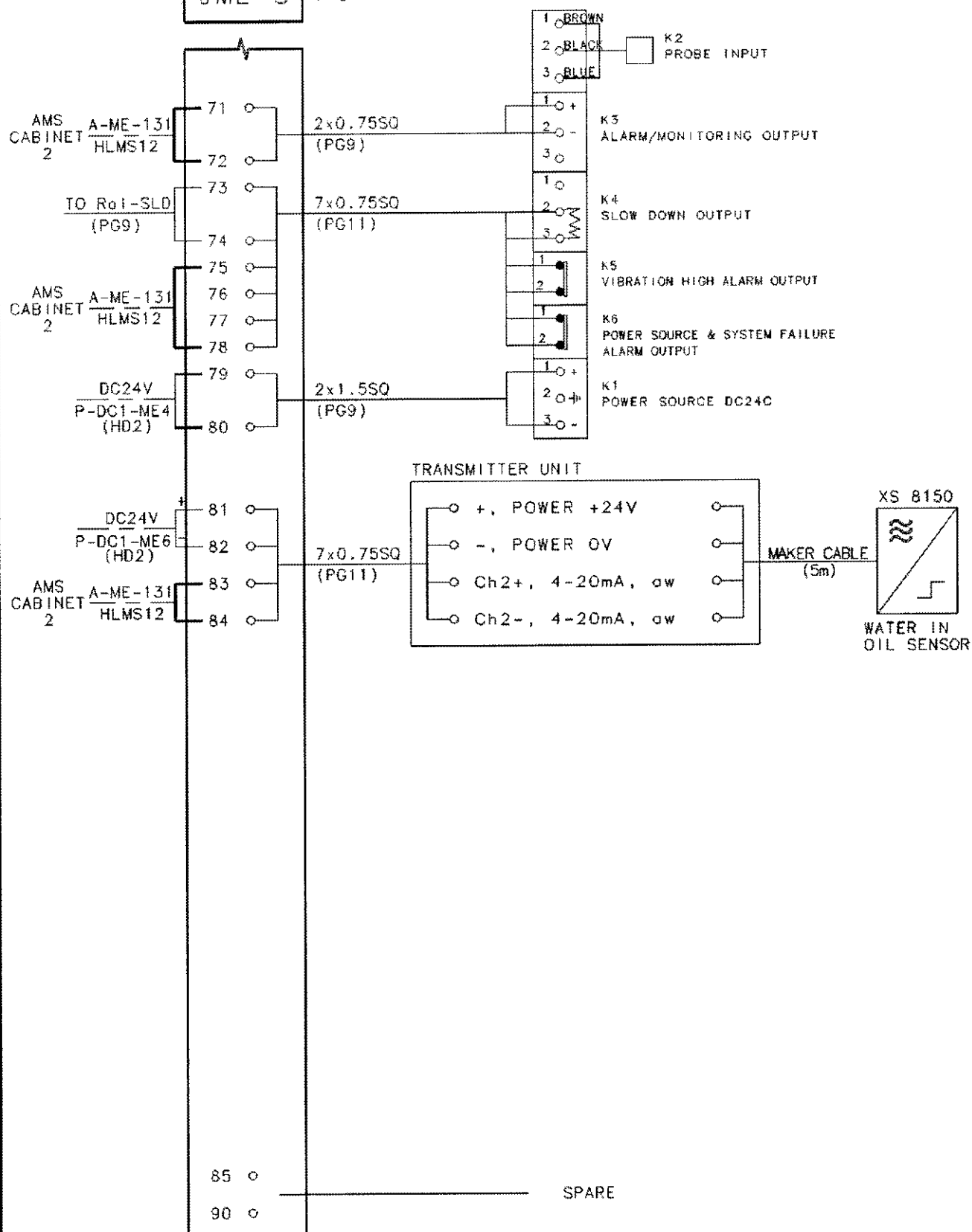




Date	Des.	Chk.	Appd.	A.C.	Replaced by Ident.no.:	R
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				*		4
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110809	BSH	BSH	JCM	*	BY SHIPYARD'S COMMENTS.	2
110408	BSH	BSH	JCM	*	LS 8611-2 ADDED.	1
110216	BSH	BSH	JCM	*	Replacement for Ident.no.:	0
Licensor Ident.no.:				Type:	6S90ME-C	
Info.no.:				Description:		
Page.no.:				MAIN ENGINE WIRING DIAGRAM(JME-3)	Ident.no.:	
338983						A14-413512-3
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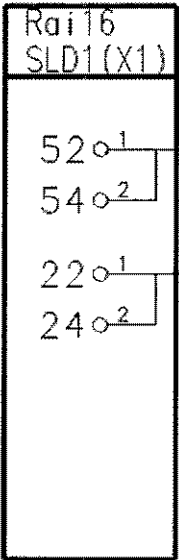
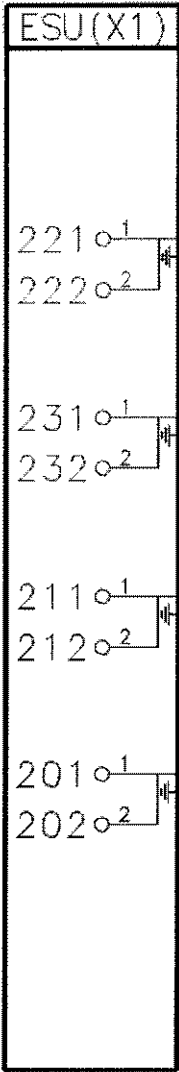
JME-3 4 OF 4

AXIAL VIBRATION MONITOR



Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R	
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				*		4	
110905	BSH	BSH	JCM	*	BWM ADDED.	3	
110809	BSH	BSH	JCM	*	BY SHIPYARD'S COMMENTS.	2	
110408	BSH	BSH	JCM	*	UP TO DATE.	1	
110216	BSH	BSH	JCM	*	Replacement for Ident.no.:	0	
Licensor Ident.no.:				Type:	6S90ME-C		
Info.no.:				Description:			Ident.no.:
Page.no.:				MAIN ENGINE WIRING DIAGRAM(JME-3)			A14-413512-3
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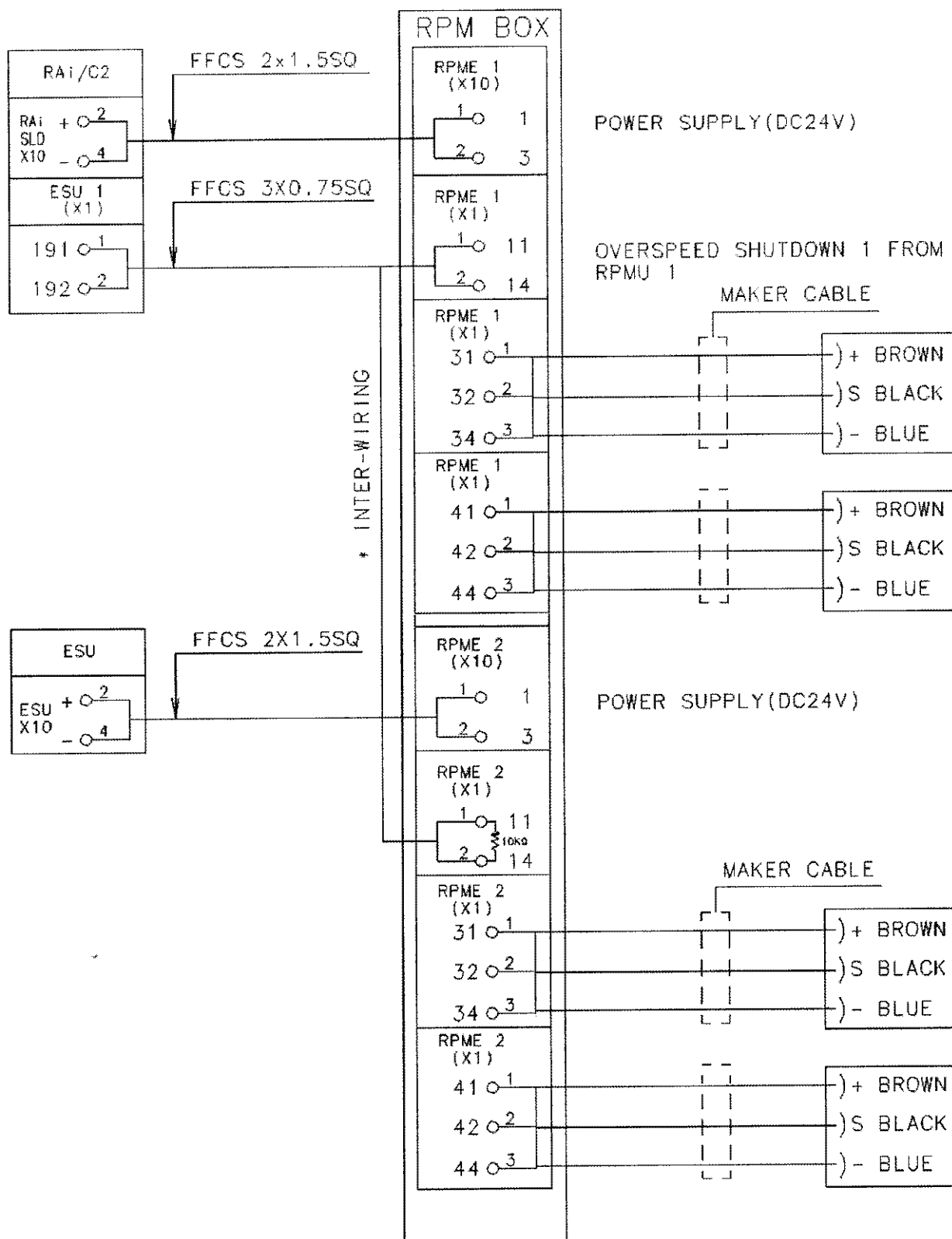
SAFETY SYSTEM CONNECTION



Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R
				*		5
				*		4
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110809	BSH	BSH	JCM	*	BY SHIPYARD'S COMMENTS.	2
110408	BSH	BSH	JCM	*	UP TO DATE.	1
110216	BSH	BSH	JCM	*	Replacement for Ident.no.:	0

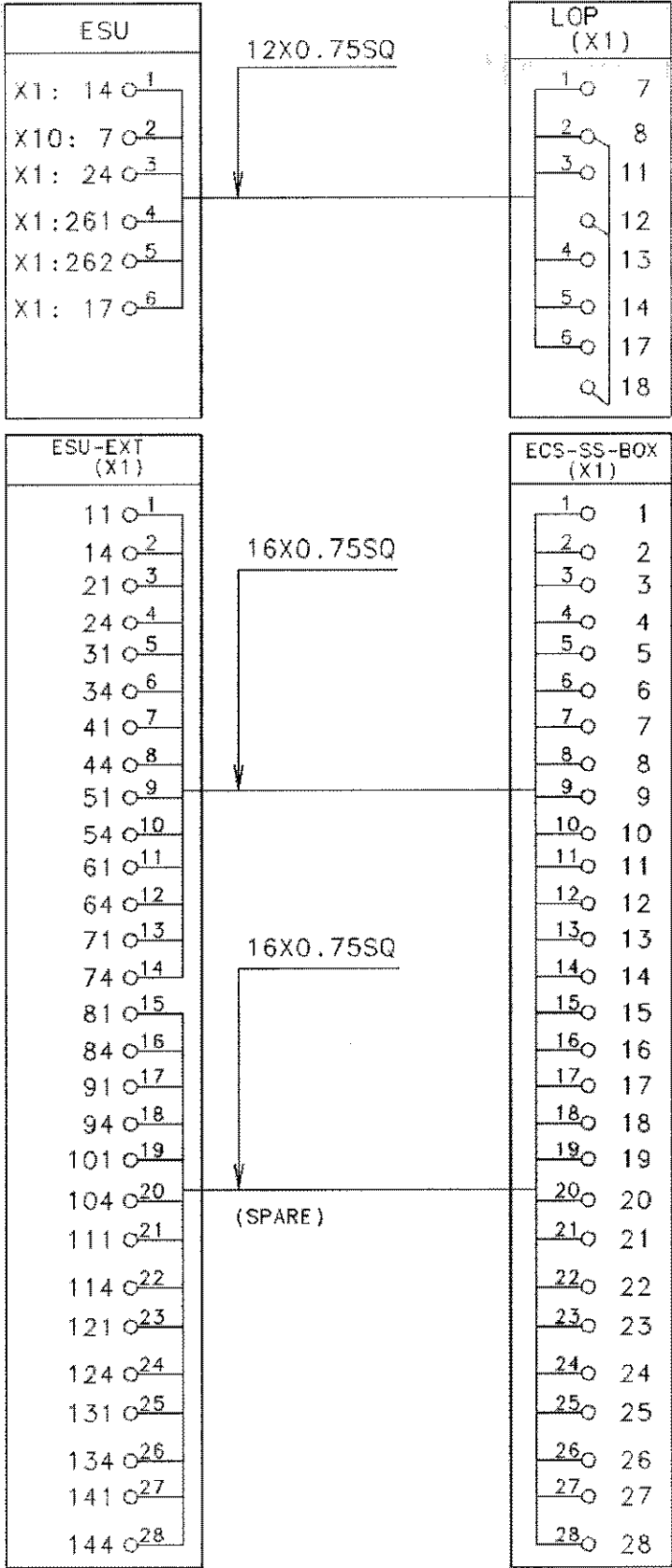
Licensor Ident.no.: Info.no.: 338983 Page.no.: 11 OF 17	Type: 6S90ME-C Description: MAIN ENGINE WIRING DIAGRAM(BMS)	 Ident.no.: A14-413512-3
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RPM PICK UP SENSOR FOR BMS & SAFETY



Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R
				*		5
				*		4
110905	BSH	BSH	JCM	*	BWM ADDED.	3
110809	BSH	BSH	JCM	*	BY SHIPYARD'S COMMENTS.	2
110408	BSH	BSH	JCM	*	UP TO DATE.	1
110216	BSH	BSH	JCM	*	Replacement for Ident.no.:	0
Licensor Ident.no.:				Type:	6S90ME-C	
Info.no.:				Description:		
Page.no.:						
338983				MAIN ENGINE WIRING DIAGRAM(BMS)		A14-413512-3
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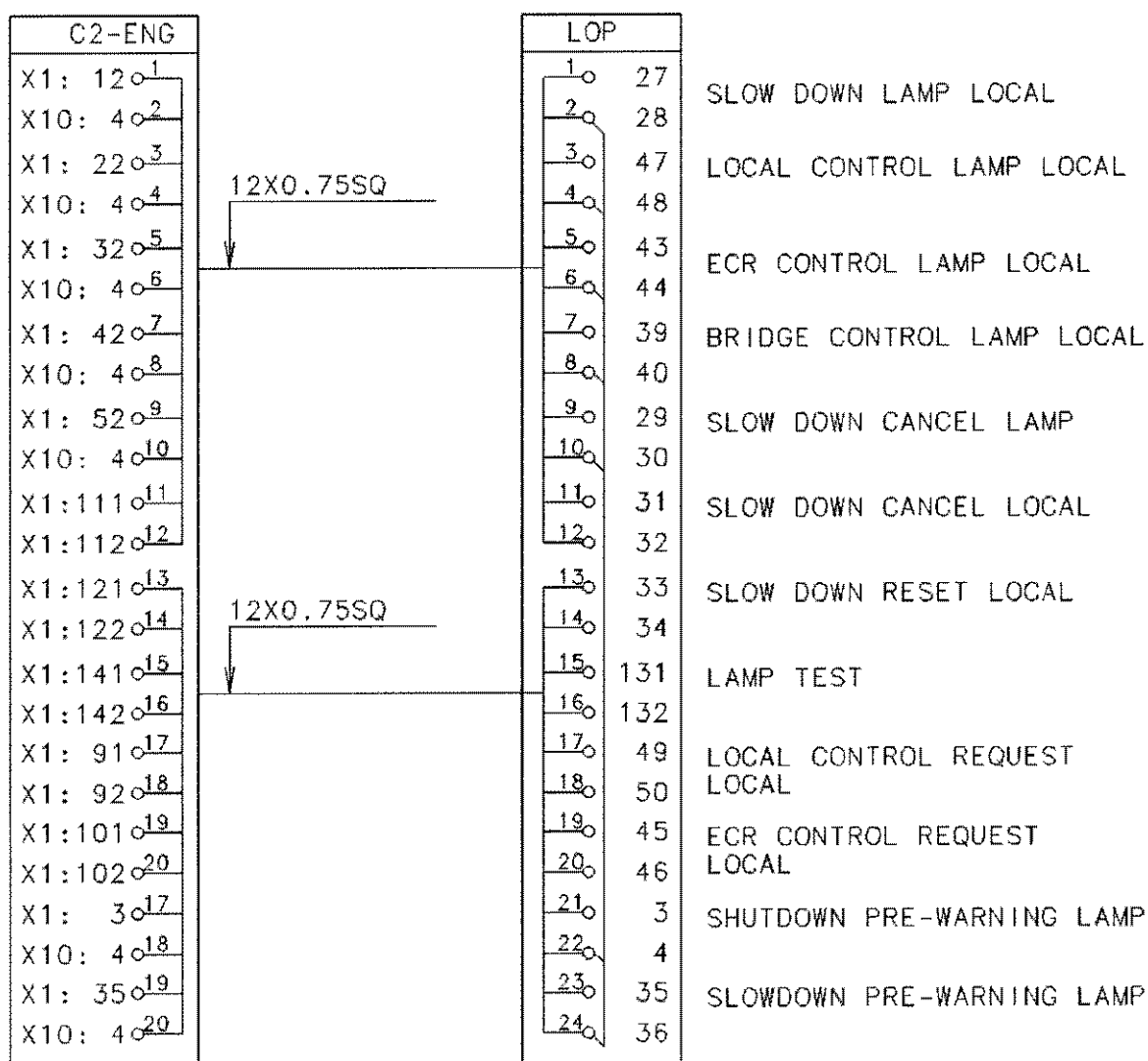
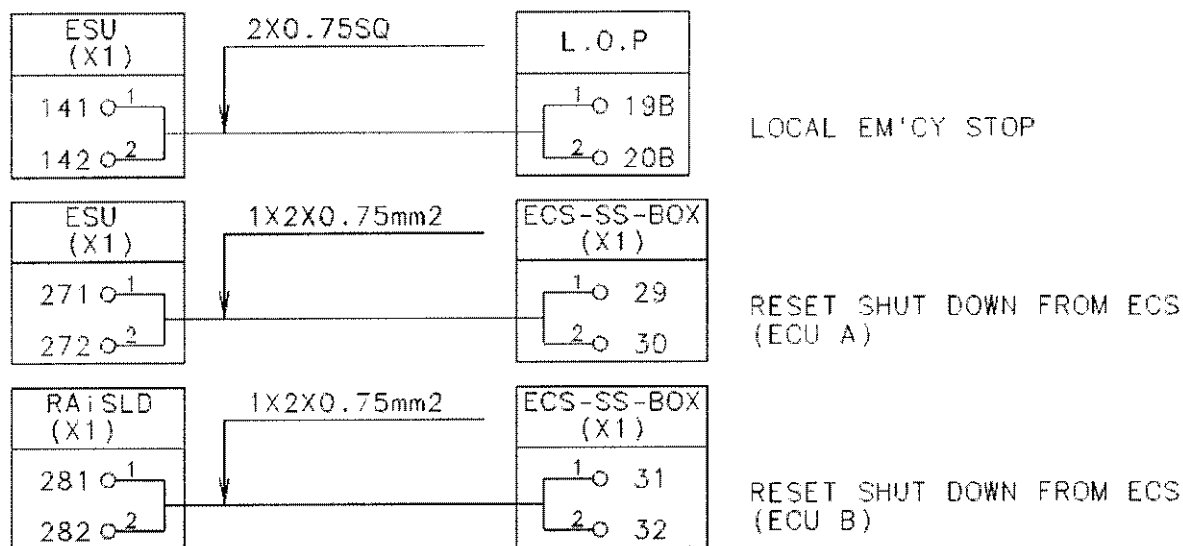
BMS & ECS CONNECTION



Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R
				*		5
				*		4
110905	BSH	BSH	JCM	*	BWM ADDED.	3
110809	BSH	BSH	JCM	*	BY SHIPYARD'S COMMENTS.	2
110408	BSH	BSH	JCM	*	UP TO DATE.	1
110216	BSH	BSH	JCM	*	Replacement for Ident.no.:	0

Licensor Ident.no.: Info.no.: 338983 Page.no.: 13 OF 17	Type: 6S90ME-C Description: MAIN ENGINE WIRING DIAGRAM(BMS)	 Ident.no.: A14-413512-3
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BMS & ECS CONNECTION



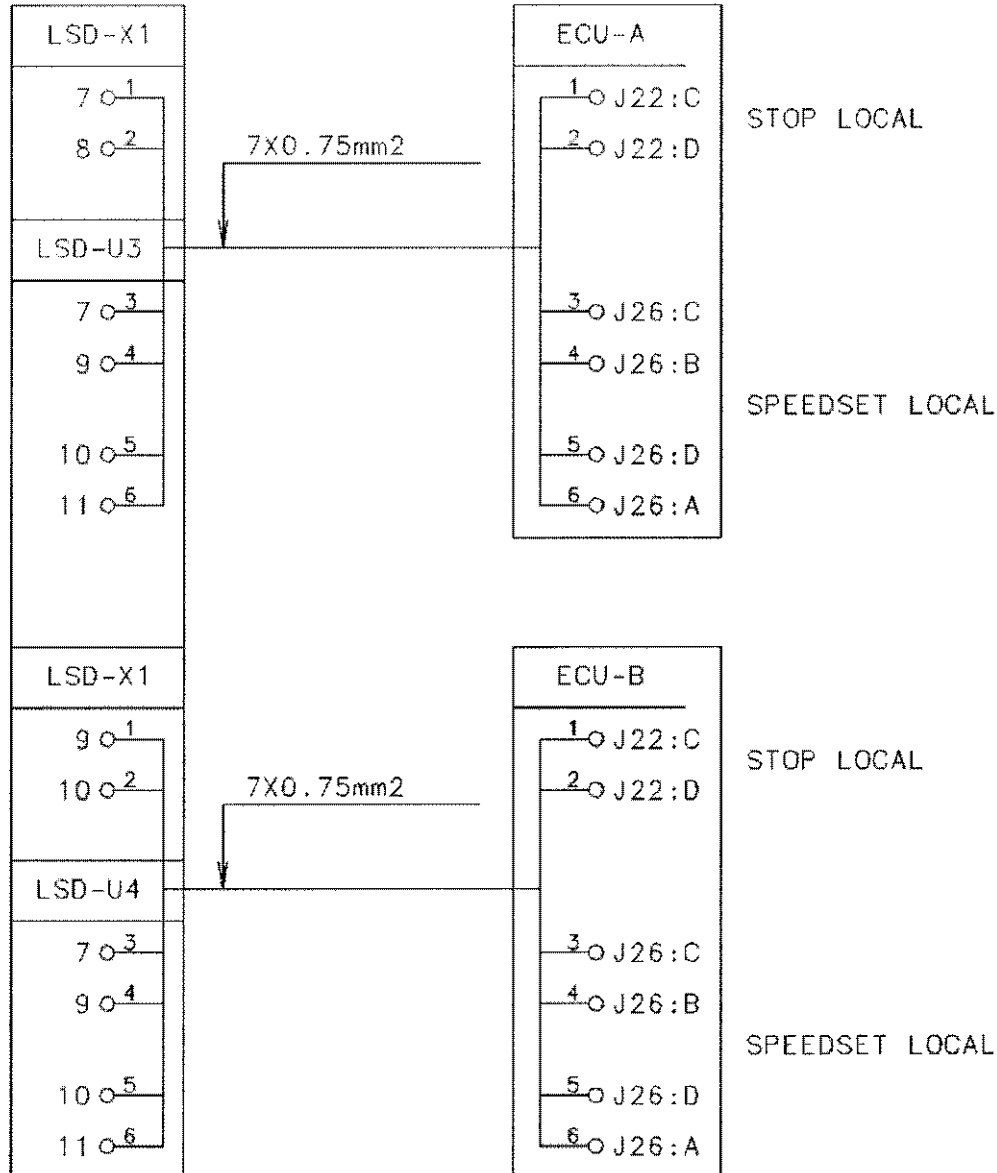
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	
				*		18
				*		19
				*		4
110905	BSH	BSH	JCM	*	BWM ADDED.	3
110809	BSH	BSH	JCM	*	BY SHIPYARD'S COMMENTS.	2
110408	BSH	BSH	JCM	*	UP TO DATE.	1
110216	BSH	BSH	JCM	*	Replacement for Ident.no.:	0
Licensor Ident.no.:				Type:	6S90ME-C	
Info.no.:				Description:	MAIN ENGINE WIRING DIAGRAM(BMS)	
Page.no.:						
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HYUNDAI
HEAVY INDUSTRIES CO., LTD.

Ident.no.: A14-413512-3

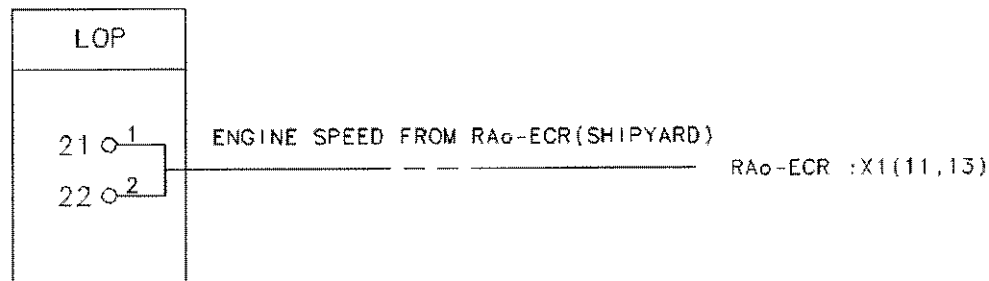
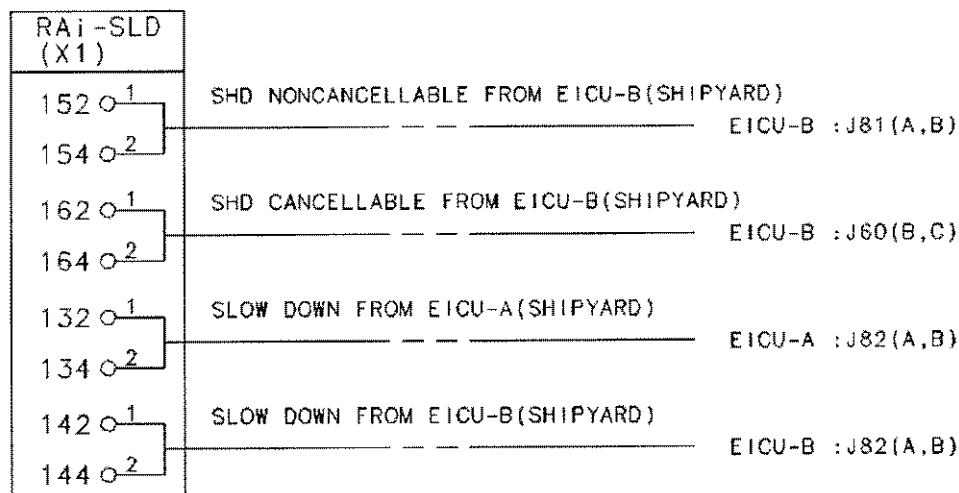
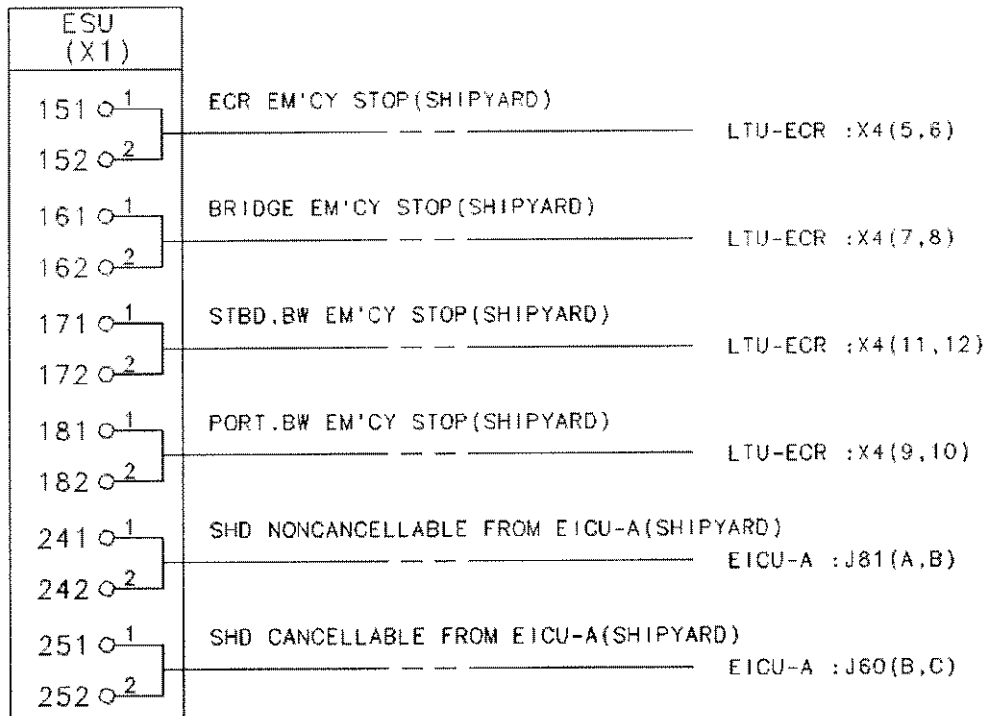
BMS & ECS CONNECTION

PBT



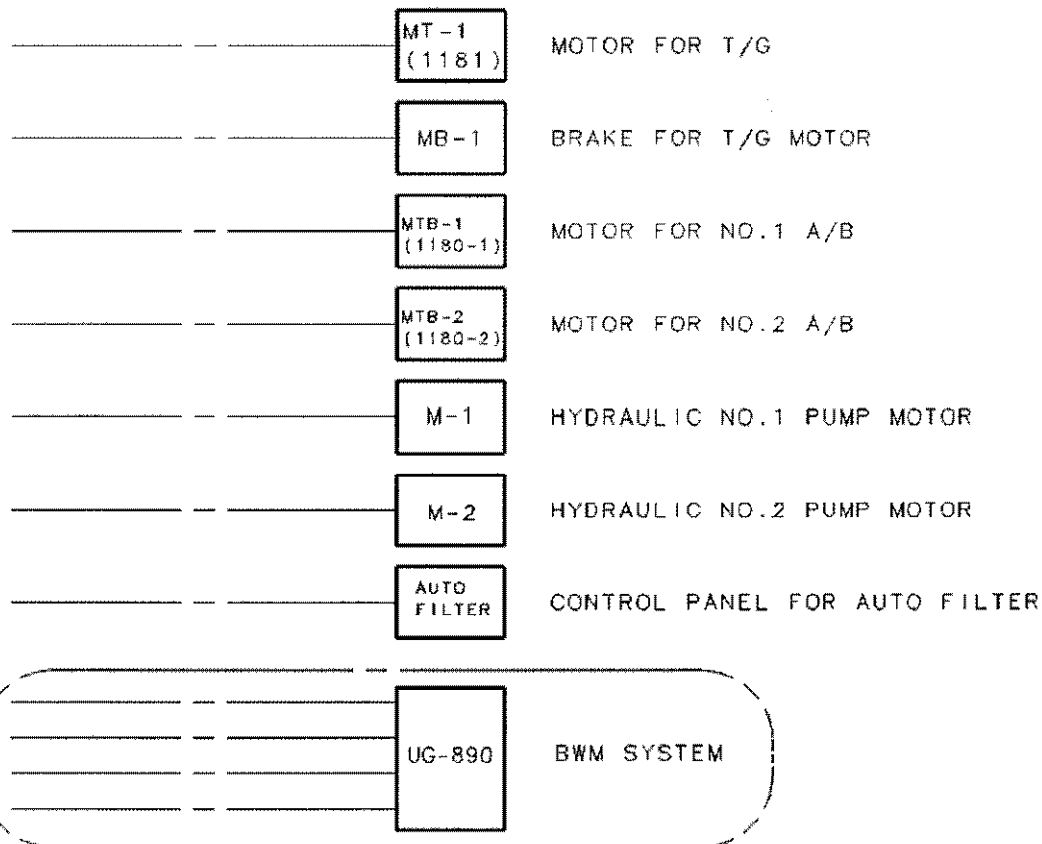
Date	Des.	Chk.	Appd.	A.C.	Replaced by Ident.no.:	R
				*		5
				*		4
110905	BSH	BSH	JCM	*	BWM ADDED.	3
110809	BSH	BSH	JCM	*	BY SHIPYARD'S COMMENTS.	2
110408	BSH	BSH	JCM	*	UP TO DATE.	1
110216	BSH	BSH	JCM	*	Replacement for Ident.no.:	0
Licensor Ident.no.:				Type:		
Info.no.:				6S90ME-C		
338983				Description:		
Page.no.:				MAIN ENGINE WIRING DIAGRAM(BMS)		Ident.no.:
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BMS & ECS CONNECTION

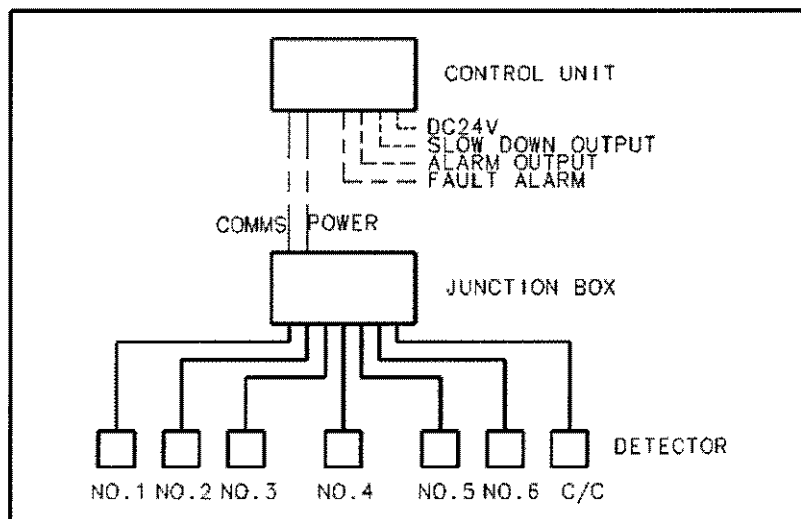


Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R
				*		5
				*		4
110905	BSH	BSH	JCM	*	BWM ADDED.	3
110809	BSH	BSH	JCM	*	BY SHIPYARD'S COMMENTS.	2
110408	BSH	BSH	JCM	*	UP TO DATE.	1
110216	BSH	BSH	JCM	*	Replacement for Ident.no.:	0
Licensor Ident.no.:				Type:		
Info.no.:				6S90ME-C		
338983						
Page.no.:				Description:		Ident.no.:
16 OF 17				MAIN ENGINE WIRING DIAGRAM(BMS)		A14-413512-3

LIST OF AUXILIARY SYSTEM CONNECTION BY SHIPYARD



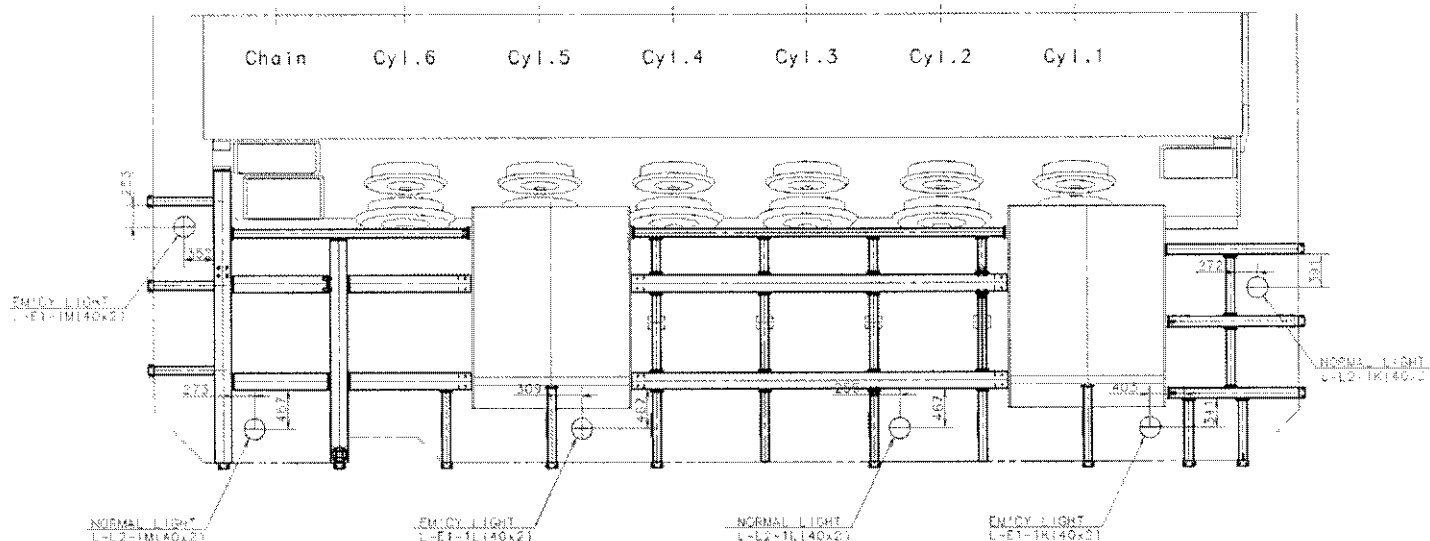
OIL MIST DETECTOR(MARK-6)



Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R
				*		5
				*		4
110905	BSH	BSH	JCM	*	BWM ADDED.	3
110809	BSH	BSH	JCM	*	BY SHIPYARD'S COMMENTS.	2
110408	BSH	BSH	JCM	*	UP TO DATE.	1
110216	BSH	BSH	JCM	*	Replacement for Ident.no.:	0
Licensor Ident.no.:				Type:	6S90ME-C	
Info.no.:				Description:	MAIN ENGINE WIRING DIAGRAM(AUX)	
Page.no.:						
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Code	1	2	3	4	5	6	7	8	9	10	11	12
Code	1	2	3	4	5	6	7	8	9	10	11	12

The data in this drawing are valid for the following products and dimensions:

Code	1	2	3	4	5	6	7	8	9	10	11	12
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Drawing No.		Project No.		Sheet No.	
1-1		33000-0		34104	
34105		APP. OF LIGHT REAR		311-413520-2	

YARD CABLE INLET

YARD CABLE INLET

YARD CABLE INLET

TYPICAL TRAINING

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	12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					S. PAGE	T. PAGE
PLAN HISTORY				ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2	
				MESSRS.	H.H.I.	
				RULE	LR + UMS	
				SHIP NO.	2585/86/87/88/89	
				ENG. NO.	AA4624/25/26/27/28	
TITLE : OIL MIST DETECTOR (MARK-6)						
Date	Des.	Dtk.	Appd.	A.C	Replaced by Ident.no.:	Replacement for Ident.no.:
20110718	ESH	ESH	JCM		FOR WORKING.	
20110217	ESH	ESH	JCM			
Licencee Ident.no.:				Type:		
Info.no.:				6S90ME-C		
Page.no.:				Description:		
(01) 02				OIL MIST DETECTOR (MARK-6)		Ident.no.:
Security:				C		A14-413495-8

INDEX

OIL MIST DETECTOR MARK-6

NO.	DESCRIPTION	DWG. NO.
1	OIL MIST DETECTOR	A14-251528-0
2	OIL MIST DETECTOR	A14-251529-1
3	CONTROL PANEL (FLUSH MOUNT) INSTALLATION	A12-219754-6
4	BEZEL FOR MK6 PANEL	A12-219753-4
5	MARK6 SYSTEM	A14-219757-1
6	MARK6 HEAD INSTALLATION	A12-219756-0
7	JUNCTION BOX INSTALLATION	A12-219758-3

Date	Des.	Drk.	Appd.	A.C	Replaced by Ident.no.1	Replacement for Ident.no.1	R
20110718	BSH	BSH	JCM		FOR WORKING.		I
20110217	BSH	BSH	JCM				O
Licence Ident.no.1		Type1		6S90ME-C			
Info.no.1		Description1		OIL MIST DETECTOR (MARK-6)		Ident.no.1	
Page.no.1 (02) 02		Security1 C				A14-413495-8	

Technical Data

Control Unit

Enclosing Rate : IP32
 Scanning Time : 1.2seconds for 64 detectors
 Power supply : 24V DC(+35% -25%)
 Protection : Self re-settable fuse inside panel
 Insulation : Flash tested to 2000V for 1 minute
 Power Consumption : 5.2W
 Temp. Rating : 0 - 55°C
 Dimensions
 Bulkhead Mounted

Height : 250mm(270mm Mounting Centers)
 Width : 500mm(445mm mounting center)
 Depth : 118mm

System Output : Volt-free change over contacts rated at 30V, 1A, DC

Main Alarm : 1set
 Fault alarm : 1set
 Engine Slow Down : 1set per engine
 Weight : 6kg

Detector

Mounting : 3/4 inch BSP
 Enclosing Rate : IP65
 Address Switch : 2 x 10 position(0 to 99)
 Indicator : Green : Detector on
 Red : Alarm
 Amber : detector Fault
 Electronit Replaceable Micro-fan
 Temperature Rating : 01 - 70°C
 Dimensions : Height : 175mm
 Width : 90mm
 Length : 205mm
 Weight : 0.6Kg

Junction Box

Enclosing Rate : IP65
 Fuse Rating : 4.5A
 Temperature Rating : 01 - 70°C
 Dimensions : Height : 160mm(110mm mounting centers)
 Width : 260mm(240mm mounting centers)
 Length : 90mm
 Weight : 2.3Kg

Setting Value

Slowdown : Dev. 0.3mg/l, Avg. 0.7mg/l

Date	Des.	Drk.	Appd.	A.C	Replaced by Ident.no.:	Replacement for Ident.no.:	R
20100118	BSH	BSH	JCM		Setting point is added.		2
20060123	KWS	KWS	KJG	*	UP TO DATE		1
20040811	KWS	KWS	KJG	*			0
Licensor Ident.no.:				Type:			
Info.no.:				MK6			
Page.no.:				Description:			
01 (01)				OIL MIST DETECTOR		Ident.no.:	A14-251528-0

Control Unit

Refer to attached MK6 Control Unit drawing.

The control unit is designed for panel mounting and must be installed in a control room or similar environment.

For panel mounting, refer to Dwg. No. 35100-K187

The position of the control unit must be sited for optimum visibility of the display.

Sufficient space must be left around the control unit to allow the fitting of glands and routing of the cables, and facilitate easy access to all aspects of the control unit.

A Minimum of 750mm must be allowed at the front of the control unit to allow the door opened.

Detector

Each detectors is mounted to an individual crankcase via 3/4 Inch BSP Threaded hole.

The detector should be located at the upper part of the crankcase wall not in the direct line of oht oil throw.

On smaller engines it is permissible to mount the detector on the crankcase door if desired or installation dictates.

The detector must be fitted at a maximum of plus or minus 200 degrees from the vertical. Horizontally the detector must be mounted level or with the detector body inclined towards the engine to ensure oil drainage.

Each detector is then connected via either a straight or 90 degree bend cable assembly to its revevant junction box.

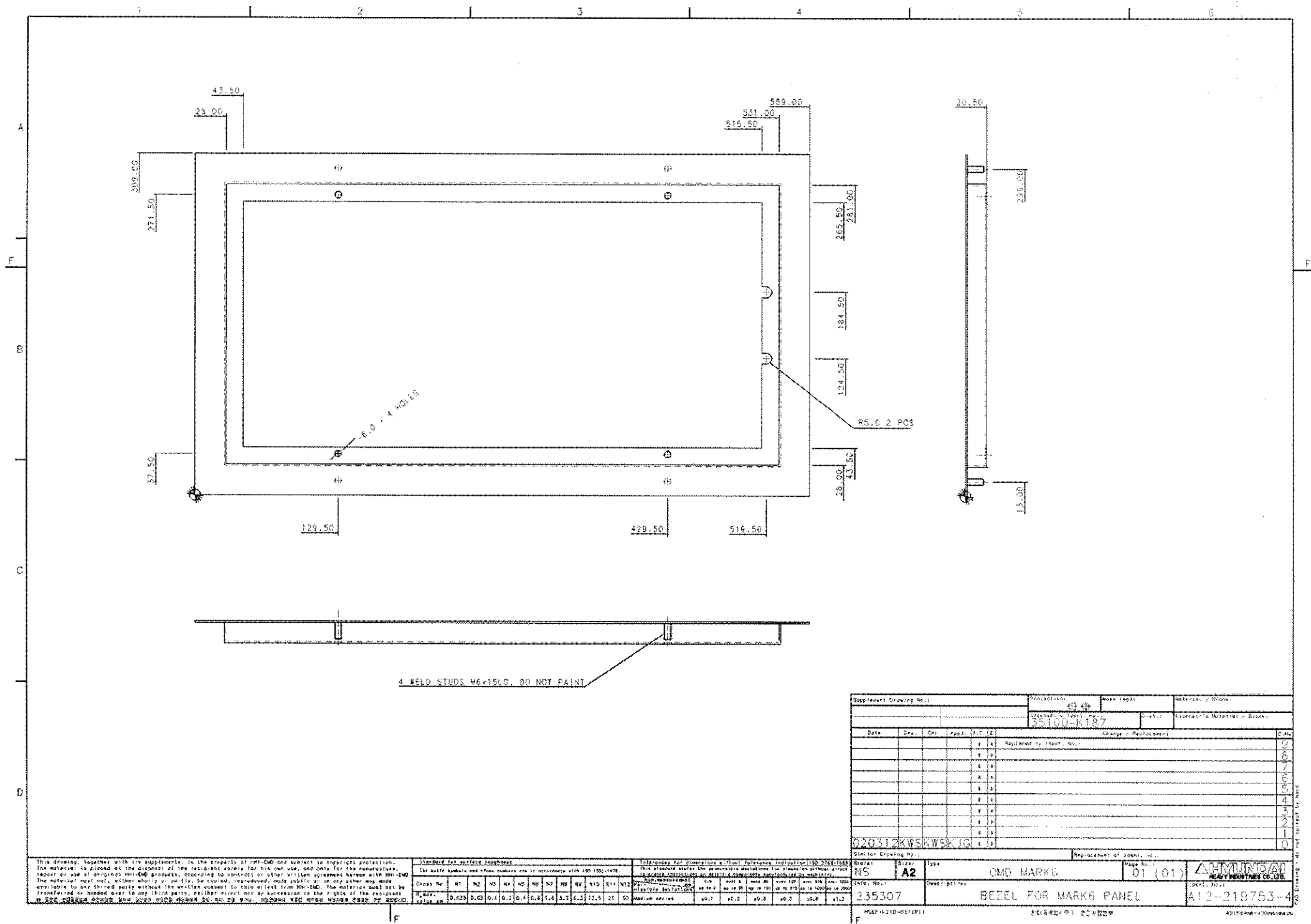
Junction Box

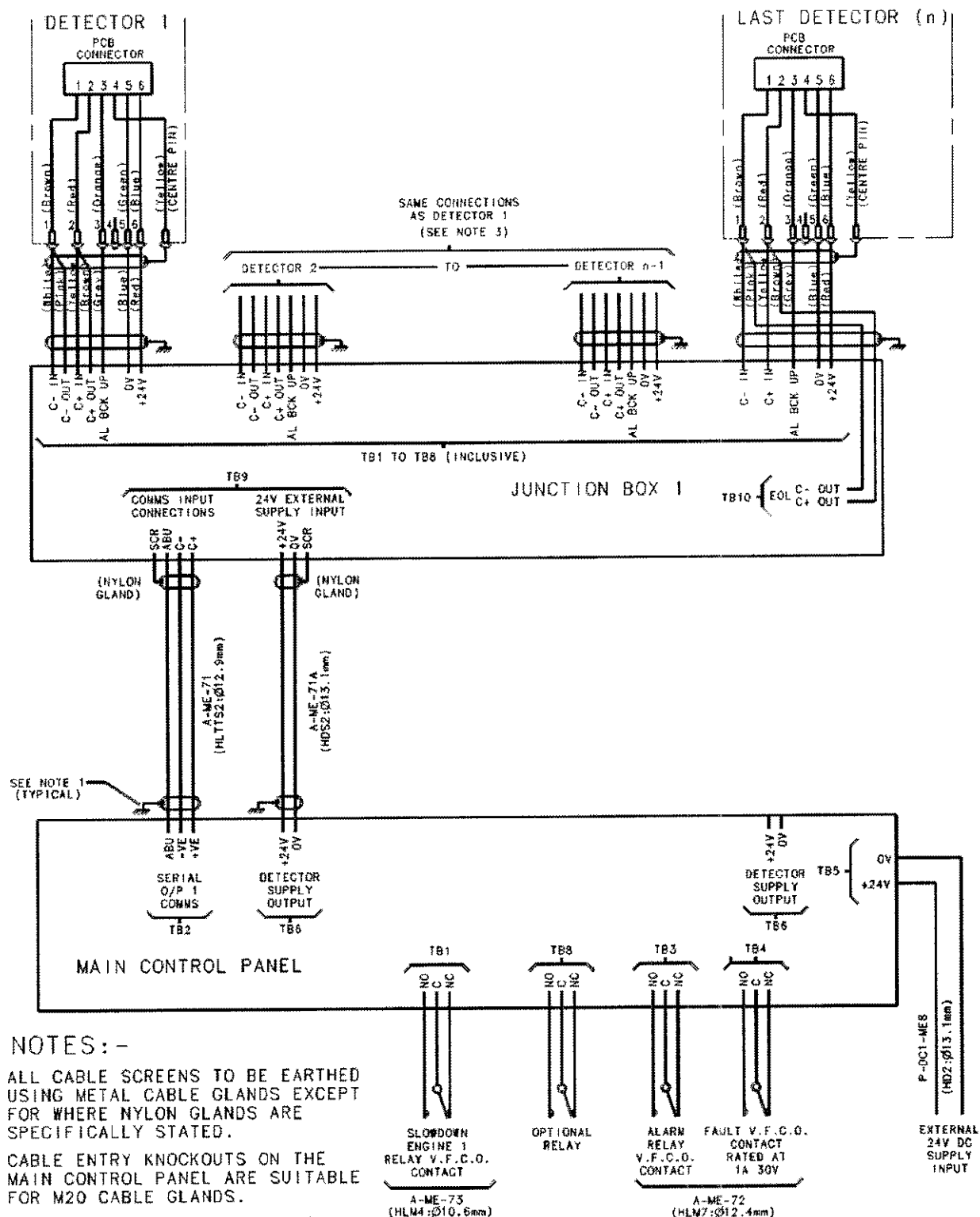
The junction box is designed for on-engine mounting and it is recommended that the box is installed as near center of the engine as possible to minimize detector cable lengths.

Mounting is via the fou M6 locating holes in the box. Sufficient space must be left around the junction box to allow axcess to the cable glands and routing of the cables and to facilitate easy access to all aspects of the junction box.

note) All connections to the control unit and junction box must be carried out accordance with these wiring drawing.

Date	Des.	Drk.	Appd.	A.C	Replaced by Ident.no.:	Replacement For Ident.no.:	R
20100824	ESH	ESH	JCM		Cadom to UG		
20040811	KWS	KWS	KJG	*			
Licencee Ident.no.:		Type:		MK6			
Info.no.:		Description:		OIL MIST DETECTOR		Ident.no.:	
Page.no.:						A14-251529-1	
01 (01)							



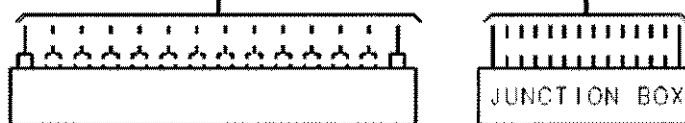


Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R
				*		5
				*		4
				*		3
				*		2
				*		1
				*		0
110901BSHBSHJCM						
Licensor Ident.no.: E9261-002(1/2)						
Info.no.: 235307						
Page.no.: 01 OF 02						
Type: OMD MARK6						
Description: MARK6 SYSTEM						
Ident.no.: A14-435058-6						

HYUNDAI
HEAVY INDUSTRIES CO. LTD.

ENGINE ROOM

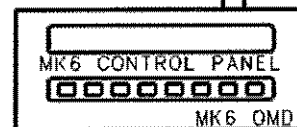
(N) DETECTOR HEAD CABLES



MAIN ENGINE MAX 14 OFF DETECTOR HEAD CABLES
WITH A MAX OF
14 DETECTORS FITTED

CONTROL ROOM

POWER CABLE A-ME-71A
COMMS CABLE A-ME-71



P-DC1-8

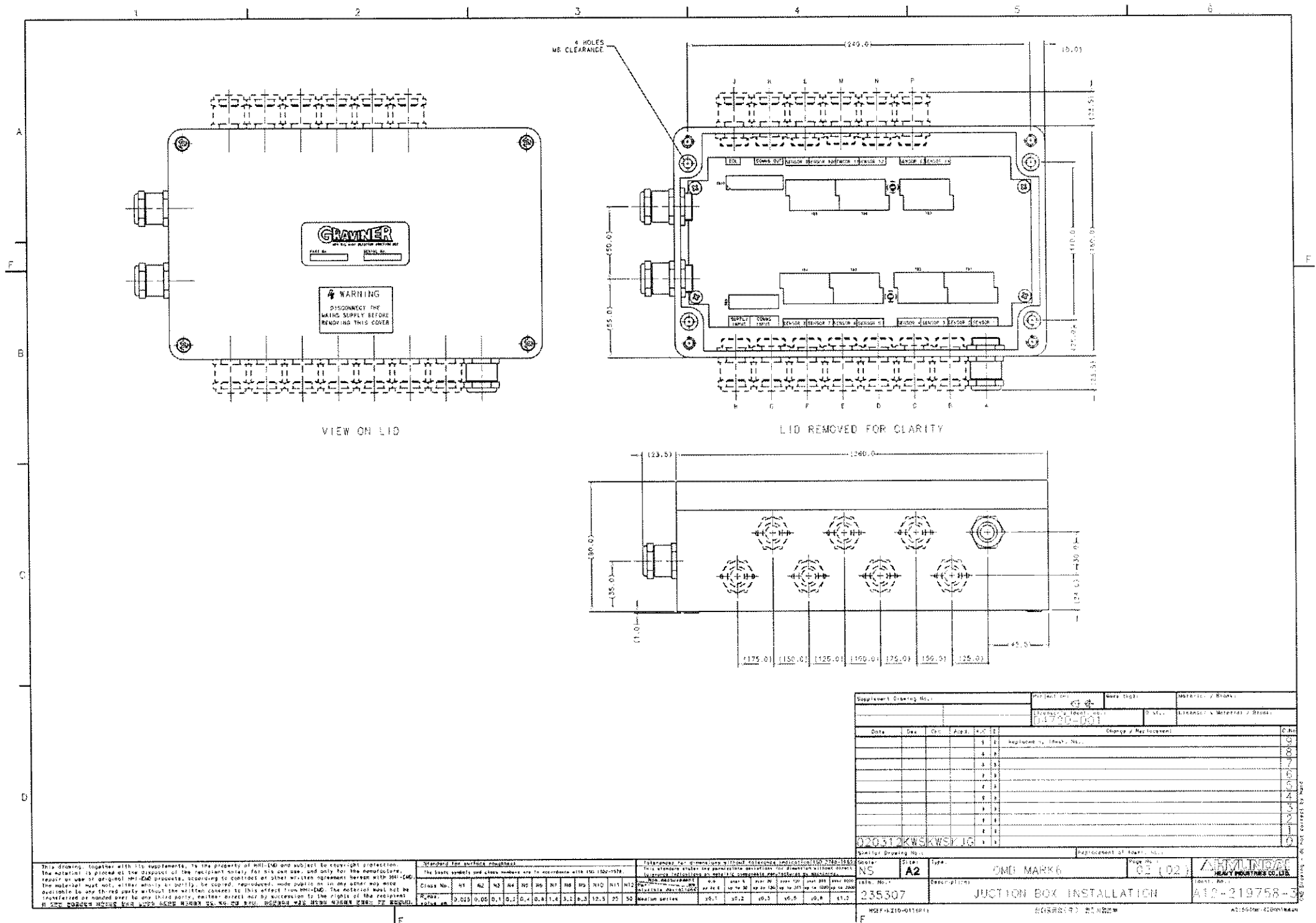
EXTERNAL
24VDC
SUPPLY
INPUT

* CABLES BETWEEN JUNCTION BOX AND CONTROL UNIT
SHOULD BE CONNECTED WITHOUT JUNCTION.

POWER CABLE: 2 CORES + EARTH, CSA 2.5mm² (50/0.25mm),
FLEXIBLE STRANDED BARE COPPER CONDUCTORS,
LOW SMOKE HALOGEN FREE INSULATION,
CORES LAID UP, ALUMINIUM/POLYESTER FOIL
PLUS A TINNED COPPER WIRE BRAID.
LOW SMOKE HALOGEN FREE SHEATH - GREY
OUTSIDE DIAMETER 9.8mm.
OPERATING TEMPERATURE 0°C TO +80°C.
SUPPLIER - FS CABLES
ORDER CODE 42302503.
OR SIMILAR.

COMMS CABLE: 2 TWISTED LOW CAPACITANCE PAIRS,
24 (7) AWG TINNED COPPER CONDUCTORS,
FOAM POLYOLEFIN INSULATION,
EACH PAIR FOIL SCREENED WITH A
TINNED COPPER DRAIN WIRE,
LOW SMOKE HALOGEN FREE SHEATH - GREY.
OUTSIDE DIAMETER 8.1mm.
OPERATING TEMPERATURE 0°C TO +70°C.
SUPPLIER - FS CABLES
ORDER CODE 2402PIFFH.
OR SIMILAR.

Date	Des.	Ghk.	Appd.	A.C.	Replaced by Ident.no.:	R
				*		5
				*		4
				*		3
				*		2
				*		1
110901	BSH	BSH	JCM	*	Replacement for ident.no.:	0
Licensor Ident.no.:					Type:	
E9261-002(2/2)					OMD MARK6	
Info.no.:					Description:	
235307					MARK6 SYSTEM	Ident.no.:
Page.no.:						A14-435058-6
02 OF 02						



					S. PAGE	T. PAGE
PLAN HISTORY					ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2
					MESSRS.	H.H.I.
					RULE	LR + UMS
					SHIP NO.	2585/86/87/88/89
					ENG. NO.	AA4624/25/26/27/28
TITLE : TURBOCHARGER TACHOMETER						
Date	Des.	Chk.	Appd.	A.C	Replace for Ident.no.:	Replace by Ident.no.:
20110718	BSH	BSH	JCM		FOR WORKING.	
20110217	BSH	BSH	JCM			
Licensor Ident.no.:				Type:		
Info.no.:				Description:		
Page.no.:				Ident.no.:		
01 02				TURBOCHARGER TACHOMETER		
						
				A14-413496-0		

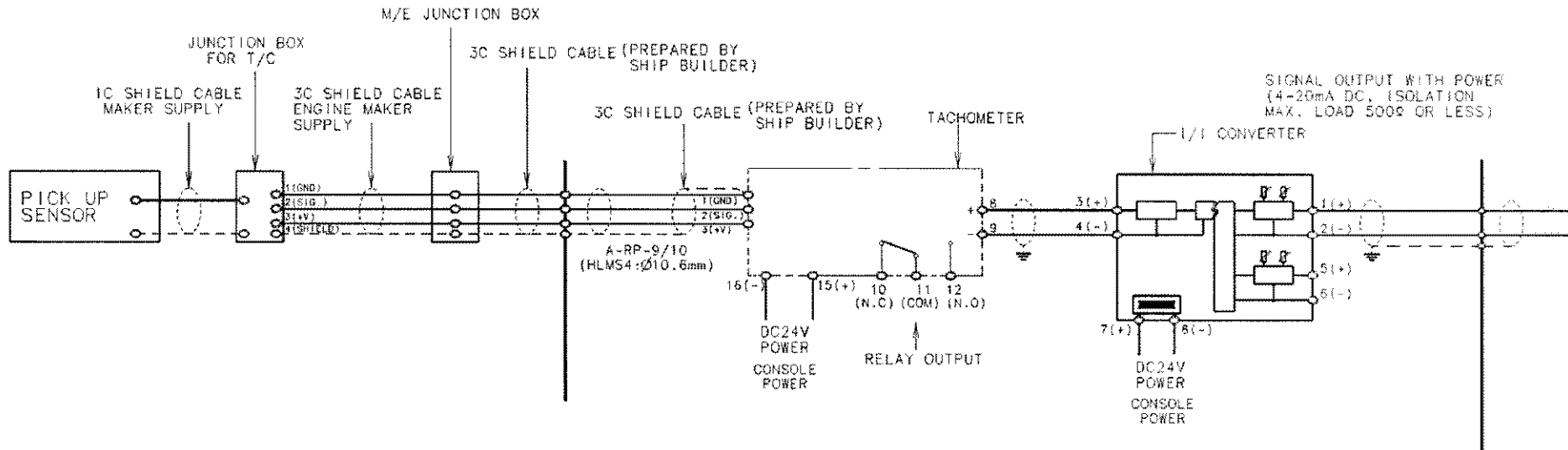
INDEX

TACHOMETER FOR MET71MB T/C (ISET)
(FULL RANGE : 0 - 16,000 RPM)
(ALARM VALUE : 13,350 RPM)

NO.	DESCRIPTION	DWG. NO.
1	WIRING DIAGRAM (WITH I/I)	A13-435061-9
2	MB-TYPE MET TACHOMETER	A14-249057-8
3	I/I CONVERTOR (8 PIN TYPE)	A13-190819-5

Date	Des.	Chk.	Appd.	A.C	Replace For Ident.no.:	Replace by Ident.no.:	R
20110718	BSH	BSH	JCM		FOR WORKING.		I
20110217	BSH	BSH	JCM				O
Licensor Ident.no.:		Type:			6S90ME-C		
Info.no.:		Description:			TURBOCHARGER TACHOMETER		
Page.no.:		Confidential:			A14-413496-0		
02 02		C					

ECR



Supplement Drawing no.:						Projection: 		Mast (kg):		Material / Blank:	
						Licensor's Ident. no.:		Div.:		Licensor's Material / Blank:	
Date	Gas.	Chk.	Appd.	A.E.	E	Change / Replacement					C.No.
				*	*	Replaced by Ident. No.:					9
				*	*						8
				*	*						7
				*	*						6
				*	*						5
				*	*						4
				*	*						3
				*	*						2
				*	*						1
				*	*						0
* 110901BSHBSHJCM											
Similar Drawing No.:								Replacement of Ident. No.:			
Scale:	Size:	Type:					Page No.:				
N/S	A3	MET TYPE T/C					01 (01)				
Info. No.:		Description:					Ident. No.:				
335470		WIRING DIAGRAM(WITH I/I)					A13-435061-9				

DRAWING No.

N36—00K—0137

PLAN RECORD		REVISIONS		APPROVED	CHECKED
ISO METRIC SCREW THREADS	No.	DESCRIPTION(DATE)			

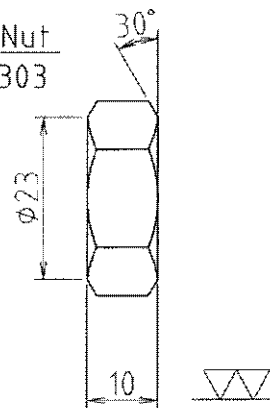
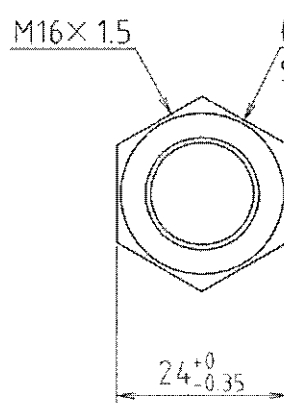
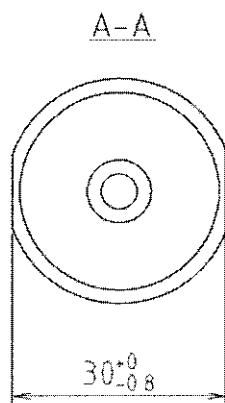
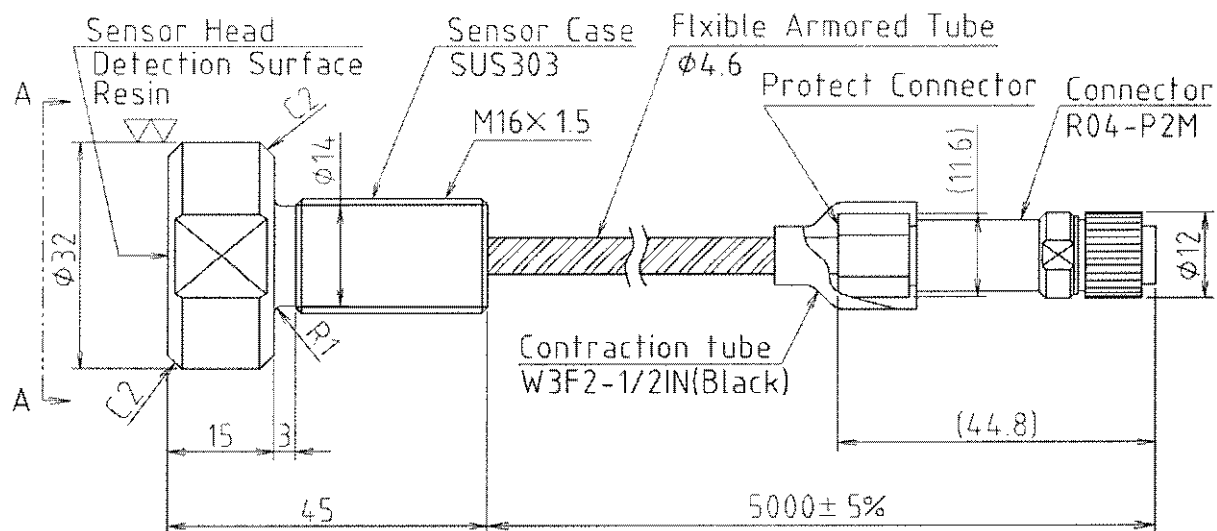
1. Probe
PU-05-496-502
2. Junction Box
CB-1AW-17
3. Indicator
73RS-DM

7 PAGES WITH COVER

MARINE TURBINE DESIGNING SECTION		TACHOMETER FOR MET TURBOCHARGER (DIGITAL INDICATOR, DC POWER SUPPLY)	
APPROVED <i>K. Shiraishi</i>			
CHECKED <i>Y. Ono</i>			
DRAWN <i>K. Sakamoto</i> <i>S. Makino</i>			
CONFERRED	SCALE		
	ORDER	DRAWING NO. N36—00K—0137	REV. 0
 MITSUBISHI HEAVY INDUSTRIES, LTD. NAGASAKI SHIPYARD & MACHINERY WORKS			

Drawn 26 August, 2010

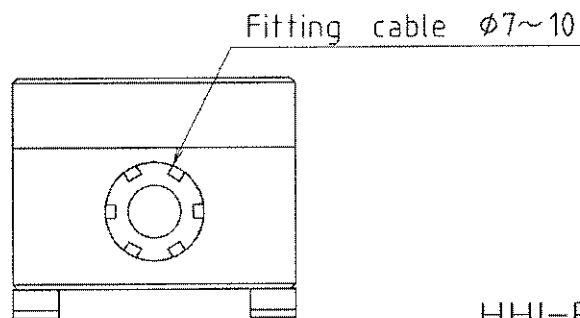
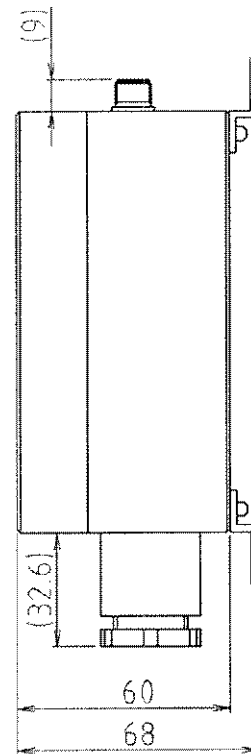
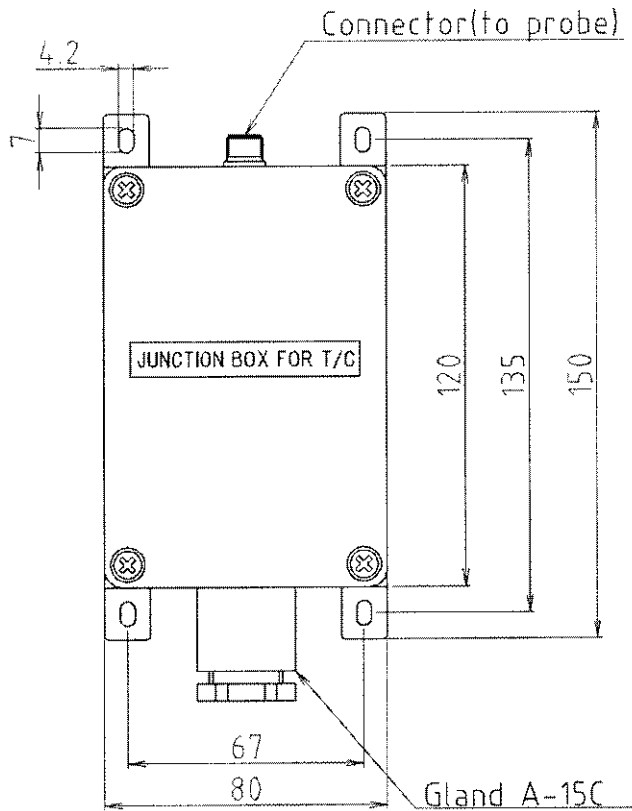
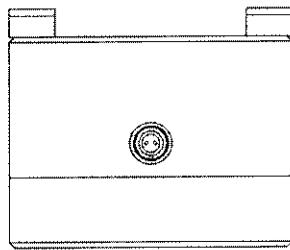
HHI-EMD no.A14-249057-8.0



HHI-EMD no.A14-249057-8.0

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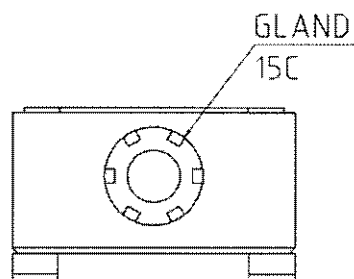
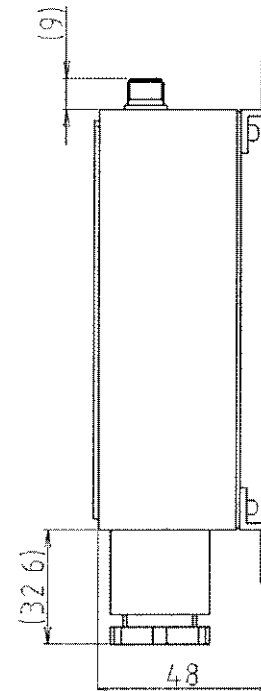
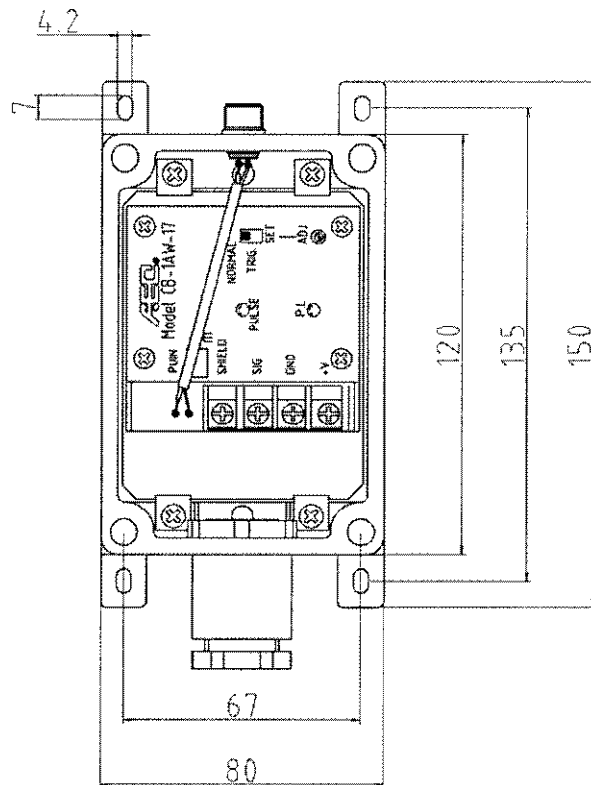
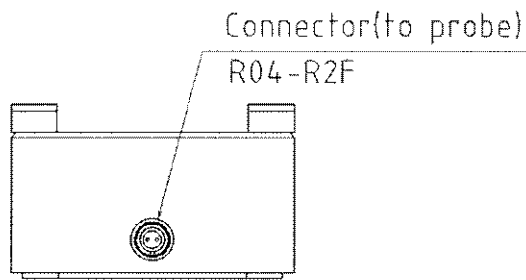
MATERIAL	DRAWN BY M.O	DATE 4/24 08	APPLIED ELECTRONICS CORP.	
TREATMENT OR FINISH	DESIGNER M.O	4/24 08	MODEL PU-05-496-502	
NOTES (H.I) 180°C MAX SHIELD TYPE auto	CHECKER S.H	4/24 08	SENSOR EXTERNAL VIEW	
	APPROVED BY S.H	4/24 08	SIZE A 4	DRAWING NO. 24430108501
			SCALE 1/1mm	REV. 02
			SHEET	OF



HHI-EMD no.A14-249057-8.0

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MATERIAL	DRAWN BY M.O	DATE 7/23 09	APPLIED ELECTRONICS CORP.		
TREATMENT OR FINISH	DESIGNER Y.H	7/23 09	Model CB-1AW-17		
NOTES (H.I) Built-in converter and terminals auto	CHECKER Y.H	7/23 09	JUNCTION BOX EXTERNAL VIEW		
	APPROVED BY K.S	7/23 09	SIZE A4	DRAWING NO. 24430309723	REV. 01
			SCALE 1/2mm	SHEET OF	

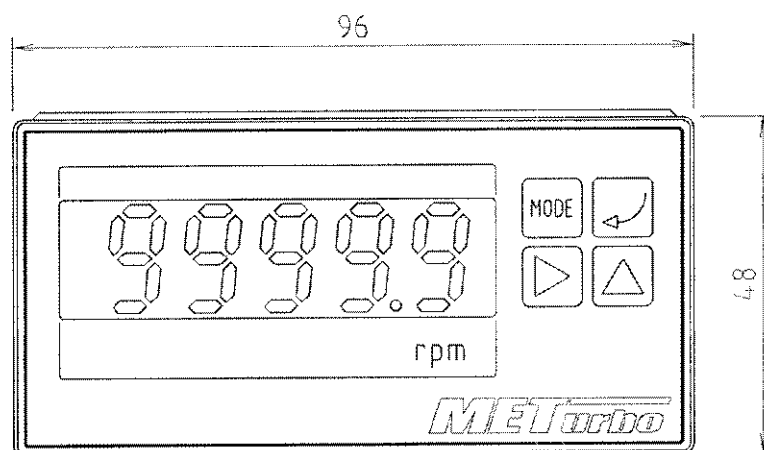


HHI-EMD no.A14-249057-8.0

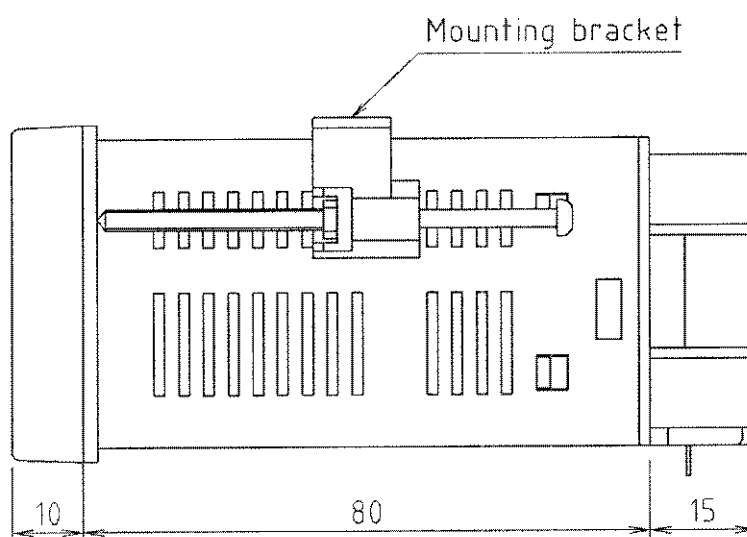
出図
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MATERIAL	DRAWN BY M.O	DATE 04 7/27	APPLIED ELECTRONICS CORP.	
TREATMENT OR FINISH	DESIGNER M.O	04 7/27	Model CB-1AW-17	
NOTES (H.I) Built-in converter and terminals auto	CHECKER Y.H	04 7/27	JUNCTION BOX INTERNAL VIEW	
	PROJECT ENGINEER		SIZE A 4	DRAWING NO. 00JDA048181
			SCALE 1 / 2 mm	REV. 03
			SHEET	OF

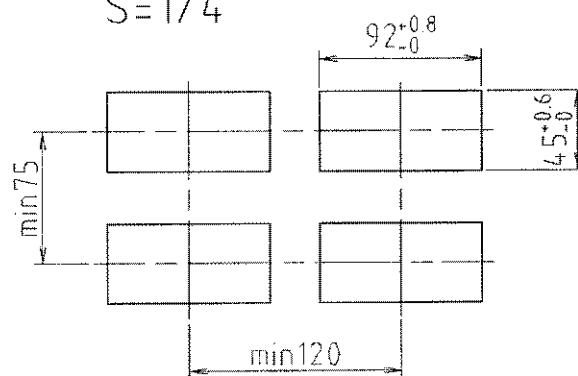
front elevation



side elevation



Panel cut
S=1/4

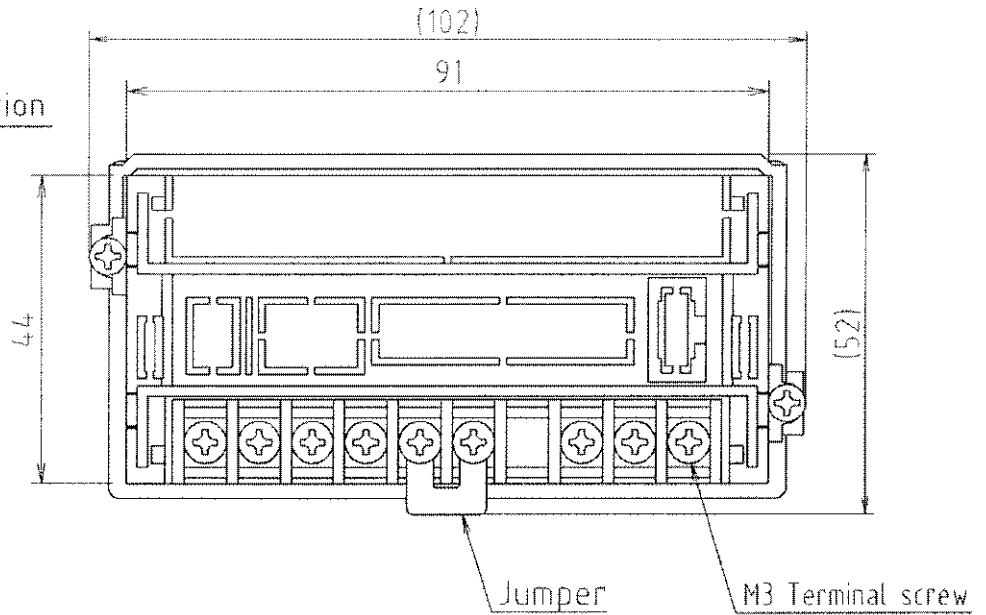


HHI-EMD no.A14-249057-8.0

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管
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外
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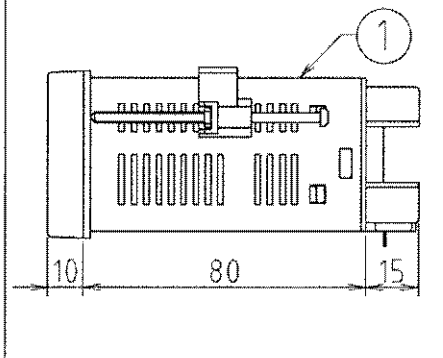
MATERIAL	DRAWN BY M.O	DATE 11/14 06	APPLIED ELECTRONICS CORP.		
TREATMENT OR FINISH	DESIGNER M.O	11/14 06	Model 73RS-DM DIGITAL TACHOMETER EXTERNAL VIEW		
NOTES (Y.W)	CHECKER Y.H	11/14 06			
auto	PROJECT ENGINEER		SIZE A 4	DRAWING NO. 24430907118	REV. 01
			SCALE 1/1mm	SHEET OF	

front elevation



side elevation

S=1/2



Caution: (DC4-20mA OUT)

In case that only ANALOG METER is used,
5 and 6 terminals should be short-circuit by jumper.
And in case that only DATA LOGGER is used,
4 and 5 terminals should be short-circuit by jumper.

REMARKS	NO.	NAME	Q'ty
1. OUTPUT SIGNAL 4~20mA DC ELECTRIC CIRCUIT MAX 500Ω	1	73RS-DM	1



1	2	3	4	5	6	7	8	9	10
SIG	GND (SHIELD)	+12V	+	-/+	-	X	NOT USE	P2	P1

A OUT1 A OUT2

JUNCTION BOX

DC 24V ---
73RS-DM

HHI-EMD no.A14-249057-8.0

出図
管技
製外
當

MATERIAL	DRAWN BY M.O	DATE 8/23	10	APPLIED ELECTRONICS CORP.	
TREATMENT OR FINISH	DESIGNER Y.H	8/23	10	Model 73RS-DM EXTERNAL VIEW	
NOTES (H.I)	CHECKER Y.H	8/23	10		
auto	APPROVED BY K.S	8/23	10	SIZE A 4	DRAWING NO. 24430410823
				SCALE 1/1mm	REV. 01
				SHEET	OF

CABLE WIRING

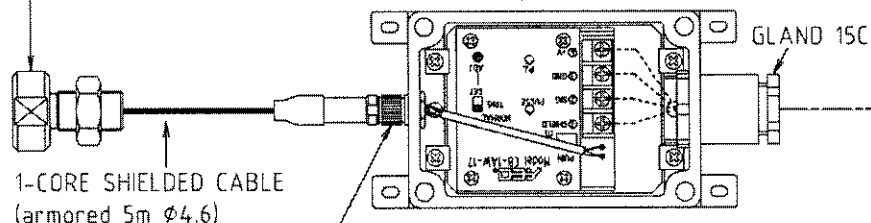
Engine side

Control room

(E) TACHOMETER
73RS-DM (DC type)

(E) SENSOR
PU-05-496-502

(E) JUNCTION BOX (built-in converter & terminals)
CB-1AW-17



1-CORE SHIELDED CABLE
(armored 5m Ø4.6)

CONNECTOR

CAUTION Tighten the connector strictly by the hand.

(Y) 3-CORES SHIELDED CABLE

CONVERTER	73RS-DM
+V	③
GND	②
SIGNAL	①
SHIELD	②

CAUTION Wrong cable connection may cause
CB-1AW-17 and 73RS-DM damaged.

CAUTION 3-cores shielded cable should be located far from
control units or power supply lines.

CAUTION

In case that only ANALOG METER is used, ⑤ and ⑥ should be
short-circuit by jumper.
And in case that only DATA LOGGER is used, ④ and ⑤ should be
short-circuit by jumper.

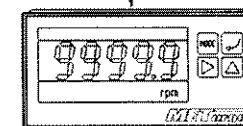
Remarks;

(E) Engine maker supply

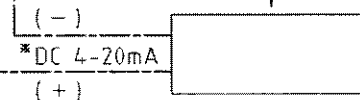
(Y) Ship yard supply

— Wired by engine maker

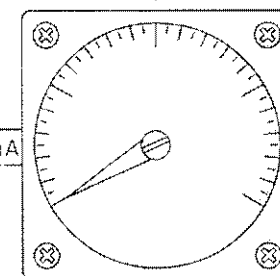
- - - - - Wired by Ship yard



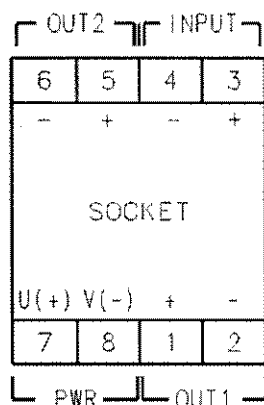
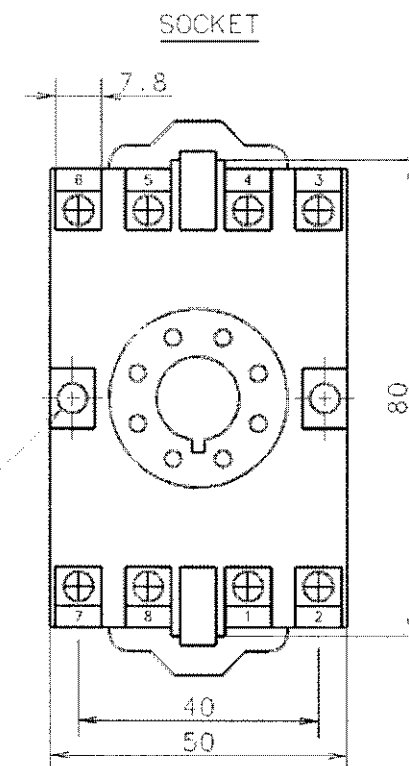
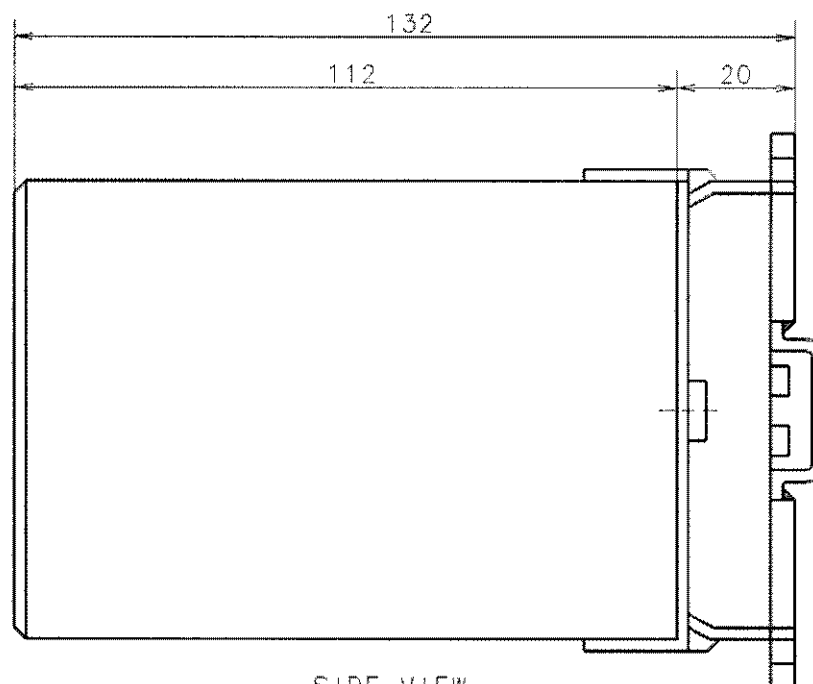
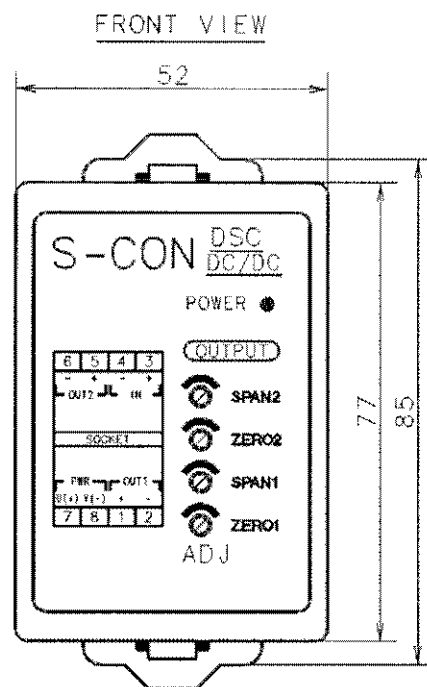
(Y) DATA LOGGER



(E) OPTION ANALOG METER



MATERIAL	DRAWN BY	DATE	10	APPLIED ELECTRONICS CORP.		
TREATMENT OR FINISH	DESIGNER	8/23	10	CABLE WIRING DIAGRAM		
NOTES	(H.I.)	CHECKER	10	SIZE	DRAWING NO	REV.
		Y.H.	8/23	A3	24430110823	02
auto	APPROVED BY	K.S.	8/23	SCALE	SHEET	OF



SPECIFICATIONS

1. INPUT SIGNAL : 4 ~ 20mA DC
(IMPEDANCE : 250Ω FIXED)
2. OUTPUT SIGNAL : 4 ~ 20mA DC x 2EA
(LOAD RESISTANCE : 0 ~ 500Ω)
3. POWER SUPPLY : DC 24V (3watt.)
4. I/O ISOLATION : ISOLATION
5. ACCURACY : ±0.1% F.S
6. MAKER : S-CON.
7. TYPE : DSC-9H88Y

Supplement Drawing no.:					Projection: 		Mass (kg):		Material / Blank:		
					Licensor's Ident. no.:		Dist.:		Licensor's Material / Blank:		
Date	Des.	Chk.	Appd.	A.C.	E	Change / Replacement					C.
				*	*	Replaced by Ident. No.:					9
				*	*						8
				*	*						7
				*	*						6
				*	*						5
030219	LSK	KS	KJG	*	*	UP TO DATE					4
020204	LSK	KS	KJG	*	*	UP TO DATE					3
000321	PKY	BJ	SSDC	*	*	INPUT SIGNAL CHANGE					2
990901	CYGB	BJ	SSDC	*	*	UP TO DATE					1
990901	CYGB	JC	MBHS	*	*						0
Similar Drawing No.:						Replacement of Ident. No.:					
Scale:	Size:	Type:				Page No.:					
1:2.1	A3	L.S.K/MC-C				01 (01)					
Info. No.:		Description:				Ident. No.:					
000000		1/I CONVERTER (8 PIN TYPE)				A13-190819-					

5	7
4	4
3	8
2	4
1	1
5	4
1	1
5	0

					S. PAGE	T. PAGE
PLAN HISTORY					ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2
					MESSRS.	H.H.I.
					RULE	LR + UMS
					SHIP NO.	2585/86/87/88/89
					ENG. NO.	AA4624/25/26/27/28
TITLE : SENSOR LIST FOR REMOTE CONTROL						
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	Replacement for Ident.no.:
20110718	BSH	BSH	JCM		FOR WORKING.	
20110217	BSH	BSH	JCM			
Licensor Ident.no.:				Type:		
Info.no.:				Description:		
Page.no.:				Security:		
(01) 03				C		
				6S90ME-C		
				SENSOR LIST FOR REMOTE CONTROL		
				A14-413497-1		



The values stated in this list refer to layout point LI (NMCR) and are for engine running on Uni-lubricating oil system without lubricating oil booster pump and with common turbocharger lubricating.

The values are for guidance only in connection with "List of Capacities of Auxiliary Machinery" for the dimensioning of auxiliary systems, and for determining the extent of alarms or actions.

The item numbers refer to the drawing showing the extent and placement of sensors for standard alarms and indications on the engine, if the signal equipment is fitted.

If the engine is provided with special equipment, some values may differ from this list. The correct values are in such a case to be obtained from the engine instruction book.

The engine slow down corresponds to 40% of nominal MCR(r/min).

Unless otherwise specified, the pressures are stated in bar gauge.

Please note that JCW replaces the text "Jacket cooling water". used.

Date	Des.	Chk.	Appd.	A.C.	Replaced by Ident.no.:	Replacement for Ident.no.:	R
20110718	BSH	BSH	JCM		FOR WORKING.		I
20110217	BSH	BSH	JCM				O
Licencee Ident.no.:		Type:			6S90ME-C		
Info.no.:		Description:			Ident.no.:		
Page.no.:		Security:			A14-413497-1		
(02) 03		C			SENSOR LIST FOR REMOTE CONTROL		

CONTENTS

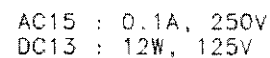
- 1 PRESSURE SWITCH
- 2 PRESSURE TRANSMITTER
- 3 TEMPERATURE SWITCH
- 4 TEMPERATURE SENSOR
- 5 FLOW/LEVEL SWITCH
- 6 LIMIT SWITCH
- 7 WATER IN OIL SENSOR

Date	Des.	Dtk.	Appd.	A.C.	Replaced by Ident.no.:	Replacement for Ident.no.:	R
20110718	BSH	BSH	JCM		FOR WORKING.		I
20110217	BSH	BSH	JCM				O
Licensor Ident.no.:		Type:			6S90ME-C		
Info.no.:		Description:			Ident.no.:		
Page.no.:		Security:		SENSOR LIST FOR REMOTE CONTROL			A14-413497-1
(03) 03		C					

Pressure Switch List

Symbol	Q'TY	Secondary letter	Description	Unit	Normal service value		Alarm		Delay sec.	Slow down		Delay sec.	Shut down		Delay sec.	TYPE	DWG. NO.
					Low	High	Low	High		Low	High		Low	High			
PS 8104	1/T.C	SHUT DOWN	Lub. Oil inlet to turbobcharger MAN/TCA MAN/NA MHI/MET ABB/TPL	bar	1.3 1.3 0.6 1.0	1.7 1.5 1.5 2.5	-	-	-	-	-	-	0.8 0.9 0.4 0.8	-	6 - 8	MBC5100- 1211-3DB04(04)	A13-172232-8
PS 8109	1	SHUT DOWN	Lub. oil inlet to main engine Measured on pressure gauge placed 1800mm above crankshaft centre line	bar	2.4	2.7	-	-	-	-	-	-	1.6	-	6 - 8	MBC5100- 1211-3DB04(04)	A13-172232-8

[illegible]



MAKER : DANFOSS

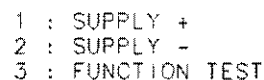
growing - do not correct by hand

Standard for surface roughness The basic symbols and class numbers are in accordance with ISO 1302-1975.													Tolerances for dimensions without tolerance indication (ISO 2768-1989) This standard states the permissible deviations for dimensions without direct tolerance indications on metallic components manufactured by machining.						
Class No.	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	Permissible deviations	0.8 up to 8	over 8 up to 30	over 30 up to 120	over 120 up to 315	over 315 up to 1000	over 1000 up to 2000
R _{max} -value, μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50	Medium series	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2

Pressure Transmitter List

Symbol	Q'TY	Secondary letter	Description	Unit	Normal service value		Alarm		Delay sec.	Slow down		Delay sec.	Shut down		Delay sec.	TYPE	DWG. NO.
					Low	High	Low	High		Low	High		Low	High			
PT 8001	1	ALARM	Fuel oil press. inlet engine after filter Fuel oil viscosity max. 700cSt/50C Measured at camshaft level	bar	7.0	8.0	6.5	-	6 - 8	-	-	-	-	-	-	MBS5150-2211-XDB04(16)	A13-172231-6
PT 8103	1/T.C	ALARM	Lub. Oil inlet to turbocharger MAN/TCA MAN/NA MHI/MET ABB/TPL	bar	1.3 1.3 0.6 1.0	1.7 1.5 1.5 2.5	1.0 1.1 0.6 0.9	-	6 - 8 6 - 8 6 - 8 -	-	-	-	-	-	-	MBS5150-1811-XDB04(6)	A13-172231-6
PT 8108	1	ALARM SLOW DOWN	Lub. Oil inlet to main engine. Measured on pressure gauge placed 1800mm above crankshaft centre line	bar	2.4	2.7	2.0	-	6 - 8	1.8	-	6 - 8	-	-	-	MBS5150-1811-XDB04(6)	A13-172231-6
PT 8401	1	ALARM SLOW DOWN	Jacket cooling water inlet c) With stopped cooling water pump, the set point for the sensor is the static pressure plus the stated value.	bar	3.5	4.5	2.0c)	-	6 - 8	1.5c)	-	6 - 8	-	-	-	MBS5150-1811-XDB04(6)	A13-172231-6
PT 8421	1	ALARM	Cooling water inlet to air cooler(s) Convention sea water cooling system Central cooling water system a) To be stated at sea trial	bar	2.0 2.0	2.5a) 4.5a)	1.0 1.0	3.5 5.5	6 - 8	-	-	-	-	-	-	MBS5150-1811-XDB04(6)	A13-172231-6
PT 8501	1	ALARM INDICATOR	Starting air inlet	bar	-	30	15	-	6 - 8	-	-	-	-	-	-	MBS5150-2611-XDB04(40)	A13-172231-6
PT 8503	1	ALARM INDICATOR	Cooling air inlet n) Finished with engine.	bar	6.5	7.5	5.5	0.5f)	6 - 8	-	-	-	-	-	-	MBS5150-2011-XDB04(10)	A13-172231-6
PT 8505	1	ALARM	Air inlet to air cyl. for exhaust valve	bar	6.5	7.5	5.5	-	6 - 8	-	-	-	-	-	-	MBS5150-2011-XDB04(10)	A13-172231-6
PT 8601	1	INDICATOR	Scav. air press. in receiver(bar abs) The set point of scavenge air press. depends on the engine load and be set during sea trial	bar	-	3.5	-	-	-	-	-	-	-	-	-	MBS5150-1611-XDB04(4)	A13-172231-6

1. NAME (Last, first, middle) [Redacted]		2. DATE OF BIRTH [Redacted]		3. SEX [Redacted]		4. RACE [Redacted]	
5. ADDRESS [Redacted]		6. CITY [Redacted]		7. STATE [Redacted]		8. ZIP [Redacted]	
9. OCCUPATION [Redacted]		10. EDUCATION [Redacted]		11. MARITAL STATUS [Redacted]		12. NUMBER OF CHILDREN [Redacted]	
13. SOCIAL SECURITY NUMBER [Redacted]		14. CURRENT EMPLOYER [Redacted]		15. DATE OF ENTRY INTO COUNTRY [Redacted]		16. DATE OF LAST VISIT [Redacted]	
17. REASON FOR ENTRY [Redacted]		18. CURRENT RESIDENCE [Redacted]		19. DATE OF BIRTH OF CHILDREN [Redacted]		20. DATE OF LAST VISIT [Redacted]	
21. REASON FOR ENTRY [Redacted]		22. CURRENT RESIDENCE [Redacted]		23. DATE OF BIRTH OF CHILDREN [Redacted]		24. DATE OF LAST VISIT [Redacted]	
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89. REASON FOR ENTRY [Redacted]		90. CURRENT RESIDENCE [Redacted]		91. DATE OF BIRTH OF CHILDREN [Redacted]		92. DATE OF LAST VISIT [Redacted]	
93. REASON FOR ENTRY [Redacted]		94. CURRENT RESIDENCE [Redacted]		95. DATE OF BIRTH OF CHILDREN [Redacted]		96. DATE OF LAST VISIT [Redacted]	
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125. REASON FOR ENTRY [Redacted]		126. CURRENT RESIDENCE [Redacted]		127. DATE OF BIRTH OF CHILDREN [Redacted]		128. DATE OF LAST VISIT [Redacted]	
129. REASON FOR ENTRY [Redacted]							



WITH FLANGE CONNECTION

PRESSURE RANGE (Kg/Cm ²)	TYPE NO.	CODE	DESCRIPTION	INFORM NO.	PART NUMBER
0 TO 4	MBS5150-1611-XDB04	060N1264	VERSION WITH PULSE-SNUBBER	135963	A19-153102-5.3
0 TO 6	MBS5150-1811-XDB04	060N1265	VERSION WITH PULSE-SNUBBER	135963	A19-153103-7.3
0 TO 10	MBS5150-2011-XDB04	060N1072	VERSION WITH PULSE-SNUBBER	135963	A19-153104-9.3
0 TO 16	MBS5150-2211-XDB04	060N1271	VERSION WITH PULSE-SNUBBER	135963	A19-153105-0.3
0 TO 25	MBS5150-2411-XDB04	060N1092	VERSION WITH PULSE-SNUBBER	135963	A19-153106-2.3
0 TO 40	MBS5150-2611-XDB04	060N1266	VERSION WITH PULSE-SNUBBER	135963	A19-153107-4.3

Page No : 01 (01) 

Supplement Drawing no.:				Projection:		Mass (kg):		Material / Blank:	
									
				Licensor's Ident. no.:		Dist.:		Licensor's Material / Blank:	
Date		Des.	Chk.	Appd.	A.C.	Change / Replacement			
				*	*	Replaced by Ident. No.:			
				*	*				
				*	*				
				*	*				
				*	*				
070829	HAY	HHJ	KJG	*	*	CODE NO. ADDED.			
070418	HHJ	HHJ	KJG	*	*	GLAND SIZE (TYPE NO.) CHANGED.			
990518	BYJ	JCMBHS		*	*	TYPE NO. CHANGED.			
990222	BYJ	JCMBHS		*	*	CODE NO. CHANGED.			
990119	BYJ	JCMBHS		*	*				
Similar Drawing No.:						Replacement of Ident. No.:			
Scale:	Size:	Type:		DIESEL ENGINE		Page No.:			
1:1	A3					01 (01)			
Info. No.:		Description:				Ident. No.:			
696131		PRESSURE TRANSMITTER				A13-172231-			

HSEF-k210-Q12(R1)

總編輯 陳其南

A 3 (420mm x 297mm) 雙邊印刷

3. Temperature Switch List

Symbol	Q'TY	Secondary letter	Description	Unit	Normal service value		Alarm		Delay sec.	Slow down		Delay sec.	Shut down		Delay sec.	TYPE	DWG. NO.
					Low	High	Low	High		Low	High		Low	High			
TS 8107	1	SHUT DOWN	Thrust bearing segment	*)	°C	55	70	-	-	-	-	-	-	90	6 - 8	RT101 (17-5022)	A13-139091-

*] Please note that the 'Normal service value' is to be stated at sea trial, but, in between the range stated. With regard to the 'Alarm', 'Slow down' and 'Shut down' levels they should be 50, 100° above the sea trial finding respectively, however, max. the value stated.

[illegible]

Temperature Sensor List

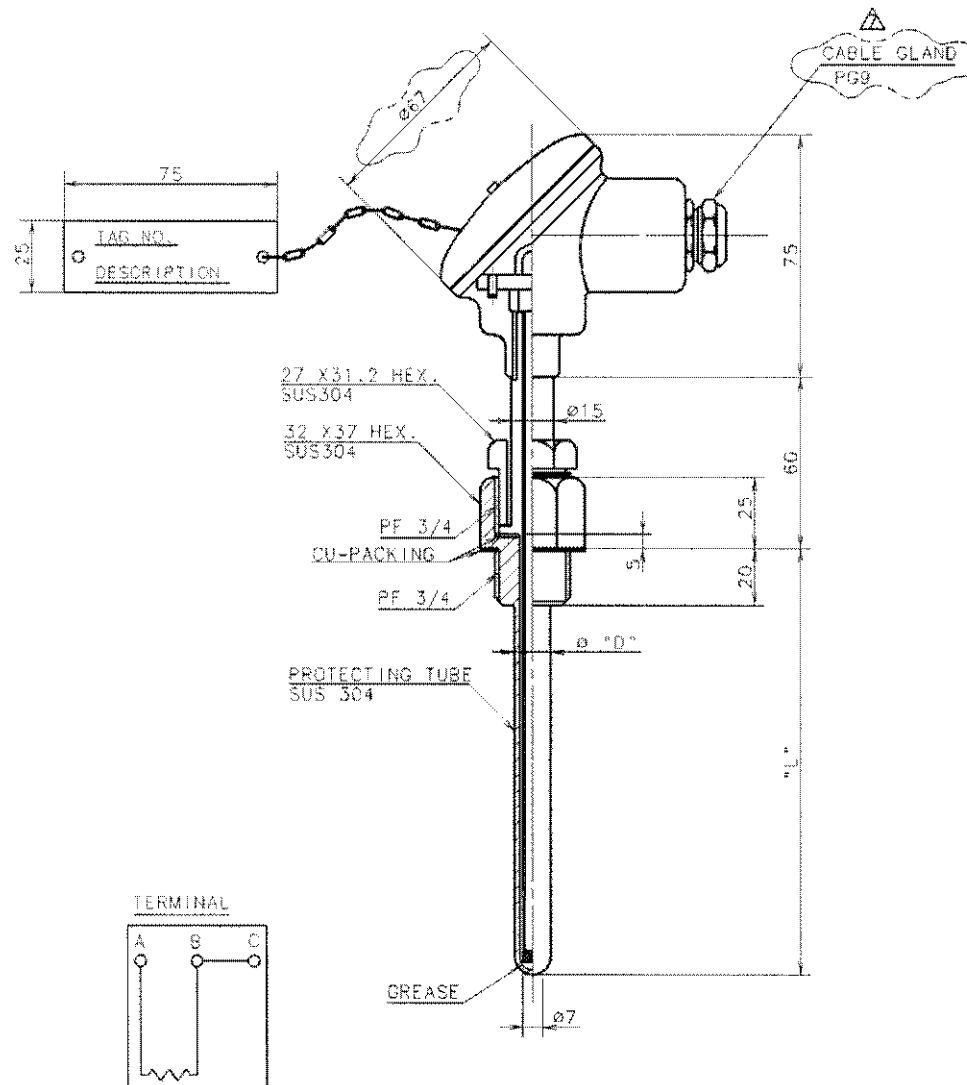
Symbol	QTY	Secondary letter	Description	Unit	Temperature		Alarm		Delays sec.	Slow down		Delay sec.	Summary		Max. temp	Type	DWG. NO.
					Low	High	Low	High		Low	High		Lrm	"D"			
TE 8005	1	ALARM	Fuel oil inlet engine t1, t2 = temperature according to chapter 705 of the instruction book, Volume I "operation"	°C	t1	t2	-	-	-	-	-	-	100	12.7	200	PTR-LN7	A12-136274-7
TE 8106	1	ALARM SLOW DOWN	Thrust bearing segment	°C	55	70	-	75	6 - 8	-	80	6 - 8	130	10	200	PTR-M	A12-136276-0
TE 8112	1	ALARM SLOW DOWN	Lub. oil inlet to main engine	°C	40	47	35	55	6 - 8	-	60	6 - 8	120	12.7	200	PTR-LN7	A12-136274-7
TE 8116	1	ALARM INDICATION	Lub. oil inlet to turbocharger	°C	40	47	35	55	6 - 8	-	-	-	200	13.3	200	PTR-LN7	A12-136274-7
TE 8113	1/CYL	ALARM SLOW DOWN	Piston cooling oil outlet/cyl.	°C	50	65	-	70	6 - 8	-	75	6 - 8	82	7.4	100	ELS-3000	A12-320737-2
TE 8117	1/T.C	ALARM SLOW DOWN	Lub. oil outlet to turbocharger MAN/TCA MAN/NA MHI/MET ABB/TPL	°C	70 70 70 70	90 90 80 90	-	95 95 85 110	6 - 8	-	- - - 120	- - - 6 - 8	80	12.7	200	PTR-LN7	A12-136274-7
TE 8202	1	ALARM	Cylinder lubricating oil temperature	°C	40	60	-	70	6 - 8	-	-	-	60	12.7	200	PTR-LN7	A12-136274-7
TE 8408	1/CYL	ALARM SLOW DOWN	Jacket cooling fresh water outlet/cyl.	°C	80	85	-	90	6 - 8	-	95	6 - 8	80	12.7	200	PTR-LN7	A12-136274-7
TE 8423	1/A.C	ALARM	Cooling water outlet from air cooler(s) Conventional sea water cooling system Central cooling system	°C	>10 >10	50 63	-	-	-	-	-	-	120	12.7	200	PTR-LN7	A12-136274-7
TE 8610	1/CYL	ALARM SLOW DOWN	Scavenge air box-fire alarm/cyl.	°C	-	-	-	80	6 - 8	-	120	6-8	200	13.8	200	PTR-LN7	A12-136274-7
TC 8701	1/T.C	ALARM	Exhaust gas temp before turbocharger Normal exhaust gas temperature depend on the actual engine load and ambient condition.	°C	380	460	-	T/C DEPENDENT	6 - 8	-	T/C DEPENDENT	6 - 8	250	-	600	A79M	A11-335150-4
TC 8702	1/CYL	ALARM SLOW DOWN	Exhaust gas Temp., after valves/cyl Average deviation from average Normal exhaust gas temperatures depend on the actual engine load and ambient condition When operation below 200°C average temp. deviation alarm is cut off.	°C	320	390	-50	430 +50	6 - 8	-60	450 +60	6 - 8	250	-	600	A79M	A11-335150-4
TC 8707	1/T.C	ALARM	Exh. gas temp after each turbocharger k) The service values apply under following conditions: Ambient temp. in engine room 25°C Scavenge air temp. in receiver 35°C	°C	220	300k)	-	350	6 - 8	-	-	-	250	-	600	A79M	A11-335150-4

1. Full name (family name, first name, last name) LUCAS E. SANCHEZ		2. Nationality COLOMBIAN		3. Age (date of birth) 25		4. Name of ship COLOMBIA MARITIME	
5. Date 15/05/2018		6. Time 10:00		7. Port of origin COLOMBIA		8. Port of destination COLOMBIA	
9. Name of ship COLOMBIA MARITIME		10. Name of captain JUAN CARLOS SANCHEZ		11. Name of crew member JUAN CARLOS SANCHEZ		12. Name of passenger JUAN CARLOS SANCHEZ	
13. Name of ship COLOMBIA MARITIME		14. Name of captain JUAN CARLOS SANCHEZ		15. Name of crew member JUAN CARLOS SANCHEZ		16. Name of passenger JUAN CARLOS SANCHEZ	
17. Name of ship COLOMBIA MARITIME		18. Name of captain JUAN CARLOS SANCHEZ		19. Name of crew member JUAN CARLOS SANCHEZ		20. Name of passenger JUAN CARLOS SANCHEZ	
21. Name of ship COLOMBIA MARITIME		22. Name of captain JUAN CARLOS SANCHEZ		23. Name of crew member JUAN CARLOS SANCHEZ		24. Name of passenger JUAN CARLOS SANCHEZ	
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117. Name of ship COLOMBIA MARITIME		118. Name of captain JUAN CARLOS SANCHEZ		119. Name of crew member JUAN CARLOS SANCHEZ		120. Name of passenger JUAN CARLOS SANCHEZ	
121. Name of ship COLOMBIA MARITIME							

- 1) PT 100 Ω at 0 $^{\circ}\text{C}$
- 2) CLASS "B" DIN
- 3) RANGE : 0-200 $^{\circ}\text{C}$
- 4) THIS TYPE IS ABLE TO BE REPLACED THE INTERNAL ELEMENT ONLY AT FITTING STATE.

CABLE GLAND	"L"	"G"	PART NUMBER
PC9	60	12.7	A19-118742-1.2
	80	12.7	A19-003670-7.2
	100	12.7	A19-003671-9.2
	120	12.7	A19-003672-0.2
	150	12.7	A19-003673-2.2
	200	13.3	A19-003674-4.2
	250	13.3	A19-003675-6.2
NEW CABLE	300	13.3	A19-003676-8.2
15C	60	12.7	A19-118743-3.2
	80	12.7	A19-003677-0.2
	100	12.7	A19-003678-1.3
	120	12.7	A19-003679-3.3
	150	12.7	A19-003680-2.3
	200	13.3	A19-003681-4.3
	250	13.3	A19-003682-6.2
JIS CABLE	300	13.3	A19-003683-8.2

Supplement Drawing No.:				Project No.:		Make No.:		Material or Blank:	
				License No. (1041) No.:		Date:		License No. Material / Blank:	
Change / Replacement:									
Date	Dev	Qty	Appr	Rev	Exploded by: Isdat, No.:				
100629	PKY	1	PKY	1	DRAWING CORRECTED				
000374	CYG	1	JSJ	1	Log plots is added, part no revised accordingly				
980714	PKY	1	JSJ	1	Part 003678 -- 003681				
980729	PKY	1	JSJ	1	Name plate is deleted				
980698	PKY	1	JSJ	1	-- 60 ADDED				
980410	PKY	1	JSJ	1	INFOC 596534 -- 796534				
981103	SHJ	1	JSJ	1	INFOC 60 ADDED				
981101	SHJ	1	JSJ	1					
Similar Drawing No.:				Replacement of Ident. No.:					
Size:				Type:		Page No.:			
1:1				A2		01 (01)			
Ident. No.:				Description:		Ident. No.:			
796534				TEMPERATURE SENSOR		A12-136274-7			



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The basic symbols and other numbers are in accordance with ISO 1501-1972.											
Glass No.	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11
Refraction	0.025	0.05	0.1	0.2	0.4	0.6	1.0	3.2	6.4	12.5	25

[illegible]

1:1	A
Int. No.	796534

2	Overnight
---	-----------

TEMP

PERATUR

E SENSEC

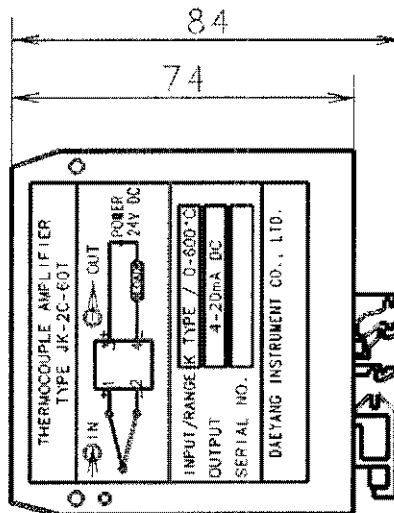
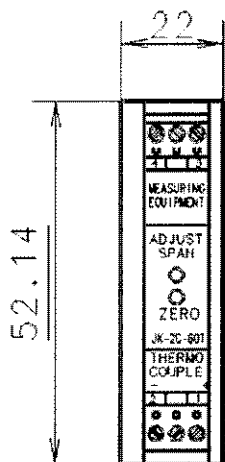
01 01

Ident. No. 6
A12-

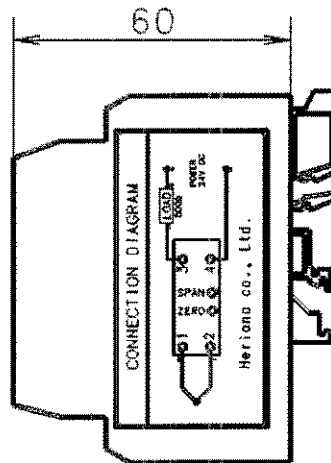
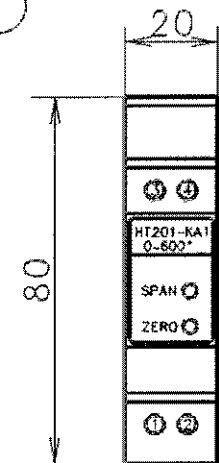
136274

이 국민들 한데서도 자살이므로 공사의 손익이 이도만큼 제3자에게 양도, 처분, 판매 행거니, 이도만큼의 부품을 제작하여 제3자에게 판매하는 것을 금합니다.

"A" TYPE



"B" TYPE



SPECIFICATION

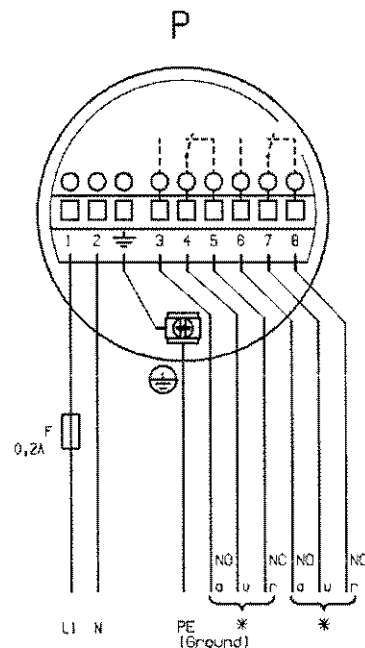
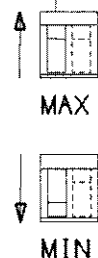
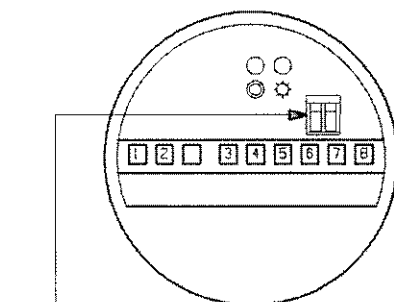
- | | |
|----------------------------------|---------------------------------------|
| 1. INPUT : THERMOCOUPLE (TYPE K) | 5. MAX. LOAD IMPEDANCE : 250Ω OR 500Ω |
| 2. OUTPUT : 4-20mA | 6. ACCURACY : ±1.0% |
| 3. MEASURING RANGE : 0-600°C | 7. SOURCE : DC24V(+20%, -20%) |
| 4. CONSUMPTION : 26mA | 8. AMBIENT TEMP. : 0-70°C |

Standard for surface roughness (ISO 1302-1978)												
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
R_a max. (µm)	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50
Tolerances for dimensions without tolerance indication (ISO 2768-1989)												
Permissible deviation	0.5 up to 6			over 6 up to 30			over 30 up to 120			over 120 up to 1000		
	±0.1			±0.2			±0.3			±0.5		
Medium series	±0.1			±0.2			±0.3			±0.5		
Supplement Dwg no.:												
Projection:  Mass (kg): Material / Blank:												
Licensor's Ident. no.: Dist.: Licensor's Material / Blank:												
Date	Des.	Chk.	Appd.	A.C.	E	Change / Replacement						C.No.
				*	*	Replaced by Ident. No.:						9
				*	*							8
				*	*							7
				*	*							6
				*	*							5
				*	*							4
				*	*							3
100629	PKY	PKY	JCM	*	*	DRAWING CORRECTED AND "B" TYPE ADDED.						2
020830	LSK	KSY	EHJ	*	*	DRAWING CORRECTED						1
980626	PKY	BJS	SBHS	*	*							0
Similar Drawing No.:						Replacement of Ident. No.:						
Scale:		Size:		Type:			Page No.:					
1:1.5		A4					01 (01)					
Info. No.:			Description:						Ident. No.:			
598020			THERMOCOUPLE AMPLIFIER						A14-164217-0			

Flow/level Switch List

Symbol	Q'TY	Secondary letter	Description	Unit	Normal service value		Alarm		Delay sec.	Slow down		Delay sec.	Shut down		DWG. NO.
					Low	High	Low	High		Low	High		Low	High	
LS 8006	1	ALARM	Leakage from high pressure pipes	-	-	-	-	High	6 - 8	-	-	-	-	-	A13-306016-4
FS 8114	1/CYL	ALARM SLOW DOWN	Piston cooling outlet/cyl.	-	-	-	NO FLOW		-	NO FLOW		-	-	-	A12-320737-2
LS 8611	2	ALARM	Water mist catcher-water level	-	-	-	-	High	6 - 8	-	-	-	-	-	A13-165840-5
LS 4112	1	ALARM	Leakage from hydraulic cyl. unit	-	-	-	-	High	6 - 8	-	-	-	-	-	A13-306016-4

Checked for accuracy Class No. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100		Checked for accuracy Class No. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100	
Date: 11/11/11 By: A1		Date: 11/11/11 By: A1	
Level Switch List		Level Switch List	



$U \approx 21 \dots 253V(AC)$

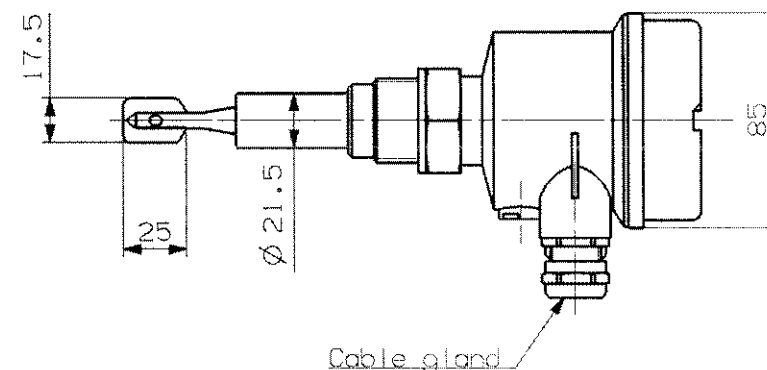
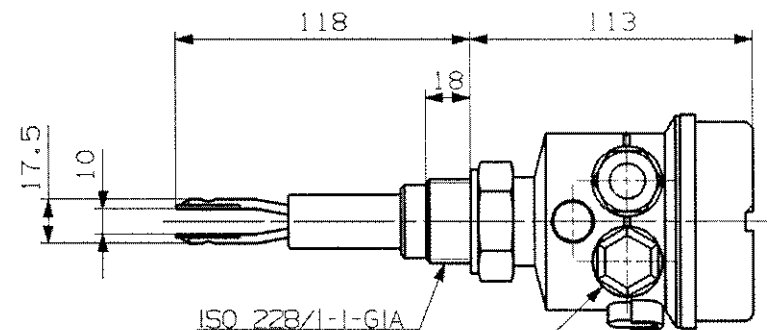
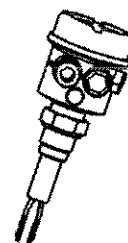
$U = 19 \dots 55V(DC)$

* $\begin{cases} U \sim \text{max. } 253V \\ I \sim \text{max. } 6A \\ P \sim \text{max. } 1500VA, \cos = 1 \\ P \sim \text{max. } 750VA, \cos > 0.7 \\ I_{\text{max}} \sim \text{max. } 6A, U < 30V \\ I_{\text{max}} \sim \text{max. } 0,2A, U < 125V \end{cases}$

126 Make or similar: 1359

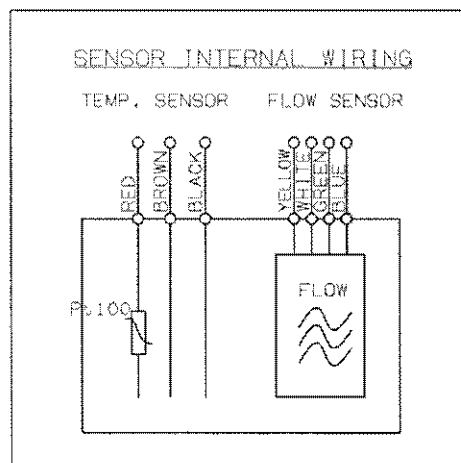
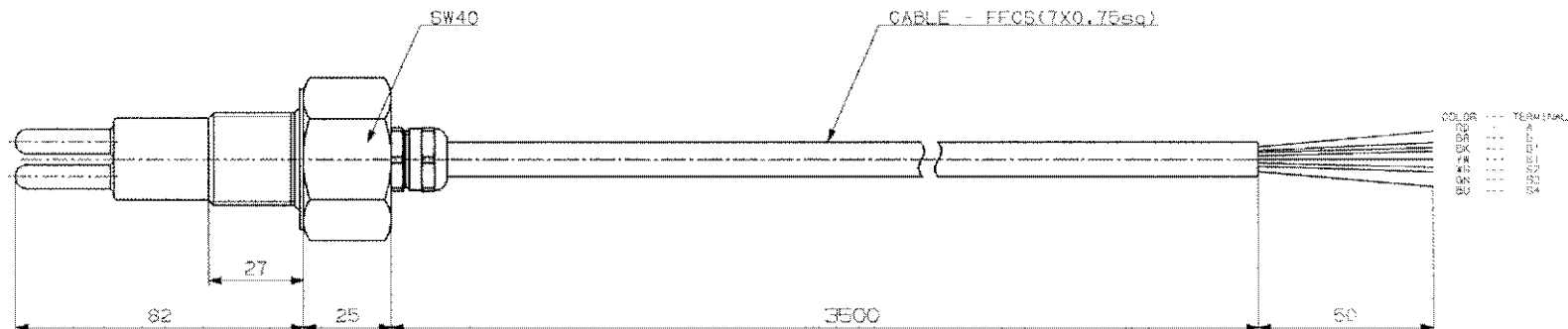
455 Type: FTL51-AGW2DB4G4S

Switch to be pre-adjusted to
"Safety mode" Max.
(i.e. NC for no fluid)



Supplement Drawing no.:					Projection	Scale	Material / Blank
					1747177-0.2	0.800	
					1747177-0.2	A92	
Date	Des.	CHK.	Appd.	A.C.	E	Change / Replacement	C.No
20110625	BSH	BSH	JCM			Dwg. is updated.	2
20091028	HHJ	JCM	SJR			CHANGED TO UG	1
20070828	HHJ	HHJ	KJG	*	*		0
Similar Dwg No.:					Replacement of:		Replaced by:
Scale:					Size:	Type:	Page No.:
1:2					A3		01/01
Info. No.:					Description:		Ident. No.:
698000					LEVEL SWITCH		A13-306016-4

Standard for surface roughness											
The basic symbols and class numbers are in accordance with ISO 1302-1970.											
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N12
R max. value μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25
This drawing is the property of HHI-BMG and is to be treated as confidential by the party to whom it has been submitted by HHI-BMG, and is not to be disclosed to third party without the specific prior written permission of HHI-BMG.											

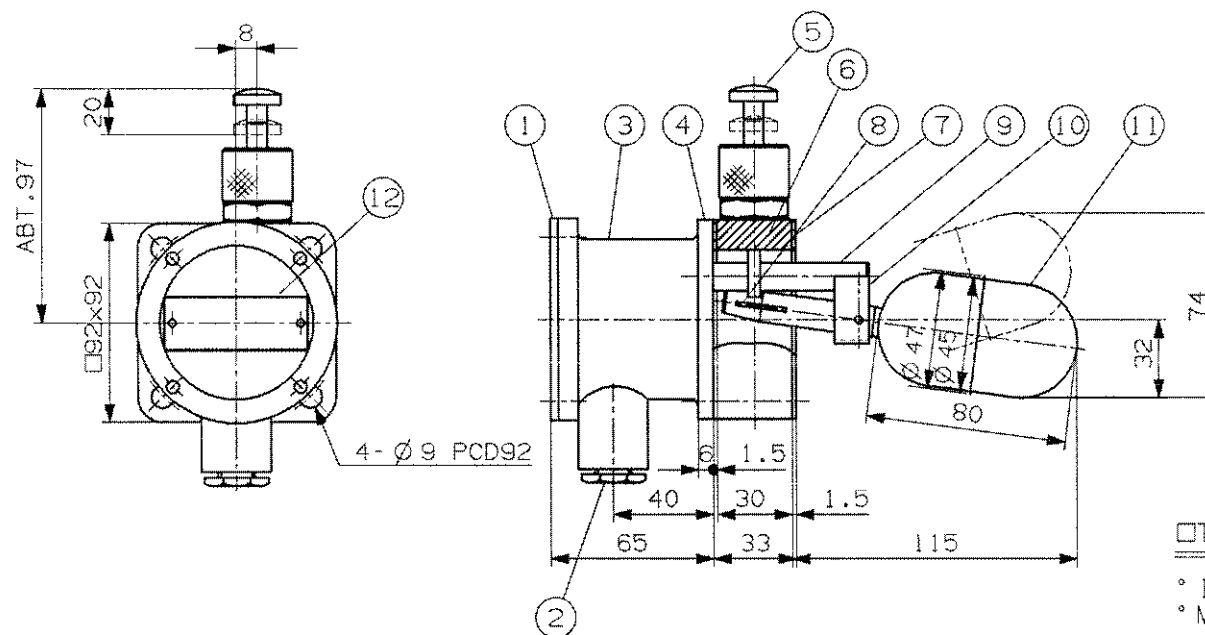


SPECIFICATIONS

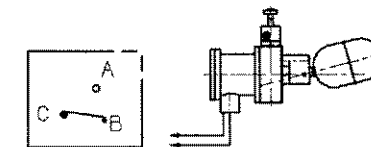
- ELEC. COMBINED FLOW & TEMPERATURE SENSOR
- FLOW SENSOR
RANGE : OIL = 0...300cm/s, WATER = 0...150cm/s
OPERATING TEMP. : -20...+100°C
- TEMPERATURE SENSOR
TYPE : B
ELEMENT : Pt100 / 100ohm at 0°C, 3WIRE TYPE
RANGE : -20...+100°C
CLASS : B

Equipment Drawing No.1						Projector		Mass (g)		Manufacturer's Name	
						Customer's Stock No.13		Rev. A32		Customer's Model No. 7-0000	
Date		Rev.		Chg.		Assn.		Acc.		LT	
										Change / Replacement	
20100501 KYY KYY JOM CABLE LENGTH CHANGED 7											
20100831 KYY KYY JOM CABLE TYPE CHANGED 7											
20100418 HHJ HHJ JOM WORKING TEMP. RANGE MODIFIED 4											
20100405 HHJ HHJ JOM UP TO DATE 4											
20090519 KYY KYY JOM Transferred to US 2											
20081008 HHJ HHJ JOM * UP TO DATE 2											
20080128 HHJ HHJ JOM * CABLE TYPE CHANGED 2											
20080107 HHJ HHJ KJG * 0											
Drawing No.1						Replacement (g)					
Total		Total		Page		Page No.1					
1/1		A2		ALL		01 1011					
Drawing No.1		Description		Date		Rev.					
000000		ELEC. COMBINED FLOW & TEMPERATURE SENS		A 2-320737-2							

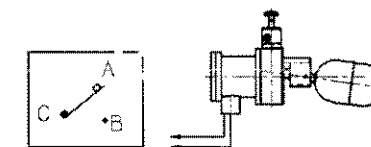
Standard for Sacchment Drawing											
The basic symbols and other notations are in accordance with ISO (2800-1987).											
This drawing is the property of Hyundai Motor Co., Ltd. and is not to be disclosed to third parties without the permission of Hyundai Motor Co., Ltd.											
Drawn by	32	33	34	35	36	37	38	39	40	41	42
Checked by	32	33	34	35	36	37	38	39	40	41	42
Approved by	32	33	34	35	36	37	38	39	40	41	42



WIRING DIAGRAM



C-B MAKES ON RISING LEVEL



C-A MAKES ON FALLING LEVEL

TECHNICAL DATA

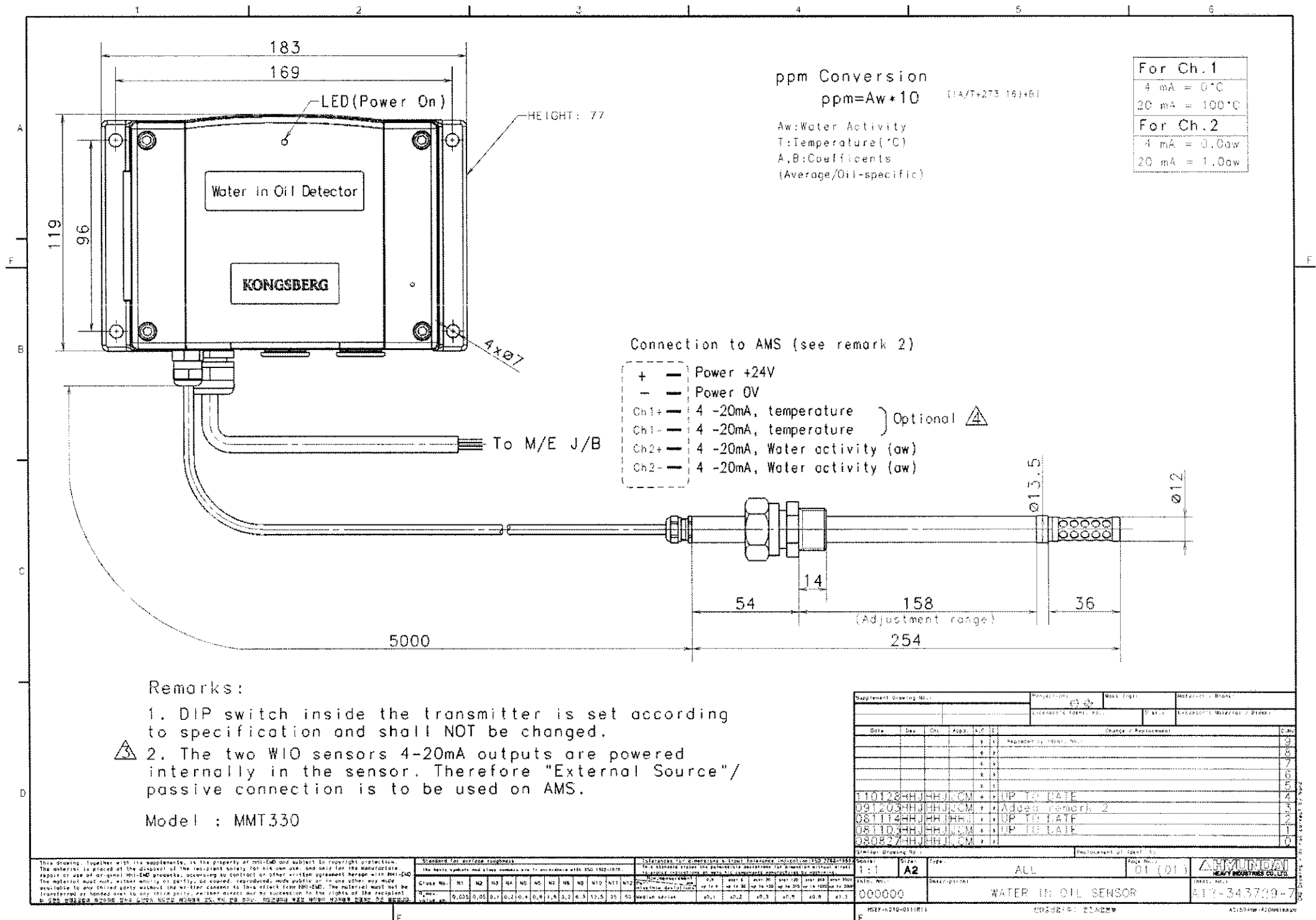
- ° INSTALLATION : SIDE MOUNTING
- ° MAX. PRESS. & TEMP: 2.5 BAR AT 135° C
3.0 BAR AT 100° C
- ° PERMISSIBLE AMB.TEMP. : -10 ~ 60° C
- ° PERMISSIBLE SPECIFIC GRAVITY : 0.80~1.3
- ° SWITCH TYPE : REED SWITCH
- ° CONTACT FORM & RATING: SPDT, 0.25A 250VAC
- ° ENCLOSURE : WATER PROOF, IP56
- ° PAINTING OF BODY: MUNSELL NO. 7.5 BG 7/2

91-1

NO.	DESCRIPTION	MATERIAL	SIZE	Q'TY	DRAWING No.
12	NAME PLATE	BSP3-H		1	A14-427523-8
11	FLOAT	SUS 304		1	
10	STOPPER	SUS 304		1	
9	REED SWITCH CHMBER	SUS 304			
8	MAGNET HOLDER	SUS 304		1	
7	GASKET	NON-ASBESTOS		1	
6	DEVICE BODY	SS41		1	
5	LEVER	BS		1	
4	FLNAGE	C.S	□92×92	1	
3	BODY	C.S		1	
2	CABLE GLAND	BS	PG9	1	
1	COVER	C.S		1	

Supplement Drawing no.1				Projection		Mass (kg)		Material / Blank	
A13-440990-9				Licensor's Ident. no.1		P82		Licensor's Material / Blank	
Date	Des.	Chk.	Appd.	A.C.	E	Change / Replacement			
20111020	KYY	KYY	JCM			POS.12 NAME PLATE ADDED.			
20110810	BSH	BSH	JCM			DESCRIPTION IS CHANGED.			
20110104	KMS	YSB	SJR			TRANSFER UG			
20081201	LMR	PST	YSB	*	*	POS.12,13 DEL.			
20080226	HAK	KMS	YSB	*	*	POS.13 DWG. NO. ADD.			
20070626	LMR	PST	SDC	*	*	POS.12 DWG. NO. ADD.			
20020913	BYJ	BYJ	EHJ	*	*	DRAWING ARE MODIFIED.			
20020318	CYG	CYG	KJG	*	*	CABLE GLAND 15C---->M59 CHANGE			
19990212	PKY	BJS	BHS	*	*	Text corrected.			
Stellar Dwg No.1				Replacement of:		Replaced by:			
Scale:	1:1	Size:	A3	Type:		Page No.:	01101	Security:	B
Info. No.:				Description:				Ident. No.:	
691405				WATER LEVEL SWITCH				A13-165840-5	

Standard for surface roughness											
The basic symbols and class numbers are in accordance with ISO 1302-1976.											
This standard states the permissible deviations for dimension without direct tolerance indications on metallic components manufactured by machining.											
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11
R max. value μ	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25
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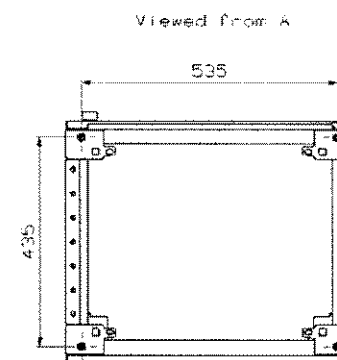
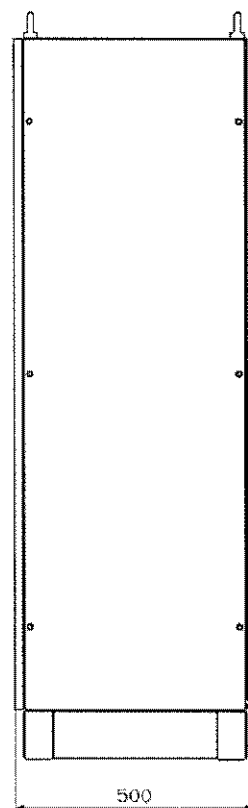
A4					S. PAGE	T. PAGE
PLAN HISTORY				ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2	
				MESSRS.	H.H.I.	
				RULE	LR + UMS	
				SHIP NO.	2585/86/87/88/89	
				ENG. NO.	AA4624/25/26/27/28	
TITLE : ENGINE CONTROL SYSTEM FOR ME ENGINE						
Date	Des.	Dkt.	Appd.	A.C.	Replaced by Ident.no.:	Replacement for Ident.no.:
20110718	BSH	BSH	JCM		FOR WORKING.	1
20110217	BSH	BSH	JCM			0
Licence Ident.no.:				Type:		
Info.no.:				Description:		
Page.no.:				Ident.no.:		
(01) 02				Security: C		6S90ME-C ECS FOR ME ENGINE A14-413498-3

INDEX

NO.	DESCRIPTION	DWG. NO.
1	ECS COMPONENT & ARRANGEMENT FOR SHIPYARD INSTALLATION	A12-298087-4
2	ECS WIRING REQUIREMENT FOR SHIYARD CONNECTION	A14-316562-0
3	ECS WIRING FOR SHIPYARD	A12-298089-8
	3.1 ECS POWER CONNECTION	A10-298090-7
	3.2 ETHERNET NETWORK	A13-335097-4
	3.3 ECS NETWORK CONNECTION	A10-298092-0
	3.4 ECS AUXILIARY UNIT CONNECTION	A11-298091-9
	3.5 BMS & AMS CONNECTION	A10-298093-2
4	ECS WIRING ON ENGINE	A10-298094-4

Date	Des.	Drk.	Appd.	A.C	Replaced by Ident.no.:	Replacement for Ident.no.:	R
20110718	BSH	BSH	JCM		FOR WORKING.		1
20110217	BSH	BSH	JCM				0
Licencee Ident.no.:		Type:		6S90ME-C			
Info.no.:		Description:		ECS FOR ME ENGINE		Ident.no.:	
Page.no.:		Security:				A14-413498-3	
(02) 02		C					

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Standard for service companies No specific details and class numbers are to be compared with ISO 1000-1979.												
Class No.	NT	02	03	04	05	06	07	08	09	10	11	12
Weight	0.025	0.05	0.1	0.2	0.4	0.6	1.0	1.6	3.2	5.0	12.5	25
Available series	5.0	6.0	8.0	10.0	12.5	16.0	20.0	25.0	32.0	40.0	50.0	63.0



- | | | | | | | |
|-------------------------|--------------------------|-----------------------|------|-------------------------|------------------|-------------------------|
| DATE | DATE | DATE | DATE | Rev. or change | Chg. No. | |
| | | | | | | |
| 20091008VIC | LWN | | | | | |
| Serial Number (MSD 307) | | | | Supply Drawing No. | | |
| Material / Dimensions | | | | Part / Part Description | | |
| Description / Remarks | | | | Notes / Remarks | | |
| Serial | Size | Product Type | | Part No. | Part Description | MAN Desc |
| 1:5 | A1 | ME-FCS UNIT | | 01101 | | |
| 6A2011 | Item Name | PREFABRICATED CABINET | | | | 5175412-2 |
| Final User / Ref. No. | Final User / Description | | | | | Part / Part Description |
| | | | | | | 010-045483-C |

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0 1 2 3 4 5 6 7 8 9

CABLING/CONNECTION FOR EICU A, EICU B IN ONE CABINET

FPP SERIAL

Abbreviations:

EICU = Engine Interface Control Unit
ECU = Engine Control Unit
AMS = Alarm Monitoring System
RCS = Remote Control System
PMS = Power Management System
ECR = Engine Control Room
S = Screen
= Yard Supply
* = Makers terminal number

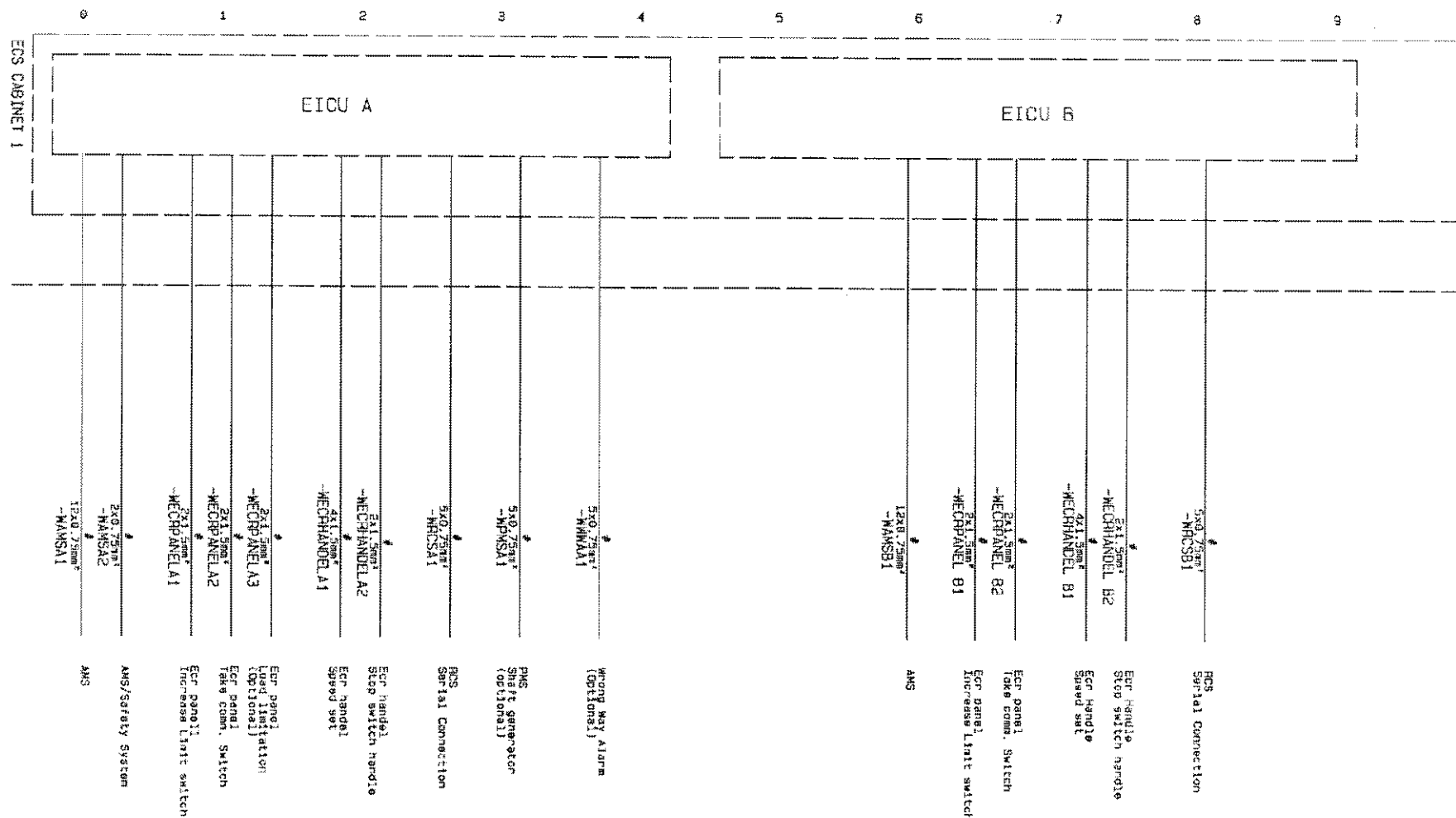
In relation to Network, Serial communication and power,
the screen is led into the cabinets, and the screen
shall cover the wires all the way to its connection point where it is
terminated in its individual terminal.

Basic Standards (NBS 88) & Suppl. Drawing No.:					EN24C Surf. roughness	Protection:	Material / Blank:
					EN24F-n Tolerances	Mass (kg):	Final User Material:
Date	Des.	Chk.	Appd.	A.G.	Change / Replacement		C.No
					Replaced by Ident. No.:		9
							8
							7
							6
							5
							4
							3
							2
							1
							0
20091015					LWN	HKP	OLS
Similar Drawing No.:					Replacement for Ident. No.:		
Scale:	Size:	Type:			Page No.:	MAN B&W Diesel A/S	
1:1	A3	EICU A, B Cabinet		1 (15)			
Info. No.:	Description:		Ident. No.:				
7B4200	Engine Control		5183089-2				
Final User Info. No.:	Final User Description:		Final User Ident. No.:				
			A10-245484-2.0				

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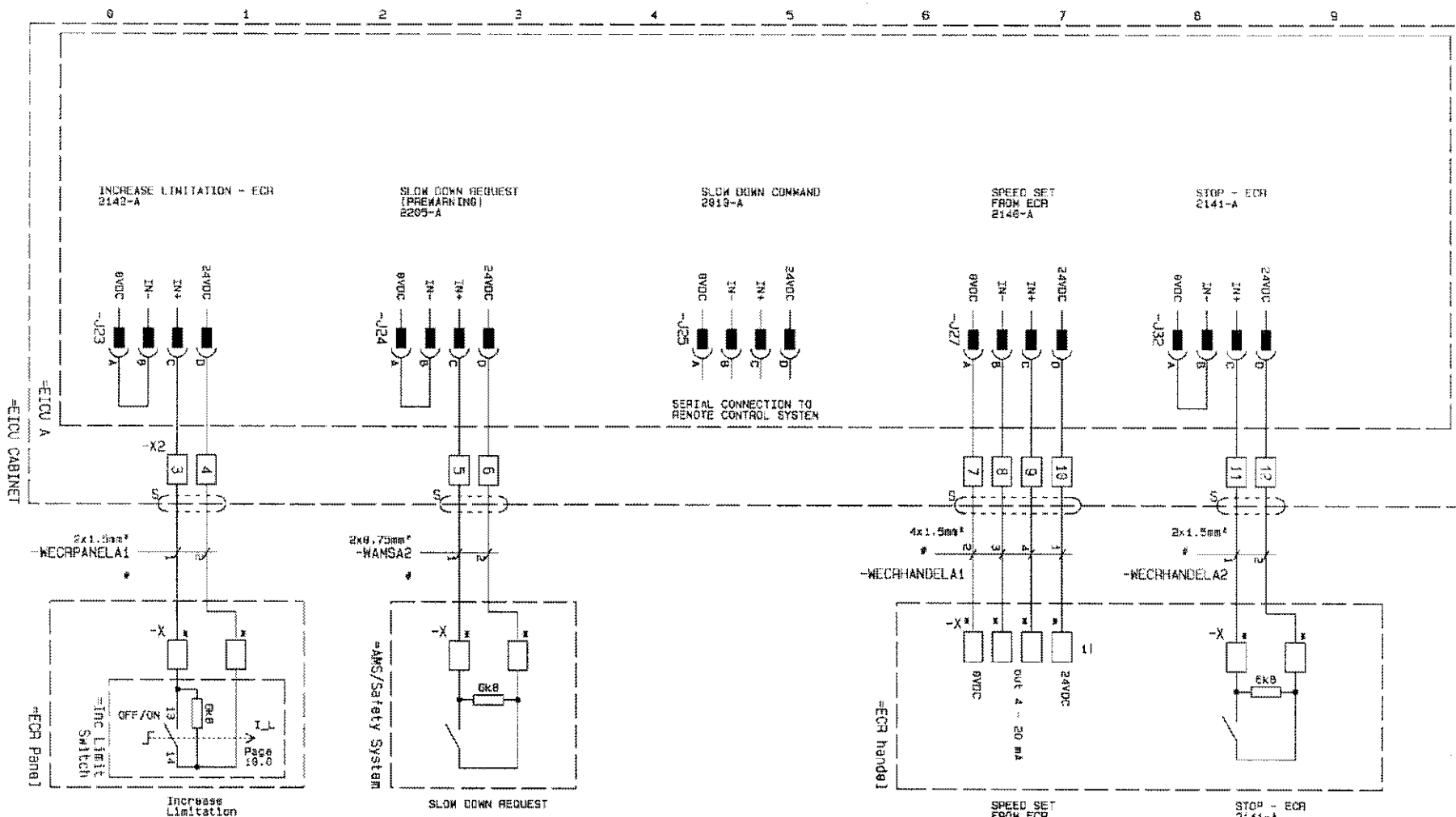


Abbreviations:

EICU = Engine Interface Control Unit
ECU = Engine Control Unit
AMS = Alarm Monitoring System
RCS = Remote Control System
PMS = Power Management System
ECR = Engine Control Room
#: Yard Supply
#: Makers terminal number

Date	Des.	Chk.	Appd.	A.C.	Change / Replacement	C.No.
20091015	LWN	HKP	OLS			0
Scale: 1: 1	Size: A3	Type:	EICU A, B Cabinet			Page No.: 2 (15)
Info. No.: 7B4200	Description: Engine Control				Ident. No.: 5183089-2	
Final User Info. No.:	Final User Description:				Final User Ident. No.: A10-245484-2.0	





Abbreviations:

EICU = Engine Interface Control Unit
 ECU = Engine Control Unit
 AMS = Alarm Monitoring System
 RCS = Remote Control System
 PMS = Power Management System
 ECR = Engine Control Room
 S = Screen
 Y = Yard Supply
 N = NAKERS terminal number

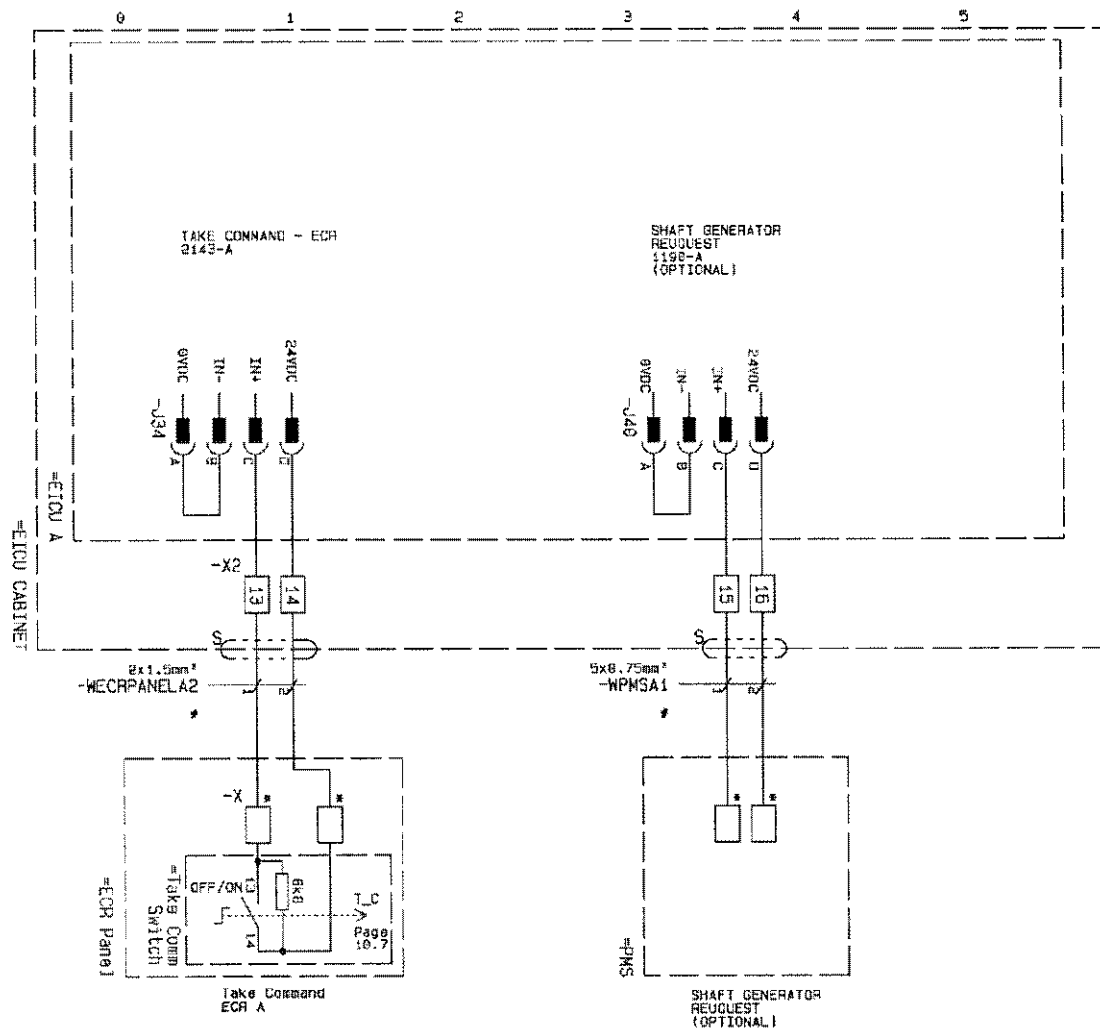
1) Signal can be connected as 2, 3 or 4 wire.

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Date	Des.	Chk.	Appd.	A.C.	Change / Replacement	C.No
20091015	LWN	HKP	OLS			0
Scale:	Size:	Type:	Page No.:			
1:1	A3		4 (15)			
Info. No.:	Description:					Ident. No.:
7B4200	Engine Control					5183089-2
Final User Info. No.:	Final User Description:					Final User Ident. No.:
						A10-245484-2.0

CAG Drawing - 05 correct by hand - PMA Drawing



Abbreviations:

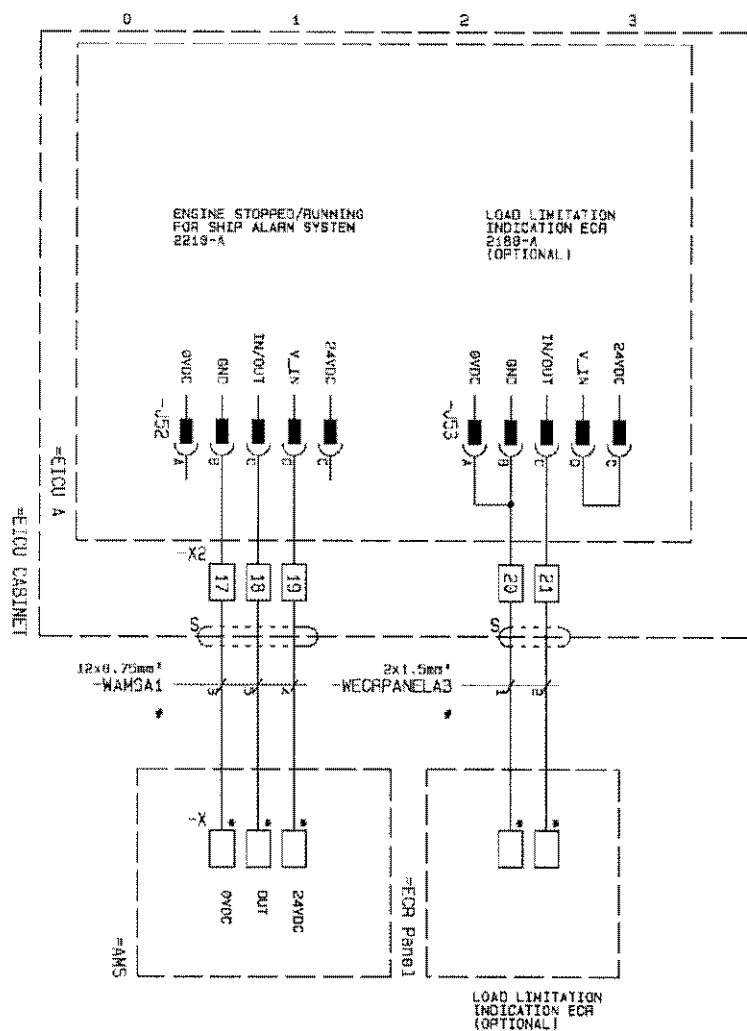
EICU - Engine Interface Control Unit
 ECU - Engine Control Unit
 AMS - Alarm Monitoring System
 RCS - Remote Control System
 PMS - Power Management System
 ECR - Engine Control Room
 S - Screen
 X - Makers terminal number

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Date	Des.	CHK.	ADD.	A.C.	Change / Replacement	C.No.
20091015	LWN	HKP	OLS			0
Scale:	Size:	Type:	Page No.: 5 (15)			
1:1	A3		MAN B&W Diesel A/S			
Info. No.:	Description:					Ident. No.:
7B4200	Engine Control					5183089-2
Final User Info. No.:	Final User Description:					Final User Ident. No.:
						A10-245484-2.0

Drawing No. 7B4200 - 5183089-2 - 001 - Rev. 001



Abbreviations:

EICU = Engine Interface Control Unit
 ECU = Engine Control Unit
 AMS = Alarm Monitoring System
 RCS = Remote Control System
 PMS = Power Management System
 ECR = Engine Control Room
 S = Screen
 Y = Yard Supply
 #: Makers terminal number

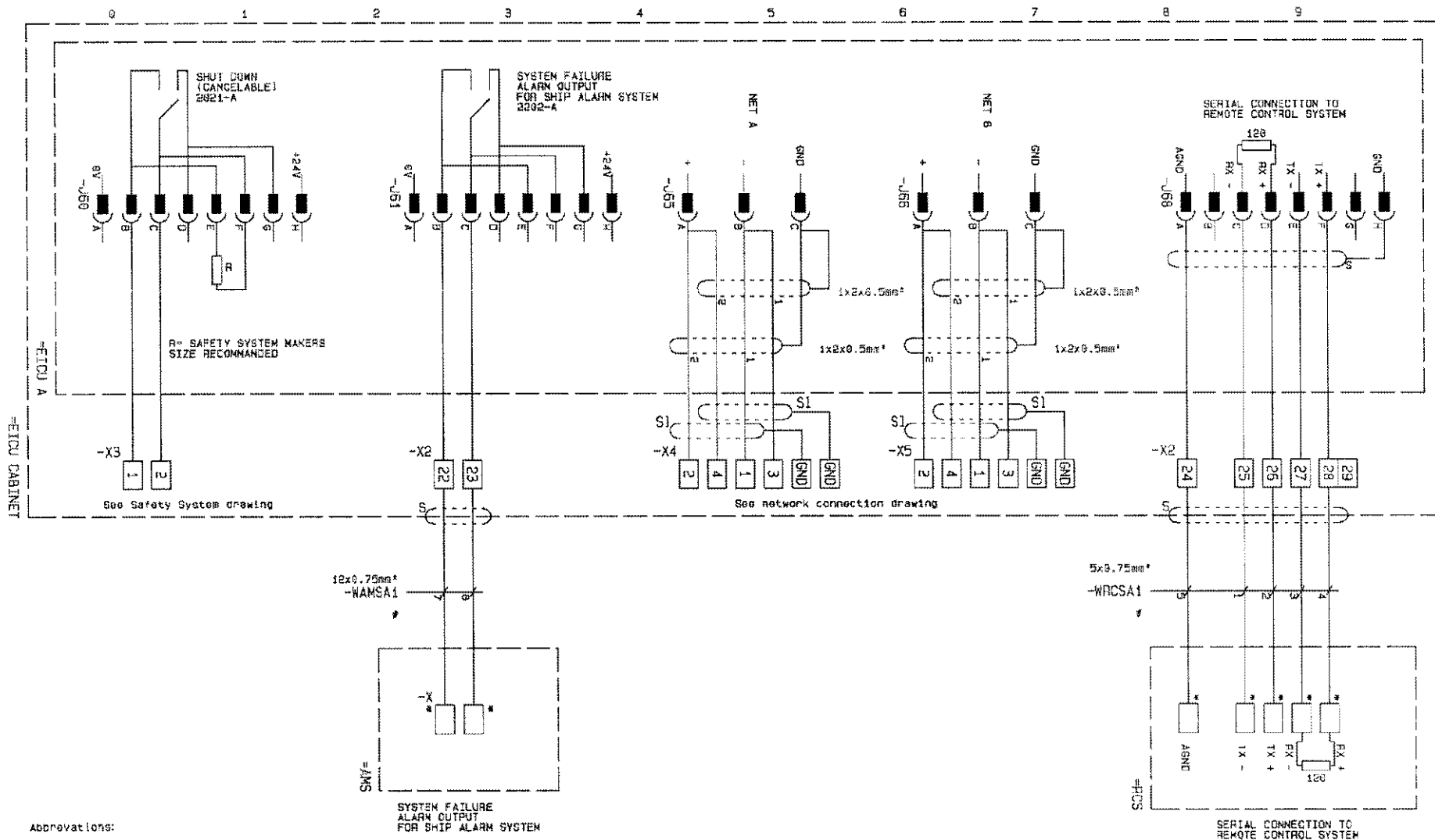
Yard



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Date	Des.	Chk.	Appd.	A.G.	Change / Replacement	C.No.
20091015	LWN	HKP	OLS			0
Scale:	Size:	Type:	Page No.:			
1:1	A3		EICU A, B Cabinet			
Info. No.:	Description:					Ident. No.:
7B4200	Engine Control					5183089-2
Final User Info. No.:	Final User Description:					Final User Ident. No.:
						A10-245484-2.0

CONTACT BY HAND - FOR DRAWING
 010 Drawing



Abbreviations:

EICU = Engine Interface Control Unit
 ECU = Engine Control Unit
 AMS = Alarm Monitoring System
 RCS = Remote Control System
 PMS = Power Management System
 ECR = Engine Control Room
 S = Screen
 #: Yard Supply
 #: Makers terminal number

SYSTEM FAILURE
 ALARM OUTPUT
 FOR SHIP ALARM SYSTEM

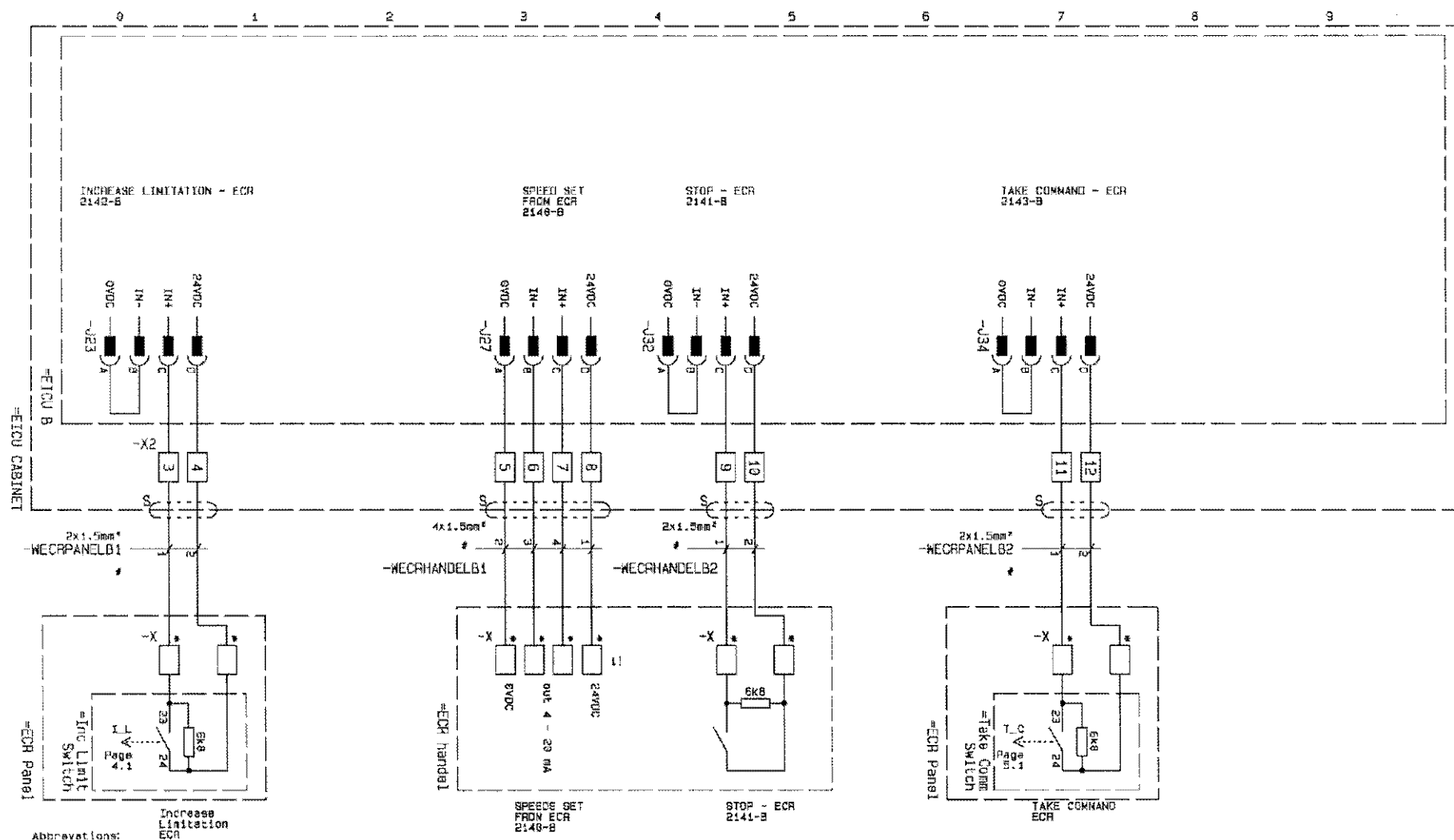
SERIAL CONNECTION TO
 REMOTE CONTROL SYSTEM

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Date	Des.	Chk.	Appd.	A.C.	Change / Replacement	C.No
20091015	LWN	HKP	OLS			0
Scale:	Size:	Type:	EICU A, B Cabinet			
1: 1	A3		7 (15) MAN B&W Diesel A/S			
Info. No.:	Description:					Ident. No.:
7B4200	Engine Control					5183089-2
Final User Info. No.:	Final User Description:					Final User Ident. No.:
						A10-245484-2.0

G:\Drawing\2009\10\15\7B4200\7B4200.dwg



Abbreviations:

EICU = Engine Interface Control Unit
 ECU = Engine Control Unit
 AMS = Alarm Monitoring System
 RCS = Remote Control System
 PMS = Power Management System
 EICR = Engine Control Room
 S = Screen
 * = Yard Supply
 # = Makers terminal number

1) Signal can be connected as 2, 3 or 4 wires.

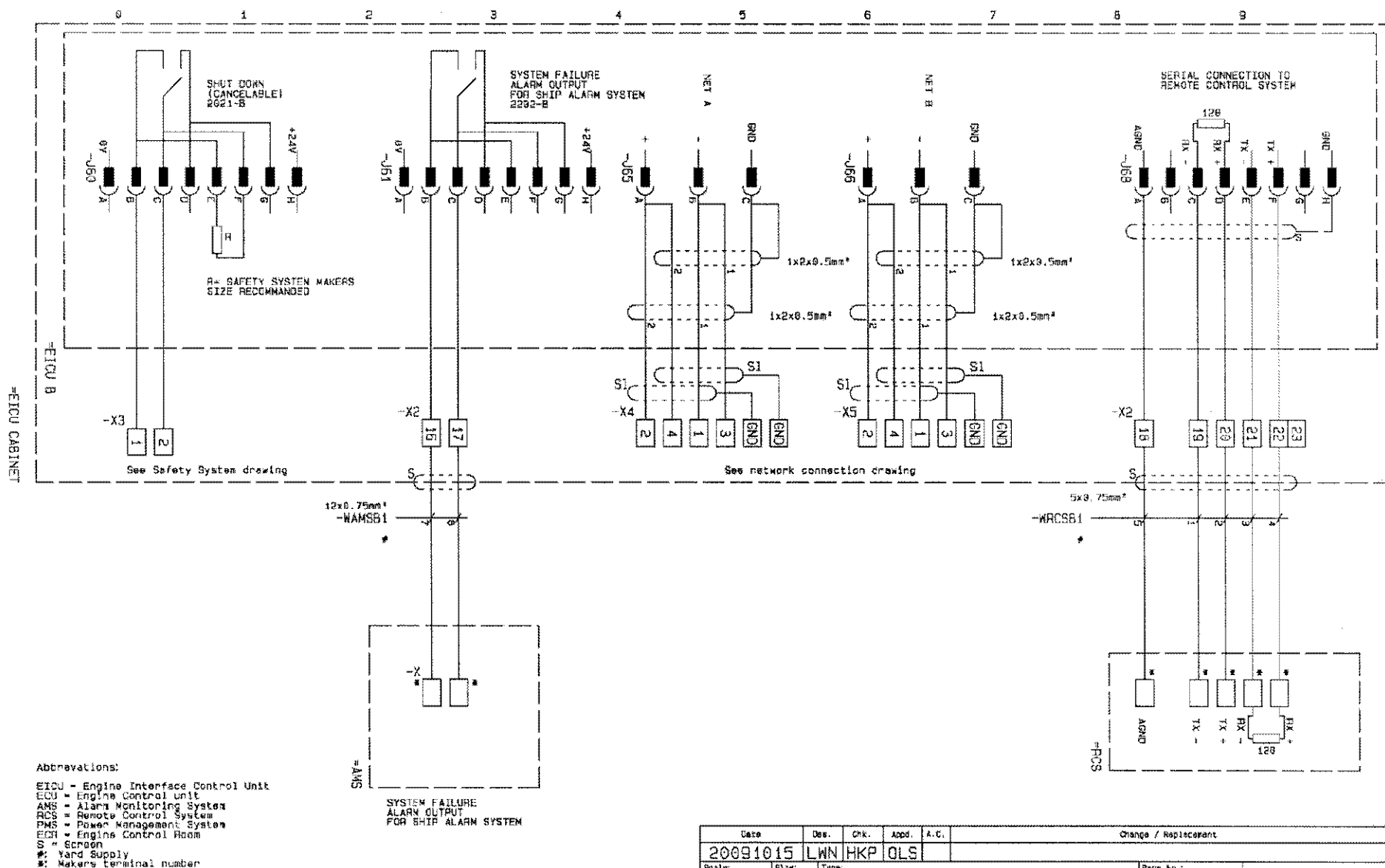
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Date	Des.	Chk.	App.	A.C.	Change / Replacement	C.No
20091015	LWN	HKP	OLS			0
Scale:	Size:	Type:	Page No.: 10 (15)			
1: 1	A3		EICU A, B Cabinet			
Info. No.:	Description:					Ident. No.:
7B4200	Engine Control					5183089-2
Final User Info. No.:	Final User Description:					Final User Ident. No.:
						A10-245484-2.0

☐ CAD Drawing ... do ☒ correct by hand ... Hqs. Drawing

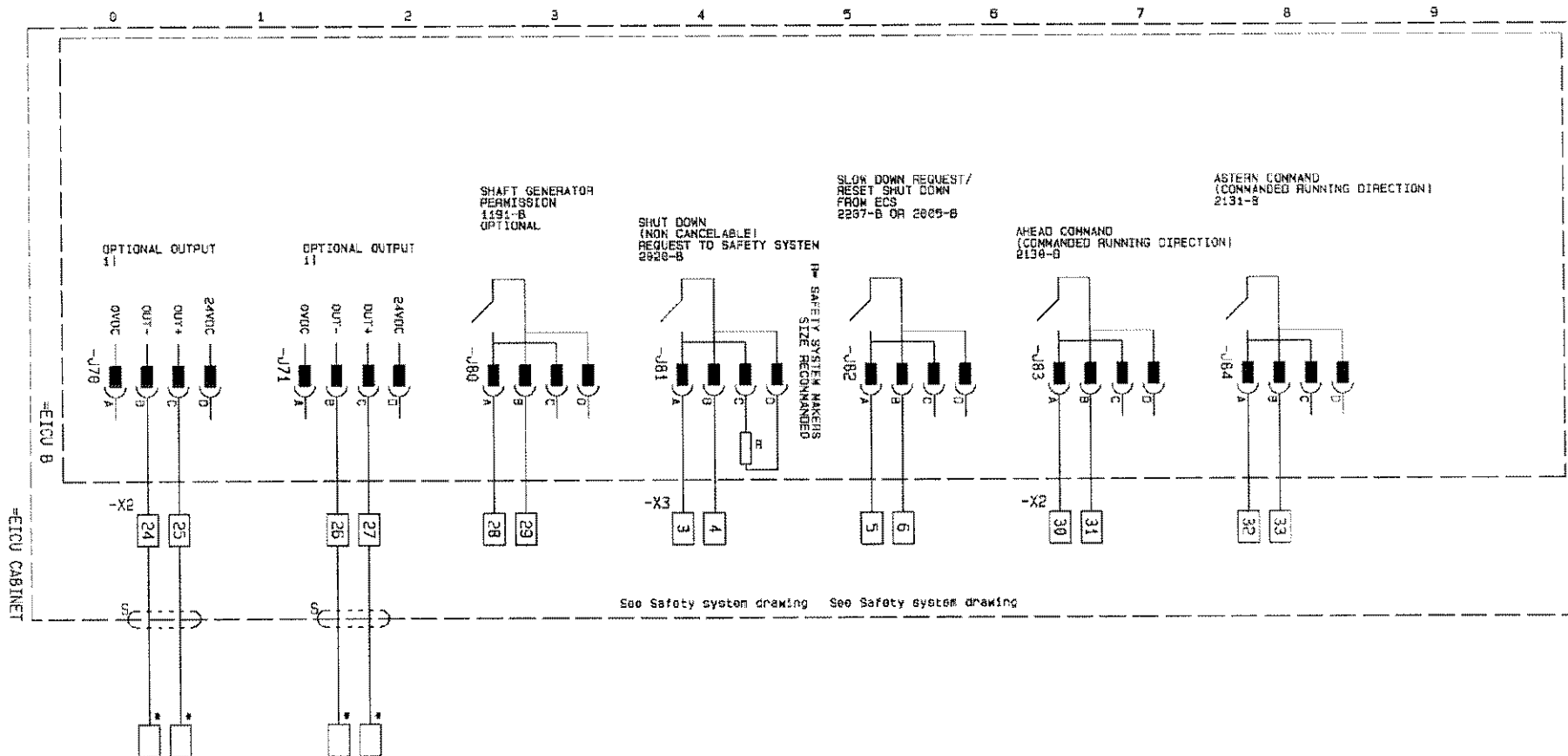


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Date	Des.	Chk.	Appd.	A.C.	Change / Replacement	C.No.
20091015	LWN	HKP	OLS			0
Scale: 1:1	Size: A3	Type:	EICU A, B Cabinet			Page No.: 12 (15)
Info. No.: 7B4200	Description: Engine Control				Ident. No.: 5183089-2	
Final User Info. No.:	Final User Description:				Final User Ident. No.: A10-245484-2.0	

Drawing No. 12 (15) MAN B&W Diesel A/S



U70 & U71 AVAILABLE OUTPUT SIGNALS:

ENGINE SPEED 2183-0/1
FUEL INDEX 2104-0/1
SPEED SET POINT 2401-0/1
HYDRAULIC PRESSURE 1050-0/1
SCAVENGE AIR PRESSURE 2410-0/1
START AIR PRESSURE 2411-0/1
RAN UNSIGNED SPEED 2402-0/1
INDEX MARGIN 2403-0/1
ACTUAL PITCH 2404-0/1

Abbreviations:

EICU = Engine Interface Control Unit
ECU = Engine Control Unit
AMS = Alarm Monitoring System
RCS = Remote Control System
PMS = Power Management System
ECH = Engine Control Room
S = Screen
#: Yard Supply
#: Makers terminal number

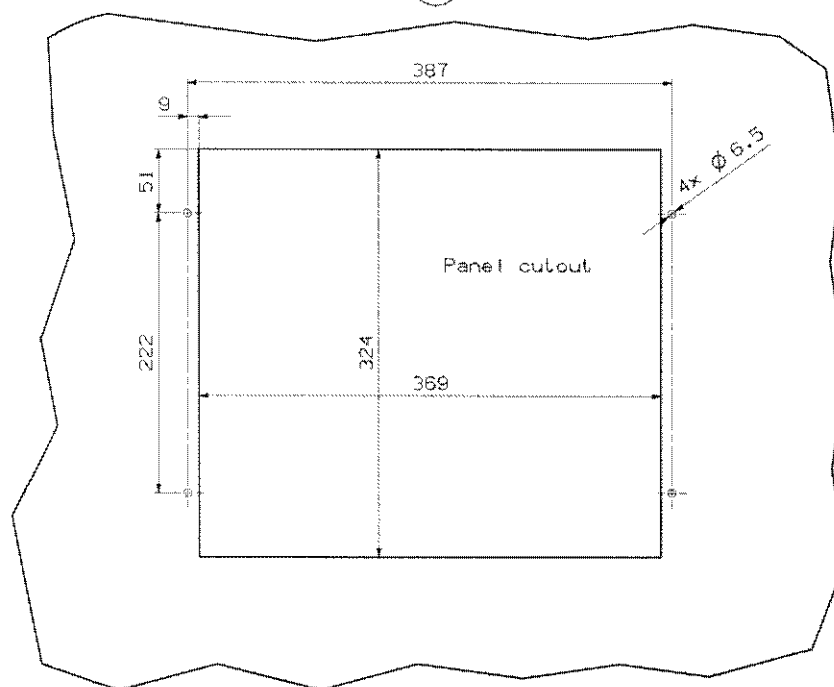
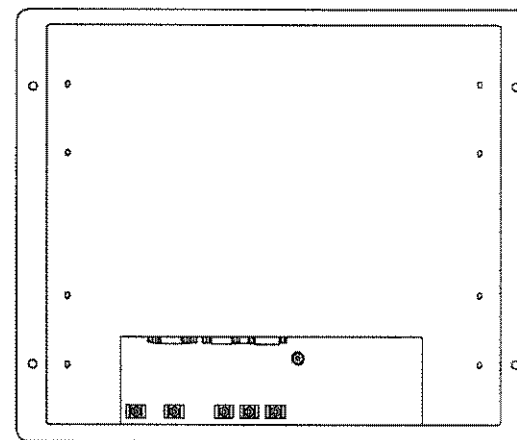
1: Signals are active 4-20 mA galvanic isolated, powered from ECS

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Date	Des.	Chk.	App.	A.C.	Change / Replacement	C.No.
20091015	LWN	HKP	OLS			0
Scale: 1:1	Size: A3	Type:	EICU A,B Cabinet			Page No.: 13 (15)
Info. No.: 7B4200	Description: Engine Control				Ident. No.: 5183089-2	
Final User Info. No.:	Final User Description:				Final User Ident. No.: A10-245484-2.0	

Drawing No. 7B4200-01



455 Type: LCD(TFT) 15" monitor with touch
JH 15T17 MMD DAI-AAAC
Resolution: 1024x768
Direct dimming control(0-100%)
Power supply: 24 VDC, 40W

4 pcs. of M6x25 Pan screws with washer

1 pcs. of standard 160p multifunction Cable#-Length 30cm
Connector from 160pin (male) are:
-3x BNC video In(female)
-1x 9p D-SUB(female) COM I/O (Touch)

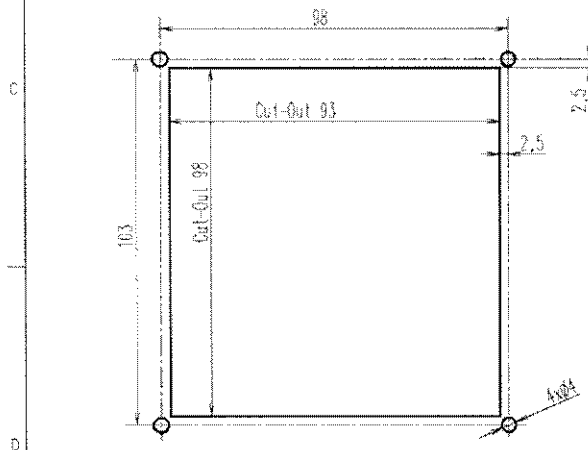
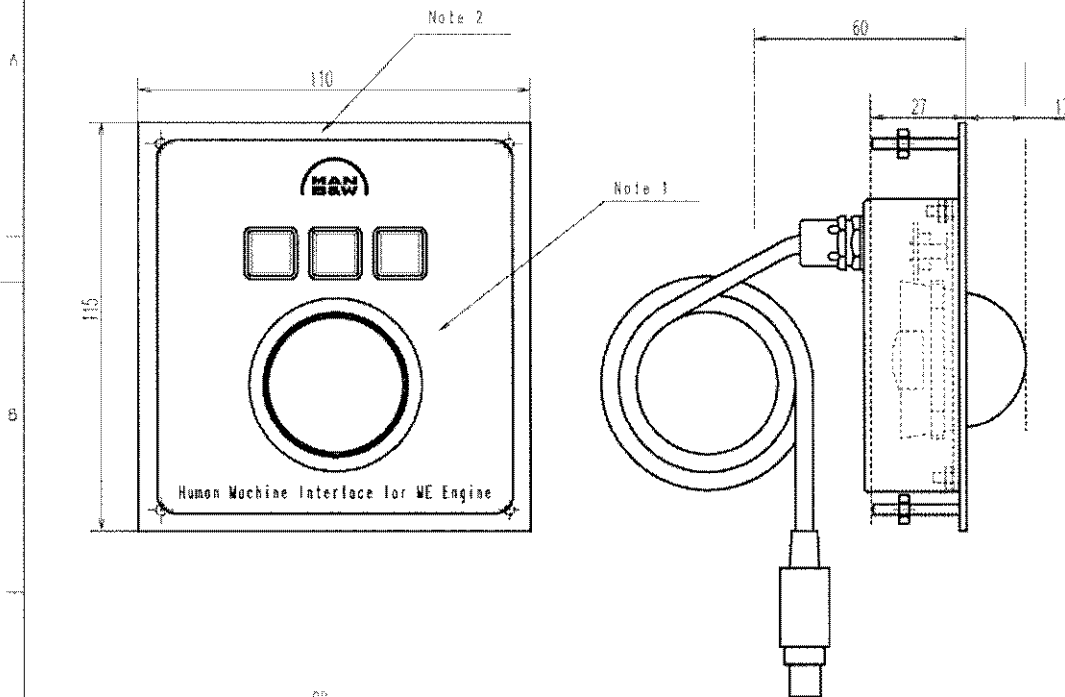
1 pcs. of DSUB: 15P Male to DSUB 15 Male-length approx: 2 m

1 pcs. of DVI-D 24P Male to DVI-D 24P Male Dual-link length approx: 2 m

1 pcs. of DC Power Input housing with internal cable screw terminals

1 pcs. of User Manual

[illegible]



INTERFACE DETAILS

Data Rate 10,000-16,666 BAUD

DATA FORMAT 1 Start, 8 Data, 1 Stop, Odd Parity

OUTPUT LEVEL TTL

INPUT LEVEL TTL

8 PIN DIN PLUG DETAILS

PIN NO. Description

- 1 DATA
- 3 GND

NOTE 1: Front: IP65

Note 2: Postgrinding: 240 grit,
horizontal direction 'X'

-125 Make: xxxx

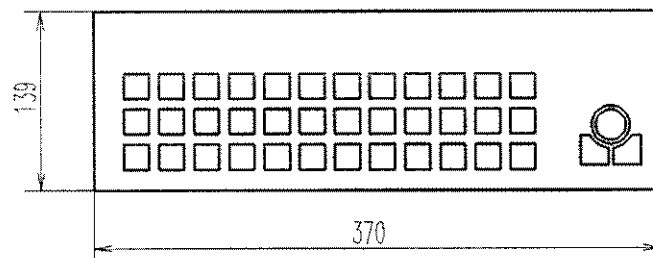
CKS Holdings Ltd
Swallow End, Swallowfields,
Welwyn Garden City
Hertfordshire AL7 1JA England
<http://www.cksholdings.com/keyboards>

-455 Type: Trackball P1 Serie, for PS2
with bezel mounting plated M3 Nuts
CKS E000A242 with 2.9 m Cable W/Plug

DIMENSIONS FOR MOUNTING HOLES													
The table specifies and shows numbers are in accordance with ISO 1502-1978.													
Class no.	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13
Max. width	10.00	12.00	14.00	16.00	18.00	20.00	22.00	24.00	26.00	28.00	30.00	32.00	34.00
Max. height	10.00	12.00	14.00	16.00	18.00	20.00	22.00	24.00	26.00	28.00	30.00	32.00	34.00

Supplement Drawing No.:		Project No.:		Work Page:		Material / Notes:	
		1142555-5.3					
Date:	Des.:	Rev.:	Ass.:	Rev.:	IS:	Change / Replacement:	
20110812		BSH1551-JCM		DWG. IS UPDATED.		2	
20091028		H.J. JOM S.H		CHANGED TO 16		1	
20040601		BY JRY,JK,JC				0	
Author: Des. No.:		Replacement No.:		Replacement No.:			
A2		ME/ME-C/ME-B		01/01		C	
693150		TRACKBALL FOR MCP		A12-255180-4			

Key Board with Trackball



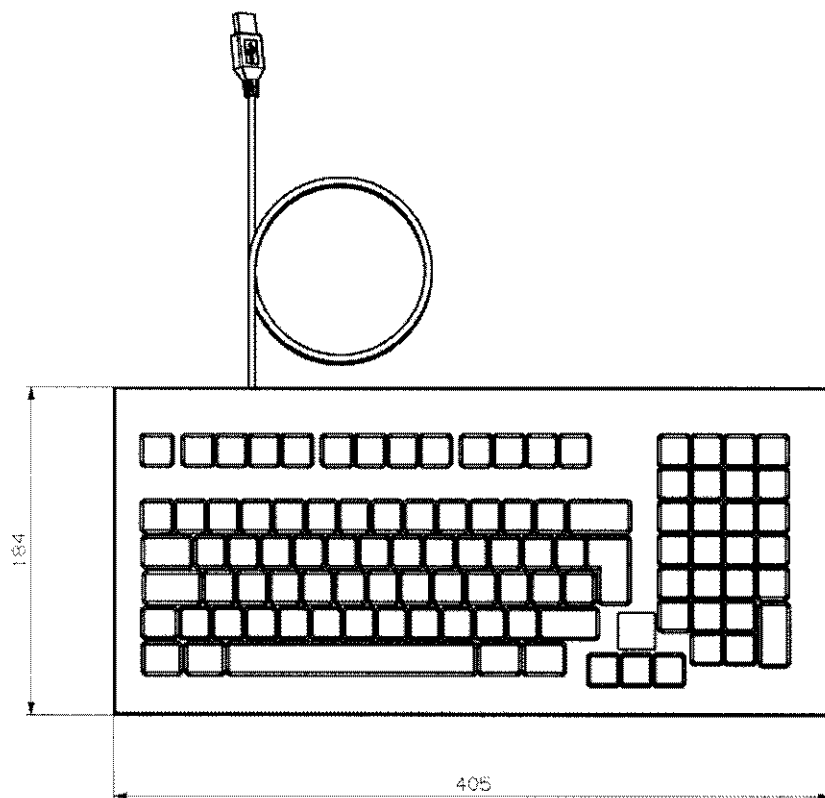
126 Make or similar: 1563

455 Type: Keyboard with Trackball (USB Version)
Key Lay-Out: EU= English(US)
Colour: Black
No.: G84-4400 PTB EU
Cable length: 1.6 meter

Supplement Drawing no.:				Projection:		Make (mg):		Material / Blank:	
				Licensor's Ident. no.:		Det.:		Licensor's Material / Blank:	
				1880422-1.1					
Date	Des.	CHK.	Appr.	A.C.	E	Change / Replacement			C.No.

Standard for Surface roughness											
The basic symbols and class numbers are in accordance with ISO 1302-1978.											
Tolerances for dimensions without tolerance indication (ISO 2768-1999)											
This standard states the permissible deviations for dimension without direct tolerance indications on metallic components manufactured by machining.											
TOLERANCE GRADING											
Permissible deviations											
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11
R max. value μ	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25
											50
Medium surface											
	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2.0	± 3.0	± 6.0	± 10.0	± 20.0

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084 Supplier: 1010

435 Type: Keyboard with mouse for
USB Connection
cable length 1.60 meter
DS102W US M USB BL MET

Drawing No.		Project No.		Rev. No.		Drawing Date	
1581454-9		A92		XXX		1581454-9	
Date	Des.	Rev.	Appr.	Check	Drawn	Checked	By
20110811 0511593.00M DWG. IS UPDATED.				1			
200805200511593.00M				0			
Drawing Title		Replacement of		Revised by		Revised Date	
N/S		A3		ME/VE-C/ME-B		01/01/10	
693150		KEYBOARD		A12-331813-5		A21834mm x 420mm	

Standard for surface roughness											
The basic symbols and data numbers are to conform with ISO 13715-1995.											
Class No.	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R12
Symbol	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50
Symbol	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50
Symbol	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50

UPS Power Supply for ME Engine

Drawing for Final

MESSRS : HYUNDAI Heavy Industries Co., Ltd.

SHIP'S NO. : 2484,2485,2486,2487,2488

CUSTOMER HYUNDAI HEAVY INDUSTRIES CO., LTD.					SCALE NONE	PROJECT UPS Power Supply for ME Engine	DATE 14th, April, 2011	APPROVED J. G. KIM	TITLE COVER SHEET	
REV.	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED	 HWASAN CO., LTD.			CHECKED S. M. KIM	DWG. NO. ME12QA-01 SHEET NO. 1 OF 15
1	14.04.2011	FOR APPROVA	J. W. BAEK	S. M. KIM	J. G. KIM				DESIGN J. G. KIM	
2									DRAWN J. W. BAEK	
3										

SPECIFICATIONS

NO.	ITEM	DESCRIPTION
1	AMBIENT TEMPERATURE	-10~50℃
2	CONSTRUCTION OF ENCLOSURE	MOUNTING METHOD : DECK MOUNTING
		SHEET FOR FRONT PANEL : SS41 2.3t STEEL PLATE
		SHEET FOR OTHER SIDE : SS41 2.3t STEEL PLATE
		SHEET FOR MOUNT. PLATE : SS41 3.0t STEEL PLATE
		PAINTING COLOR : RAL7032
		PROTECTION DEGREE OF ENCLOSURE : IP23
3	LETTER OF DOCUMENT & DWG.	ENGLISH
4	NAME PLATE(TITLE)	LETTERS : POWER SUPPLY A(B) FOR ECS
		SIZE : 150(W)x40(H)
		COLOR : BLACK LETTERS ON WHITE
5	ELECTRIC SOURCE	AC230V 1PHASE 50/60HZ
6	ELECTRICAL CHARACTERISTICS	UNINTERRUPTED DC POWER SUPPLY
		A.V R AND BATTERY CHARGING SYSTEM
		OUTPUT POWER :DC24V 2000W(FOR 12 CYLINDERS)
		CAPACITY : 100A CONTINUOUS
		BATTERIES : 12V 65A FOR 1HOUR, 65Ah x 2SETS
		LIFE TIME : 5YEARS/20℃ AFTER MANUFACTURE (REFER TO MANUFACTURING DATE ON BATTERY)
		Kcal/Hour : Type A(1824.8Kcal/Hour)
		Kcal/Hour : Type B(1817.5Kcal/Hour)
7	COOLING FAN	Cooling fan automatically runs when TEMP. of inside exceeds 30℃.
8	DISTRIBUTION SECTION	BREAKERS QUANTITY & SIZE : 16A 25PCS, 6A 2PCS
9	CABLE ENTRY	All cable to have entry from bottom.

NO.	ITEM	DESCRIPTION
10	ALARM & SHUTDOWN (Alarm contacts for remote signaling.) Alarm output(Free contacts)	AC POWER FAILURE ALARM
		LOW OR HIGH VOLTAGE ALARM
		RECTIFIER(SKYLLA) ALARM
		LOW VOLTAGE SHUTDOWN(18VDC)
		HIGH VOLTAGE SHUTDOWN(32VDC)
		EARTH FAILURE ALARM(TYPE 'A' ONLY)
11	ADJUSTMENTS (Above mentioned setting points are adjusted at factory default.) (So, it is operated at limit setting conditions LV,HV and so on.)	OUTPUT VOLTAGE
		LOW VOLTAGE ALARM SET.
		HIGH VOLTAGE ALARM SET.
		LOW VOLTAGE SHUTDOWN SET.
12	QUANTITY : 2SETS	TYPE A : with INSULATION MONITORING DEVICE
		TYPE B : without INSULATION MONITORING DEVICE
13	WEIGHT	TYPE A : 260Kg
		TYPE B : 258Kg
14	LOCATION	ECR

CUSTOMER HYUNDAI HEAVY INDUSTRIES CO., LTD.

SCALE NONE

PROJECT UPS Power Supply for ME Engine

DATE 14th.April.2011

APPROVED J. G. KIM

TITLE GENERAL SPECIFICATION

REV	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
1	14th.April.2011	FOR APPROVAL	J. W. BAEK	S. M. KIM	J. G. KIM
2					
3					

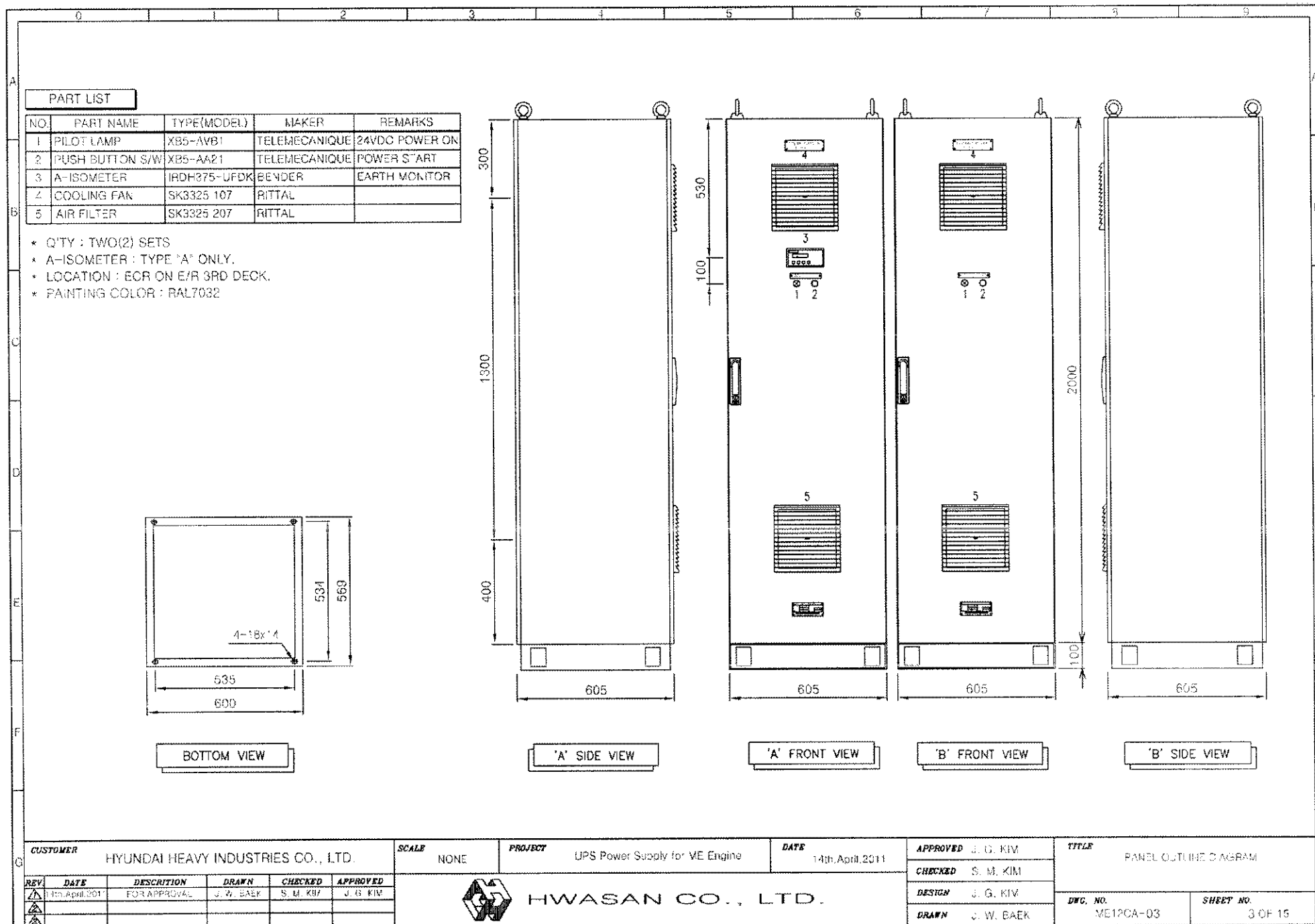


HWASAN CO., LTD.

CHECKED	S. M. KIM
DESIGN	J. G. KIM
DRAWN	J. W. BAEK

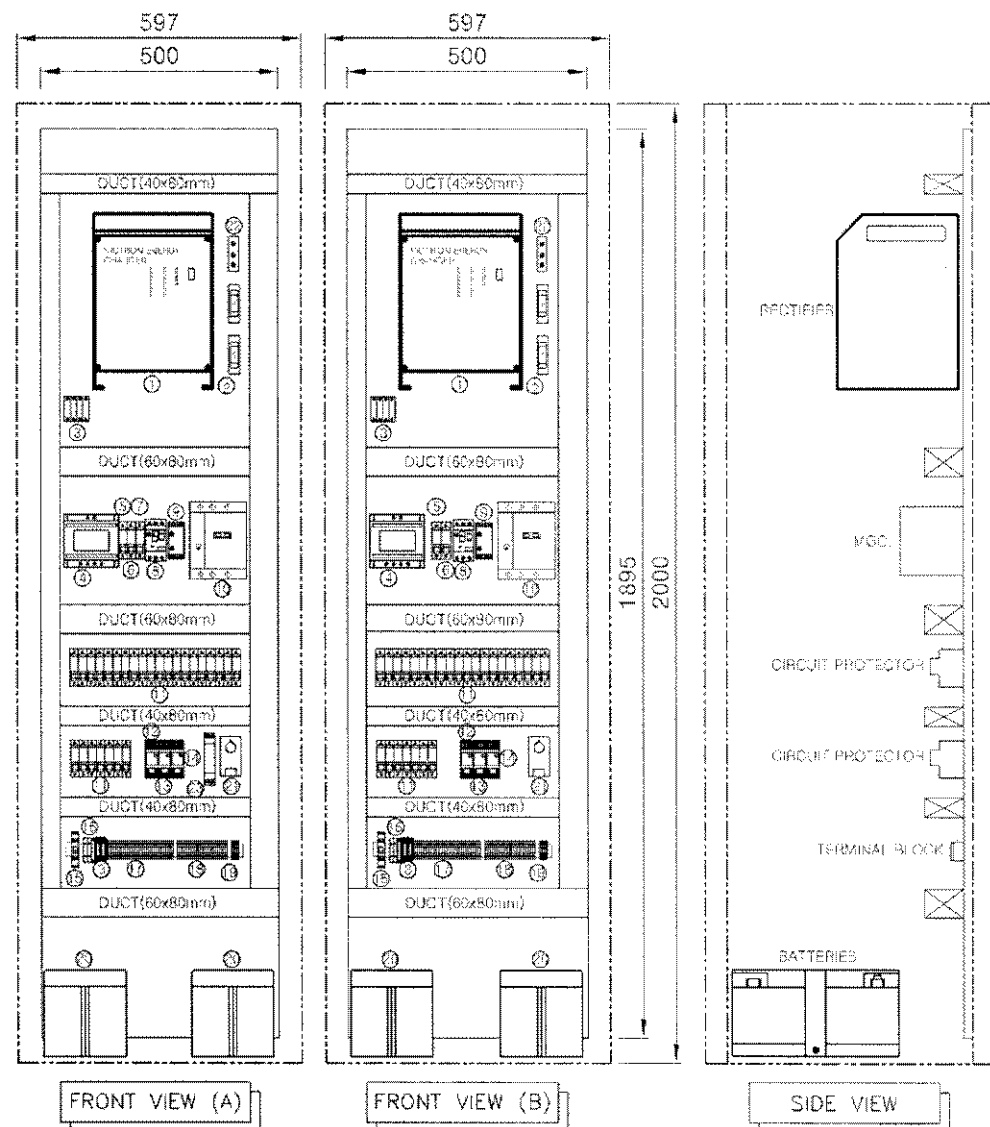
DWG. NO. VE12CA-02

SHEET NO. 2 OF 15



PART LIST

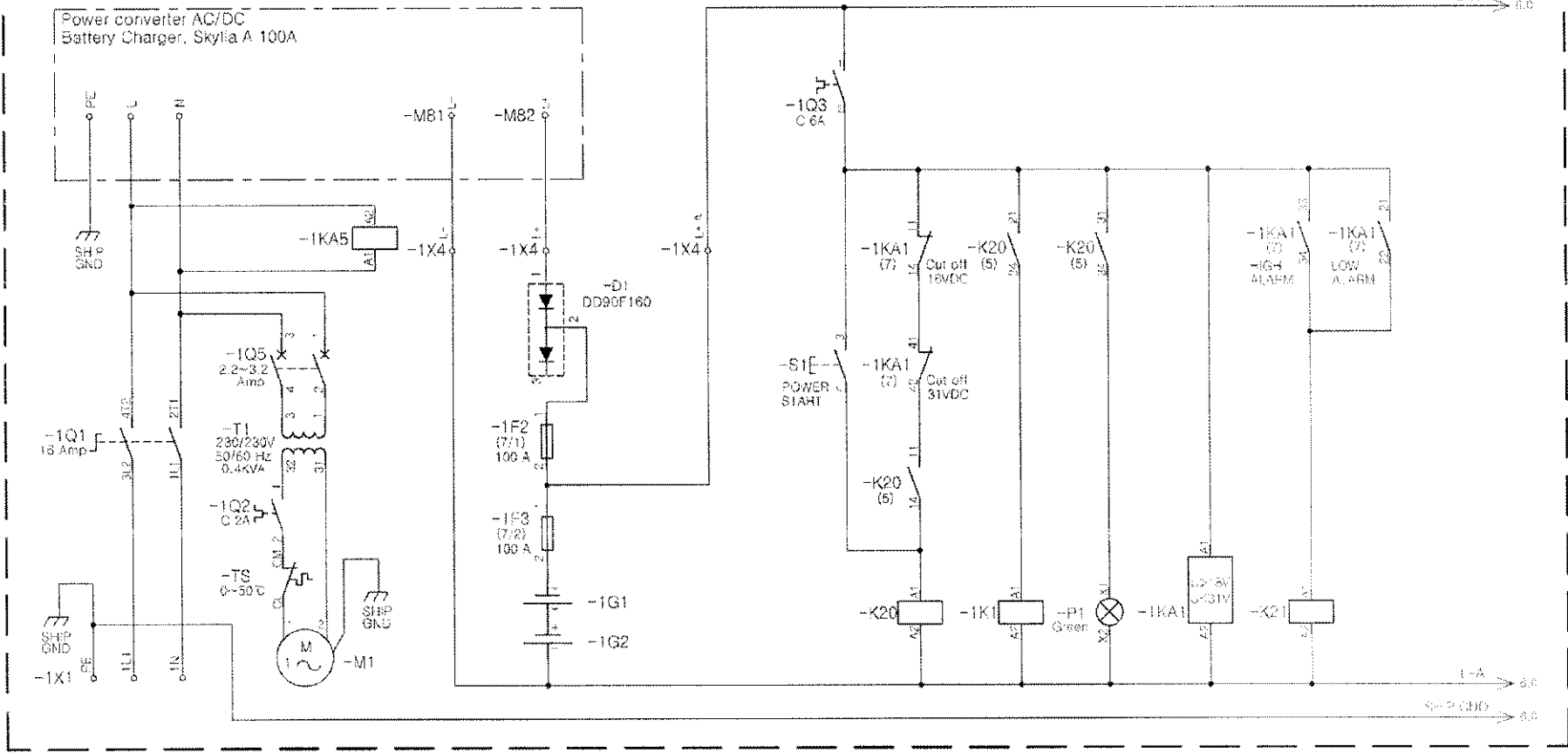
NO.	PART NAME	SYMBOL	TYPE (MODEL)	MANUFACTURER	REMARKS
1	RECTIFIER	AC/DC	SKYLA-1G24/100	VICTRON ENERGY	
2	FUSE & HOLDER	-1P2-3	NH00C-100A	CIFEN	DC POWER FUSE
3	TERMINAL BLOCK	-1X1	WCL35+WQV35/2	WEDMULLER	
4	TRANSFORMER	-T1	AC230/230V 10 400VA	DAELIM	
5	CIRCUIT PROTECTOR	-1Q2	CB0N 1P/2A	MERLIN GERIN	FAN ON/OFF
6	CIRCUIT PROTECTOR	-1Q3	CB0N 1P/5A	MERLIN GERIN	AUX POWER ON/OFF
7	CIRCUIT PROTECTOR	-1Q4	CB0N 1P/2A	MERLIN GERIN	METER ON/OFF (TYPE A ONLY)
8	CIRCUIT BREAKER	-1Q5	GV2-ME07 (1.6-2.5A)	TELEMECANIQUE	FAN ON/OFF
9	BATTERY V-RELAY	-1KA1	BVC5-0024-AA-3E	THIM	BATTERY MONITOR
10	MAGNETIC CONTACTOR	-1K1	LC1D-115BD	MERLIN GERIN	LOAD OPEN/CLOSE
11	CIRCUIT PROTECTOR	-2Q1~27	CB0N1P/16A(8A)	MERLIN GERIN	DC OUTPUT ON/OFF
12	AUX. CONTACTOR	-K20	RX1M4B2B0	TELEMECANIQUE	
13	AUX. CONTACTOR	-K2	RX1M4B2B0	TELEMECANIQUE	
14	AUX. CONTACTOR	-1KA5	RX1M4B2P7	TELEMECANIQUE	
15	CIRCUIT PROTECTOR	-1Q1	GB2-CD21/16A	TELEMECANIQUE	MAIN POWER ON/OFF
16	TERMINAL BLOCK	-1X1	WDU6	WEDMULLER	AC POWER INPUT T/B
17	TERMINAL BLOCK	-1X2	WDU2.5	WEDMULLER	DC OUTPUT T/B
18	TERMINAL BLOCK	-1X3	WDU2.5	WEDMULLER	ALARM OUTPUT T/B
19	TERMINAL BLOCK	PE	WPE2.5	WEDMULLER	
20	BATTERIES	-1G1~2	KB05-12N	ATLAS BX	
21	TEMP. S/W	-TS	DCTC-050C	DAECHANG	FAN ON/OFF
22	DIODE MODULE	-D1	DD90F120	SANREXPAK	
23	TRANSMITTER	-T1	PR4114(0-10V/4-20mA)	PR ELECTRONICS	



CUSTOMER HYUNDAI HEAVY INDUSTRIES CO., LTD.					SCALE NONE	PROJECT UPS Power Supply for ME Engine	DATE 14th April, 2011	APPROVED J. G. KIM	TITLE POWER BOARD ARRANGEMENT DWG.	
REV	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED					
1	14th April, 2011	FOR APPROVAL	J. W. BAEK	S. M. KIM	J. G. KIM					
2										
3										
									DWG. NO. ME12CA-04	SHEET NO. 1 OF 15

UPS Power A

Power converter AC/DC
Battery Charger, Skylla A 100A



Supply Voltage
230 VAC, 50/60 Hz

FAN
ALARM FOR
MAIN POWER
FAIL

BATTERY 1+2

AUX. RELAY

MAIN
SWITCH

24VDC
POWER ON

OLT OFF
LOW-HIGH
VOLTAGE
MONITOR

ALARM

7/8 7/0

5 6 7

7/3

8 5 6 5

7/0

CUSTOMER HYUNDAI HEAVY INDUSTRIES CO., LTD.

SCALE NONE

PROJECT UPS Power Supply for ME Engine

DATE 14th April 2011

APPROVED J. G. KIM

TITLE SCHEMATIC DIAGRAM A1

REV	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
1	14th April 2011	FOR APPROVAL	J. W. BAEK	S. M. KIM	J. G. KIM
2					
3					



HWASAN CO., LTD.

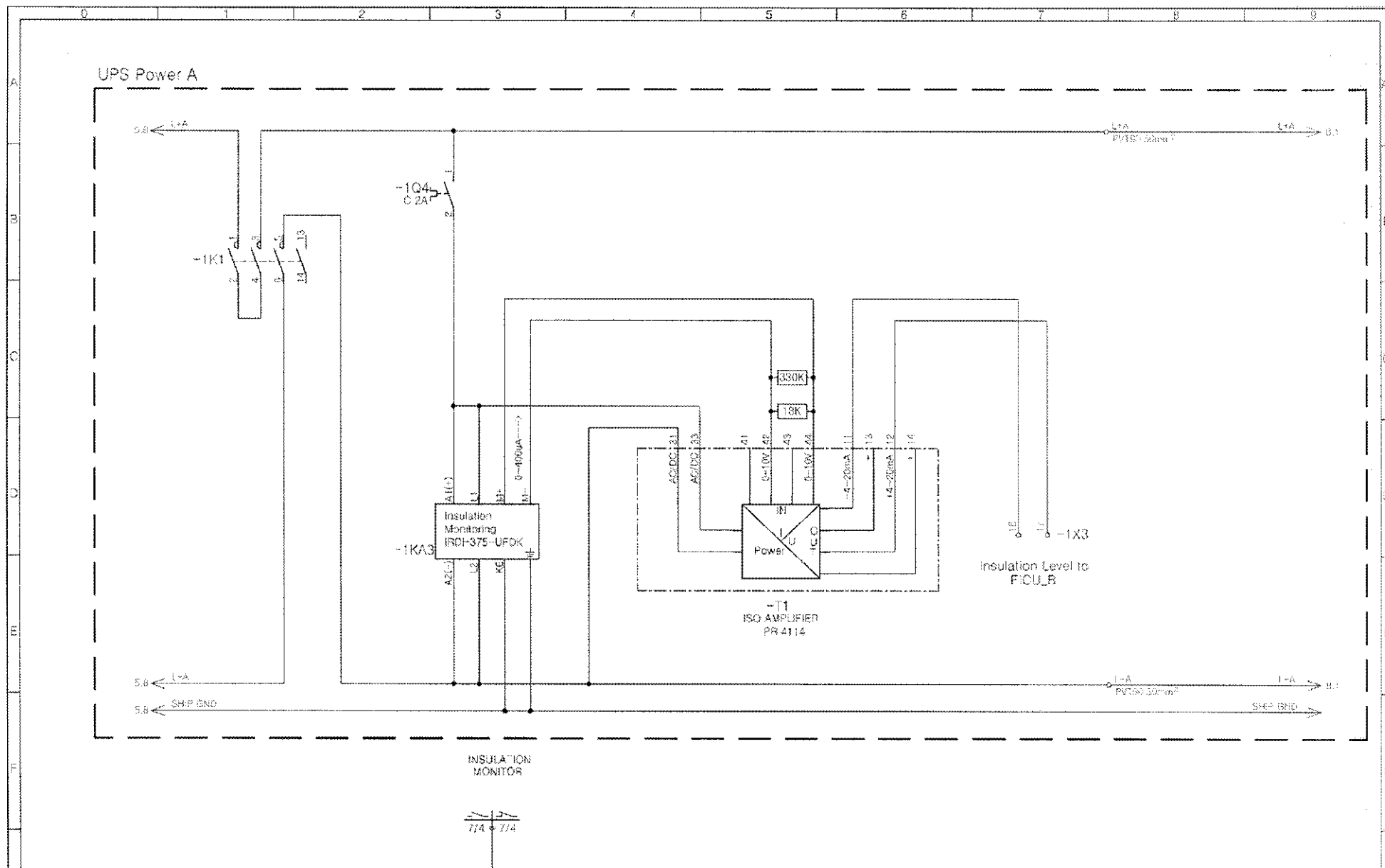
CHECKED S. M. KIM

DESIGN J. G. KIM

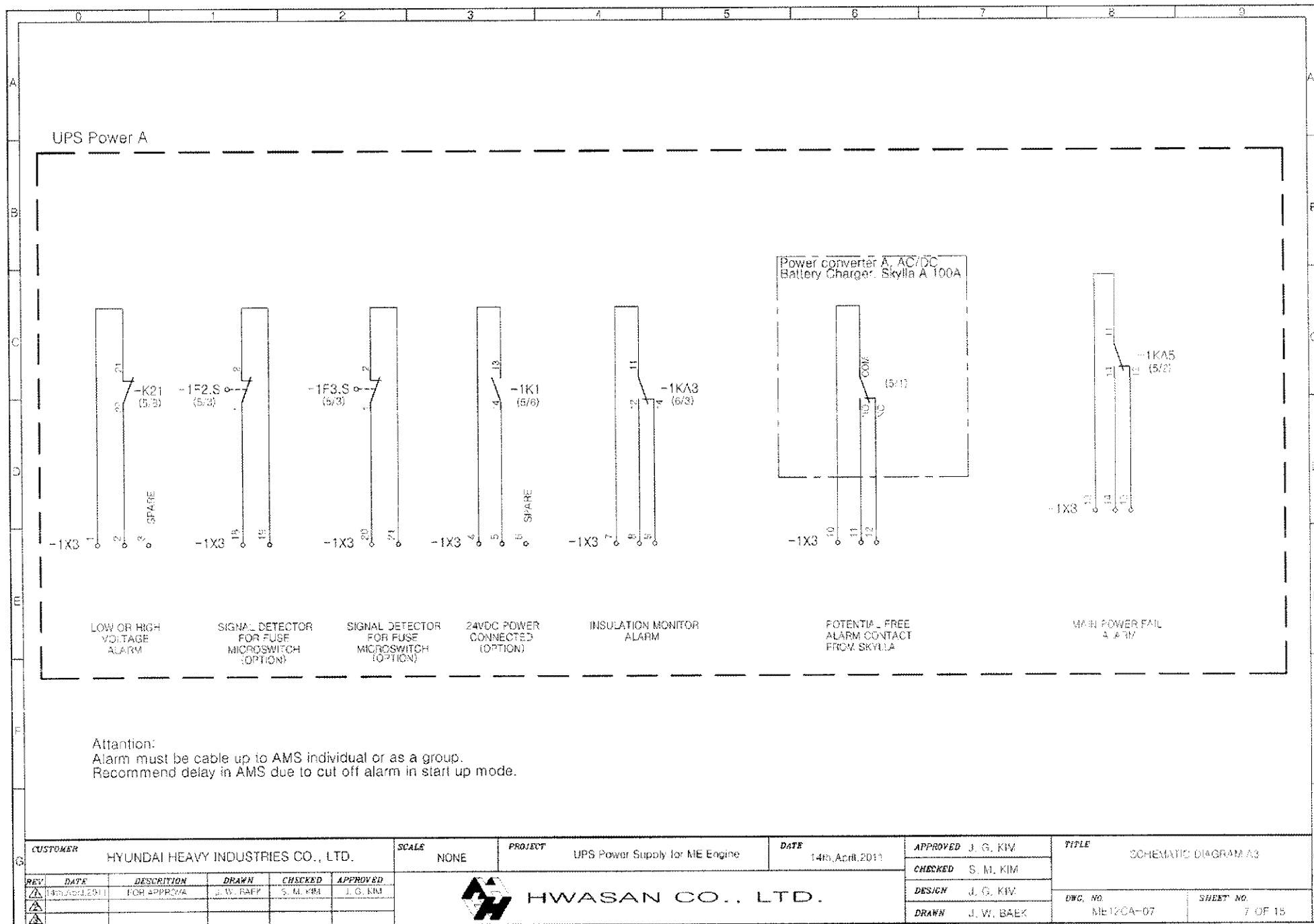
DRAWN J. W. BAEK

DWG. NO. ME12CA-05

SHEET NO. 5 OF 15



G	CUSTOMER HYUNDAI HEAVY INDUSTRIES CO., LTD.					SCALE NONE	PROJECT UPS Power Supply for ME Engine	DATE 14th April, 2011	APPROVED J. G. KIM	TITLE SCHEMATIC DIAGRAM A2			
	REV	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED	 HWASAN CO., LTD.						
	1	14th April, 2011	FOR APPROVAL	J. W. BAEK	S. M. KIM	J. G. KIM							
	2												
								DESIGN J. G. KIM					
								DRAWN J. W. BAEK					



B

B

C

C

D

D

E

E

F

F

G

G

Attention:

Alarm must be cable up to AMS individual or as a group.

Recommend delay in AMS due to cut off alarm in start up mode.

CUSTOMER

HYUNDAI HEAVY INDUSTRIES CO., LTD.

SCALE

NONE

PROJECT

UPS Power Supply for ME Engine

DATE

14th, April, 2011

APPROVED J. G. KIM

CHECKED S. M. KIM

DESIGN J. G. KIM

DRAWN J. W. BAEK

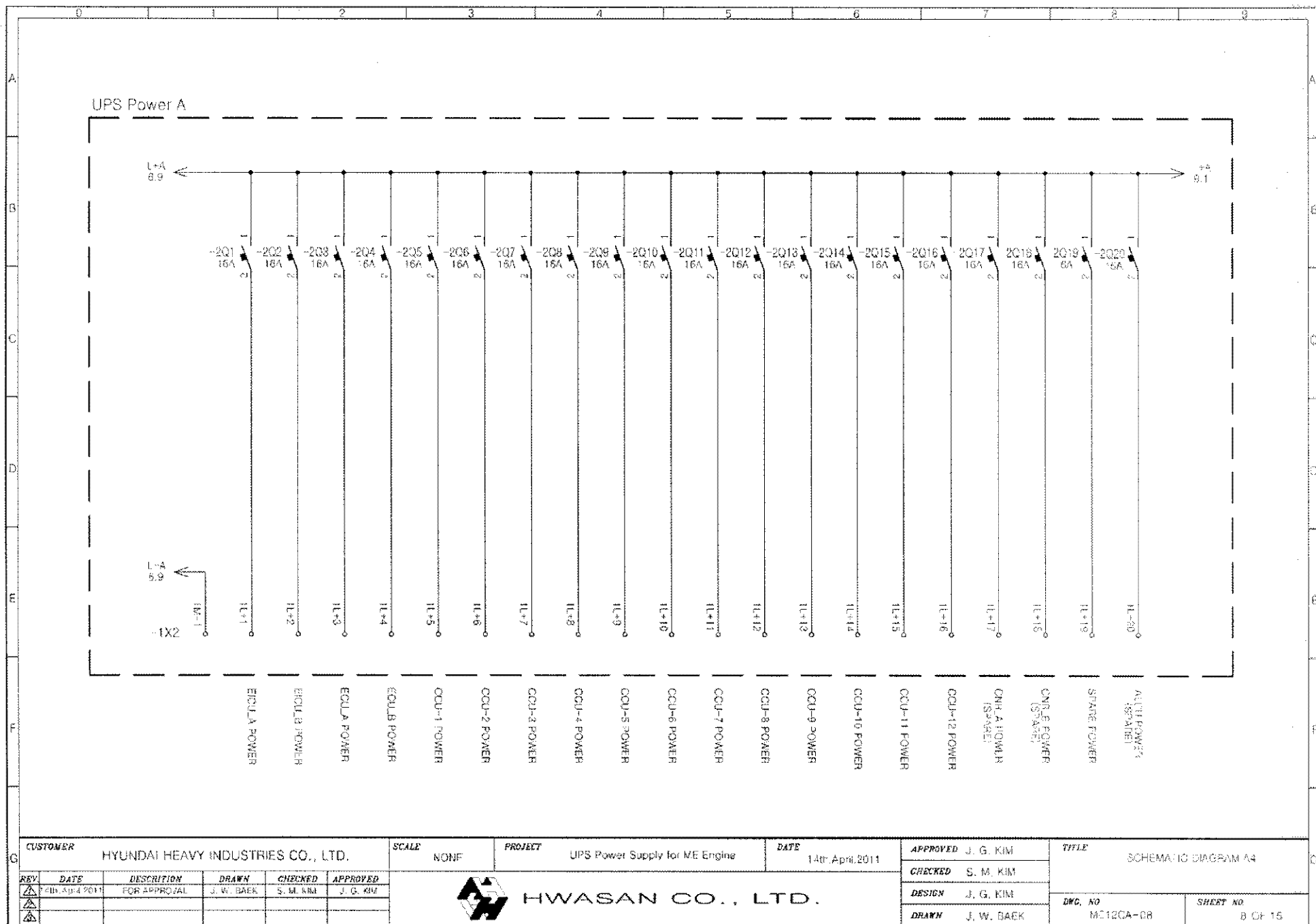
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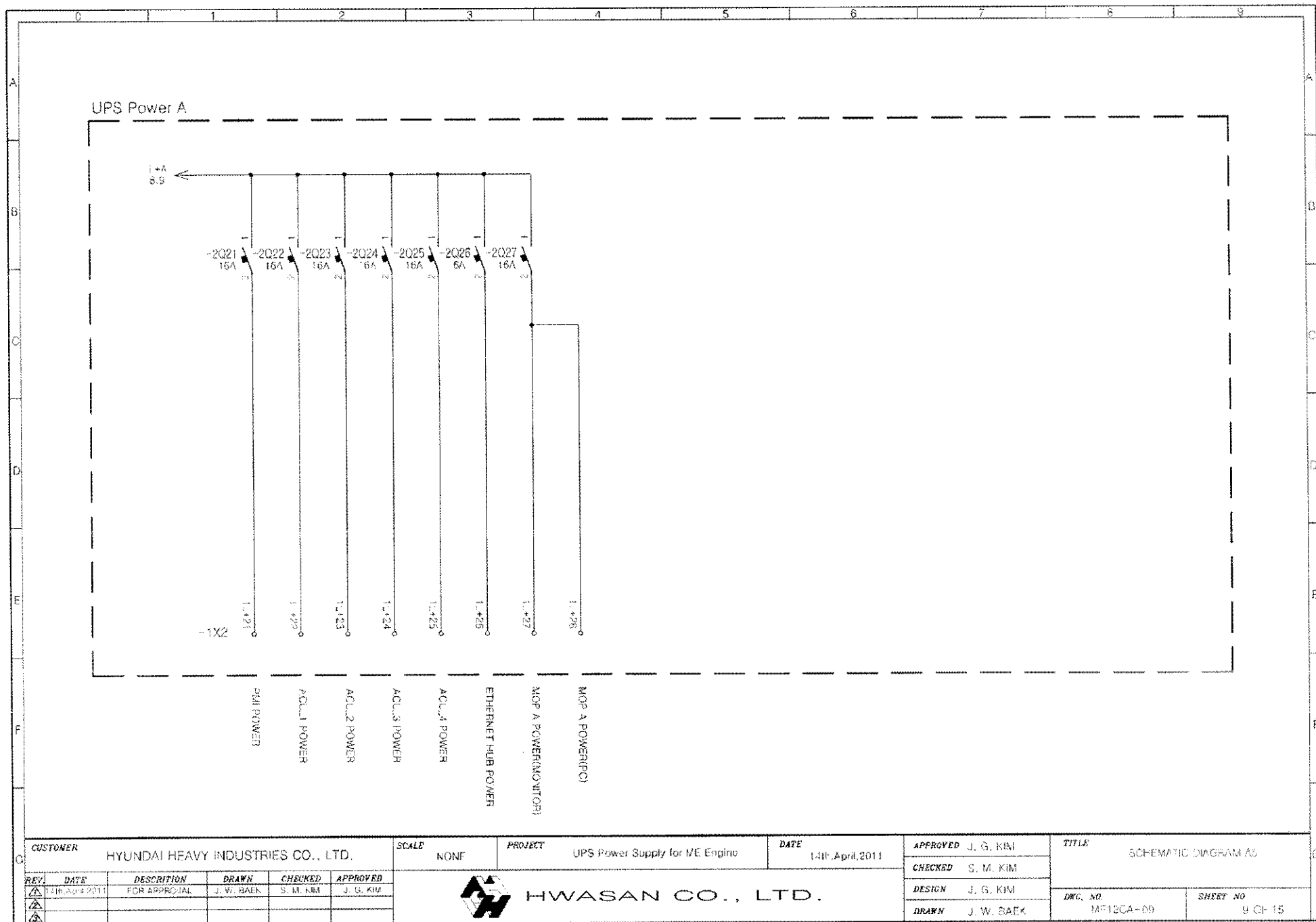
SCHEMATIC DIAGRAM A3

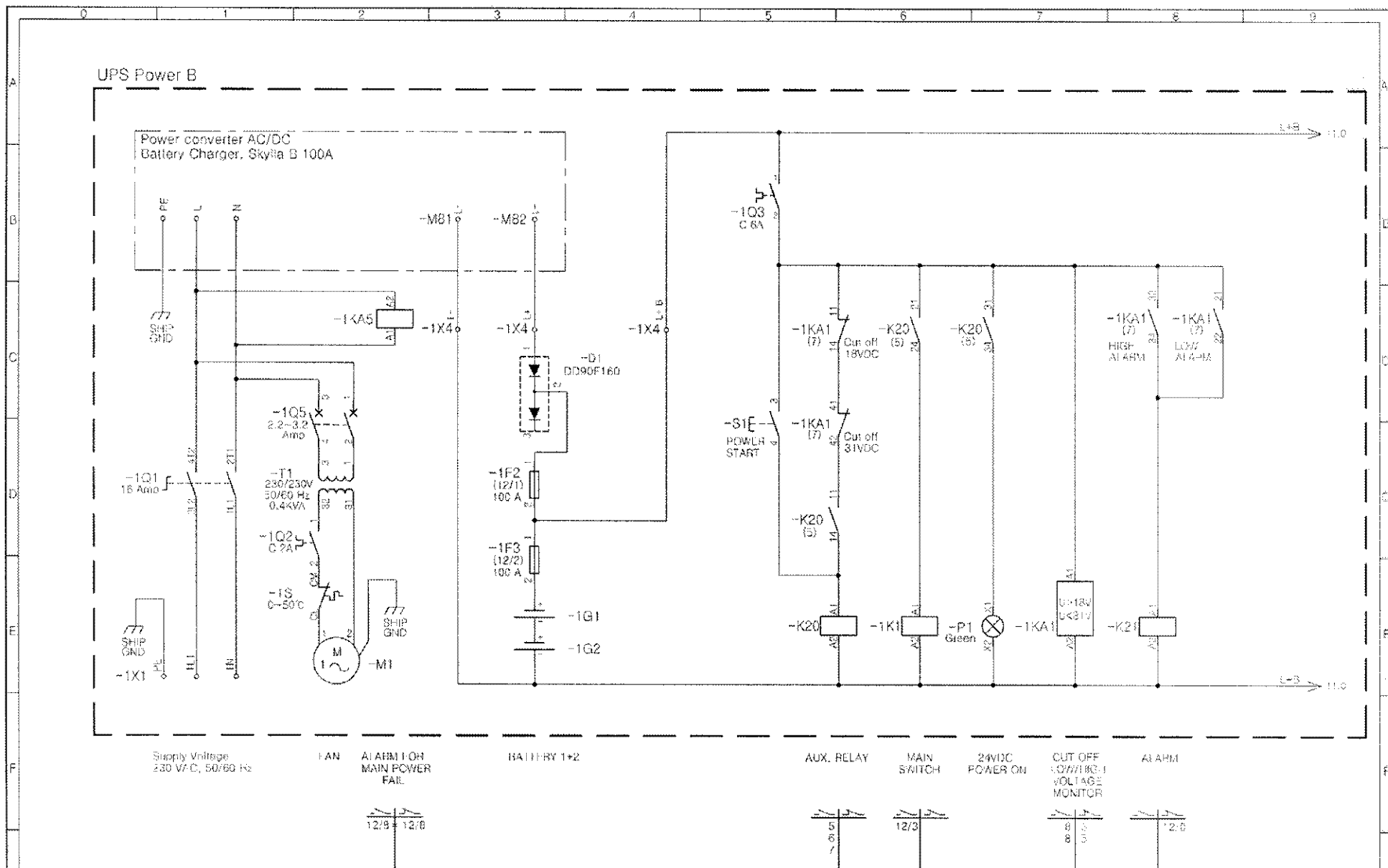
REV	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
1	14/04/2011	FOR APPROVAL	J. W. BAEK	S. M. KIM	J. G. KIM
2					
3					

HWASAN CO., LTD.

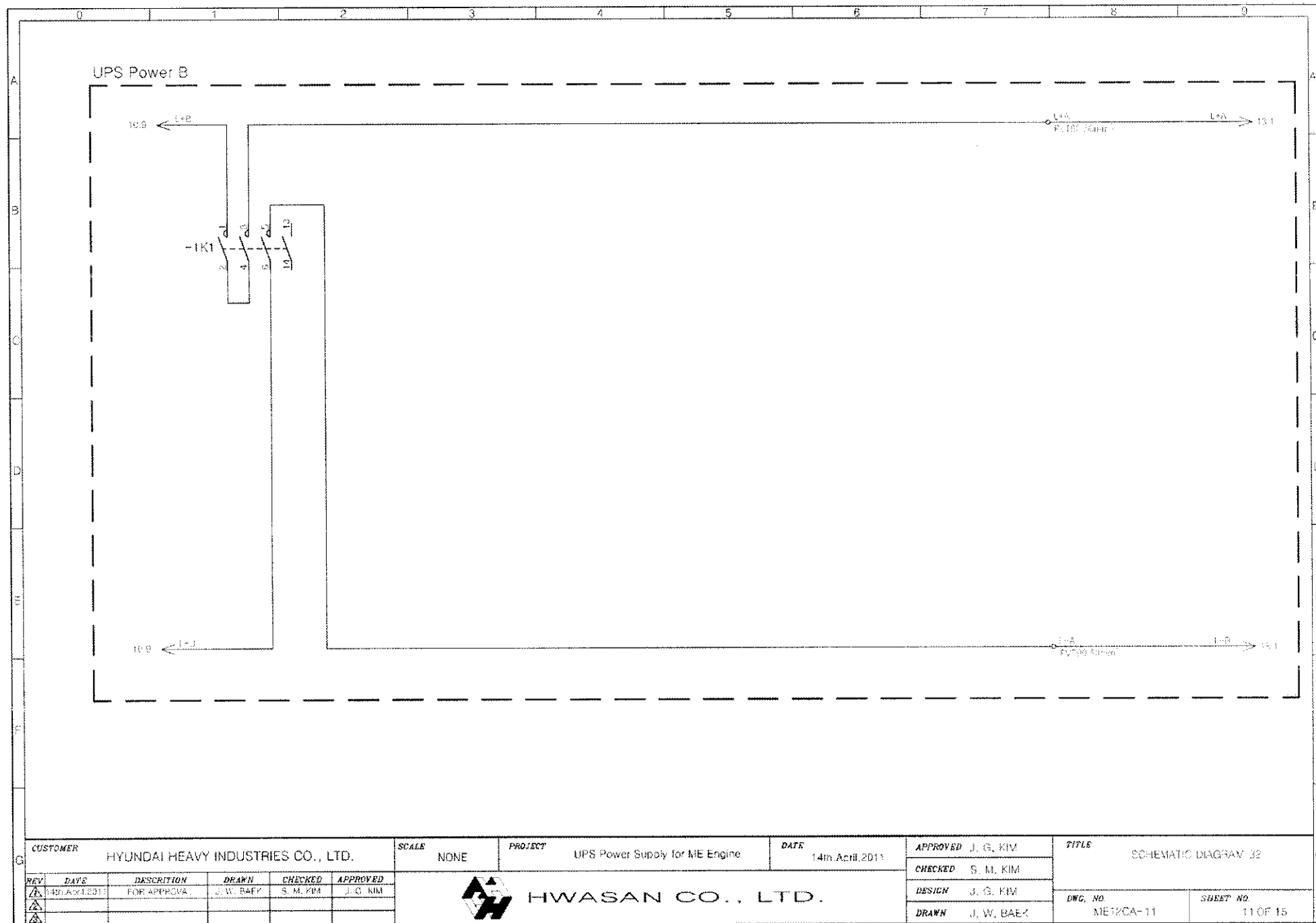
DWG. NO.	ME12CA-07	SHEET NO.	7 OF 15
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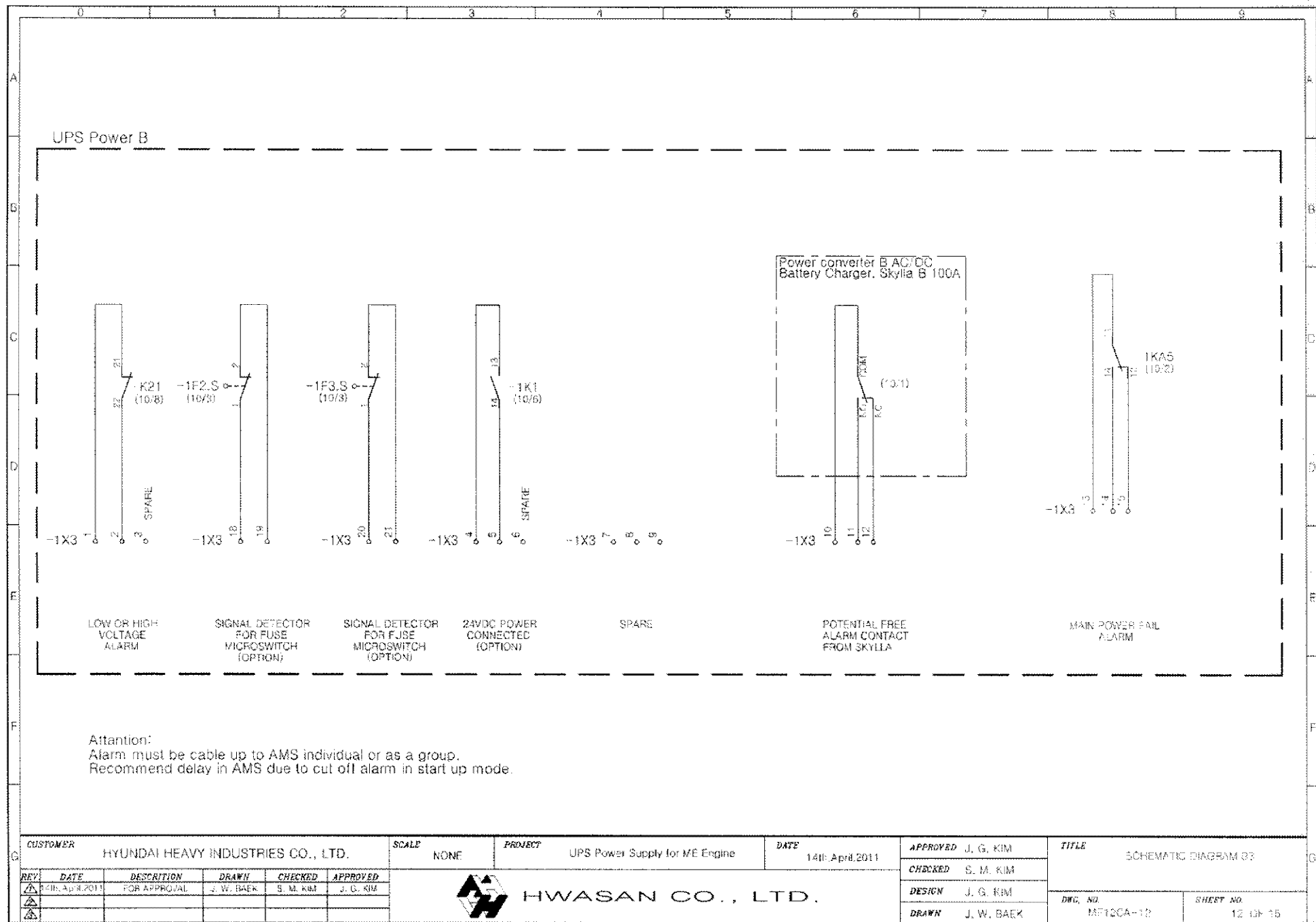


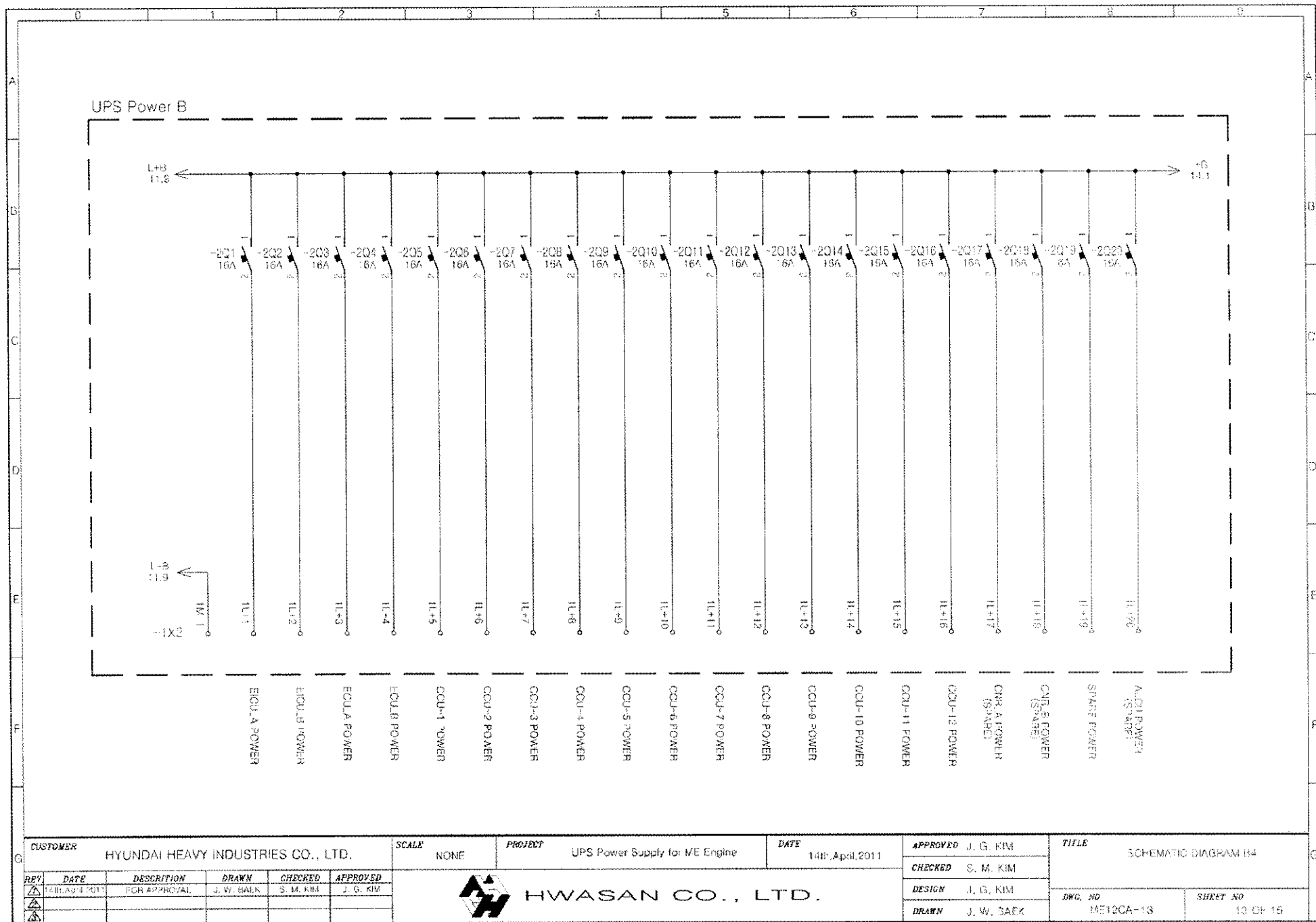


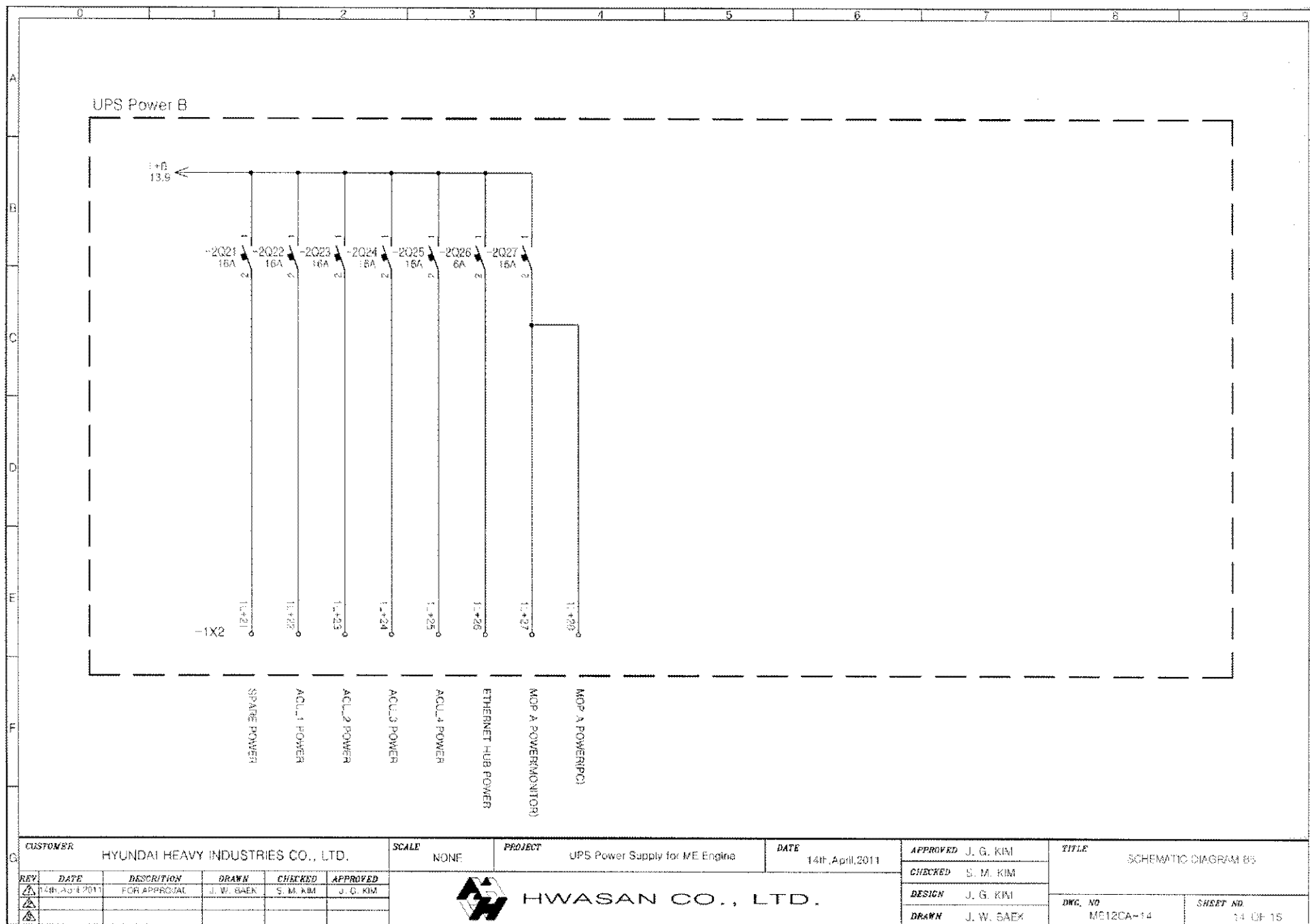


G	CUSTOMER					HYUNDAI HEAVY INDUSTRIES CO., LTD.	SCALE	NONE	PROJECT	UPS Power Supply for ME Engine	DATE	14th April 2011	APPROVED	J. G. KIM	TITLE		SCHEMATIC DIAGRAM 61
	REV	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED	 HWASAN CO., LTD.							CHECKED	S. M. KIM		
	1	14th April 2011	FOR APPROVAL	J. W. BAEK	S. M. KIM	J. G. KIM								DESIGN	J. G. KIM		
	2													DRAWN	J. W. BAEK		









TERMINAL BLOCK

NAME	WIRE No.	TB No.	
-IX1	-IX1:1L1	1L1	
PE	-IX1:1N	1N	
	-IX2:1M-1	-1M-1	MAIN POWER INPUT LINE P-1L13, P-1L13
	-IX2:1M-1	-1M-1	OV LINE
	-IX2:1L+1	1L+ 1	EQU. A POWER
	-IX2:1M-1	1M-1 1-1	OV LINE
	-IX2:1L+2	1L+ 2	EQU. B POWER
	-IX2:1M-1	1M-1 2-1	OV LINE
	-IX2:1L+3	1L+ 3	EQU. A POWER
	-IX2:1M-1	1M-1 3-1	OV LINE
	-IX2:1L+4	1L+ 4	EQU. B POWER
	-IX2:1M-1	1M-1 4-1	OV LINE
	-IX2:1L+5	1L+ 5	EQU. A POWER
	-IX2:1M-1	1M-1 5-1	OV LINE
	-IX2:1L+6	1L+ 6	EQU. B POWER
	-IX2:1M-1	1M-1 6-1	OV LINE
	-IX2:1L+7	1L+ 7	EQU. A POWER
	-IX2:1M-1	1M-1 7-1	OV LINE
	-IX2:1L+8	1L+ 8	EQU. B POWER
	-IX2:1M-1	1M-1 8-1	OV LINE
	-IX2:1L+9	1L+ 9	EQU. A POWER
	-IX2:1M-1	1M-1 9-1	OV LINE
	-IX2:1L+10	1L+ 10	EQU. B POWER
	-IX2:1M-1	1M-1 10-1	OV LINE
	-IX2:1L+11	1L+ 11	EQU. A POWER
	-IX2:1M-1	1M-1 11-1	OV LINE
	-IX2:1L+12	1L+ 12	EQU. B POWER
	-IX2:1M-1	1M-1 12-1	OV LINE
	-IX2:1L+13	1L+ 13	EQU. A POWER
	-IX2:1M-1	1M-1 13-1	OV LINE
	-IX2:1L+14	1L+ 14	EQU. B POWER
	-IX2:1M-1	1M-1 14-1	OV LINE
	-IX2:1L+15	1L+ 15	EQU. A POWER
	-IX2:1M-1	1M-1 15-1	OV LINE
	-IX2:1L+16	1L+ 16	EQU. B POWER
	-IX2:1M-1	1M-1 16-1	OV LINE
	-IX2:1L+17	1L+ 17	EQU. A POWER
	-IX2:1M-1	1M-1 17-1	OV LINE
	-IX2:1L+18	1L+ 18	EQU. B POWER
	-IX2:1M-1	1M-1 18-1	OV LINE
	-IX2:1L+19	1L+ 19	EQU. A POWER
	-IX2:1M-1	1M-1 19-1	OV LINE
	-IX2:1L+20	1L+ 20	EQU. B POWER
	-IX2:1M-1	1M-1 20-1	OV LINE
	-IX2:1L+21	1L+ 21	EQU. A POWER
	-IX2:1M-1	1M-1 21-1	OV LINE
	-IX2:1L+22	1L+ 22	EQU. B POWER
	-IX2:1M-1	1M-1 22-1	OV LINE
	-IX2:1L+23	1L+ 23	EQU. A POWER
	-IX2:1M-1	1M-1 23-1	OV LINE
	-IX2:1L+24	1L+ 24	EQU. B POWER
	-IX2:1M-1	1M-1 24-1	OV LINE
	-IX2:1L+25	1L+ 25	EQU. A POWER
	-IX2:1M-1	1M-1 25-1	OV LINE
	-IX2:1L+26	1L+ 26	EQU. B POWER
	-IX2:1M-1	1M-1 26-1	OV LINE
	-IX2:1L+27	1L+ 27	EQU. A POWER
	-IX2:1M-1	1M-1 27-1	OV LINE
	-IX2:1L+28	1L+ 28	EQU. B POWER
	-IX2:1M-1	1M-1 28-1	OV LINE

TERMINAL BLOCK

-IX3:1	1	
-IX3:2	2	
-IX3:4	4	
-IX3:5	5	
-IX3:7	7	
-IX3:8	8	
-IX3:9	9	
-IX3:10	10	
-IX3:11	11	
-IX3:12	12	
-IX3:13	13	
-IX3:14	14	
-IX3:15	15	
-IX3:16	16	
-IX3:17	17	
-IX3:18	18	
-IX3:19	19	
-IX3:20	20	
-IX3:21	21	
PE		
PE		
PE		
PE		

A-ME-69/76(HLM67)

A-ME-69/65(MAKER CABLE)

A-ME-69/65(MAKER CABLE)

A-ME-69/65(MAKER CABLE)

A-ME-67/68(H16)

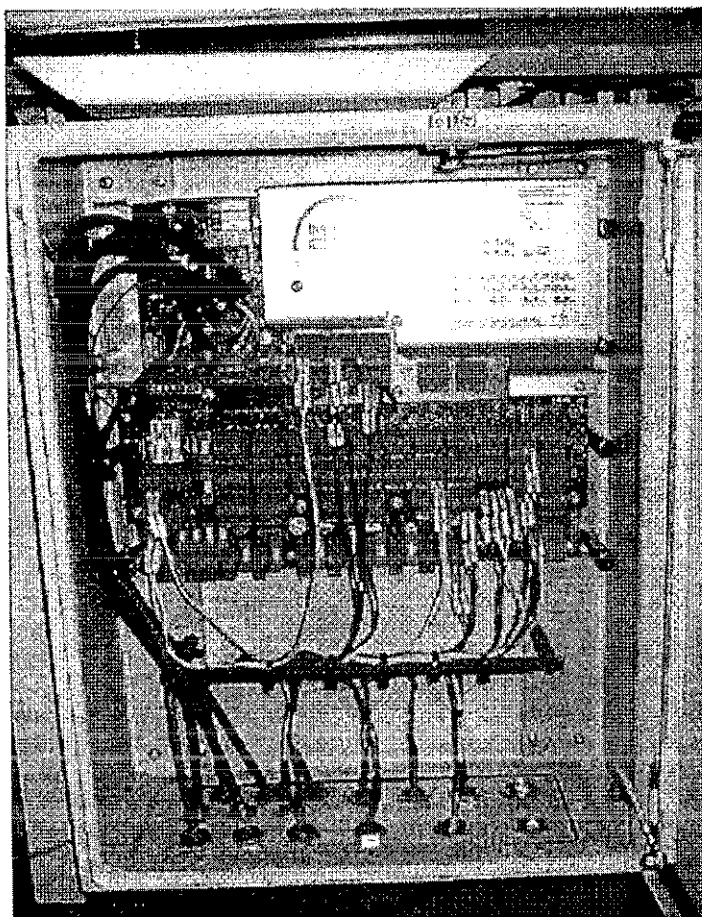
CUSTOMER HYUNDAI HEAVY INDUSTRIES CO., LTD.					SCALE NONE	PROJECT UPS Power Supply for ME Engine	DATE 14th April 2011	APPROVED J. G. KIM	TITLE CONNECTION DIAGRAM	
CHECKED S. M. KIM								DRAWN J. W. BAEK		
DESIGN J. G. KIM								DWG. NO. ME12CA-15		SHEET NO. 15 OF 15
DRAWN J. W. BAEK										



HWASAN CO., LTD.

ECS WIRING REQUIREMENT FOR SHIPYARD CONNECTION

HHI-EMD



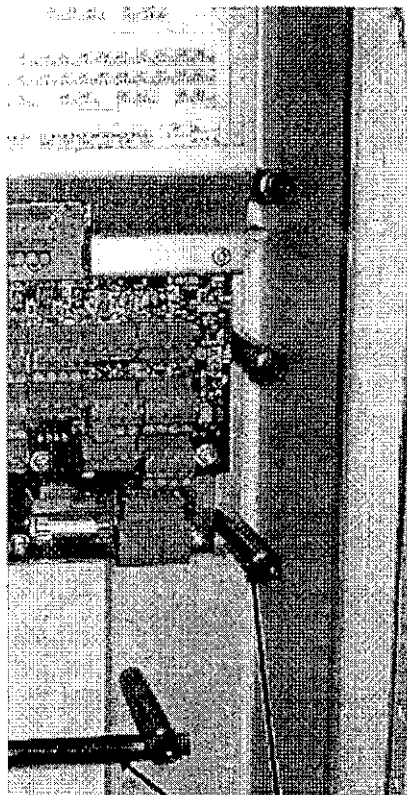
Correct mounting of EICU!

- EICU-A & EICU-B must be mounted inside EMC cabinets in the Engine Control Room

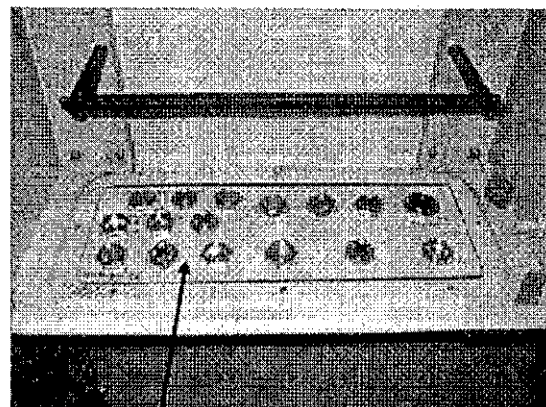
Normally the EICU cabinets are mounted inside the control desk

- EMC cabinets must not be covered by insulation or other materials

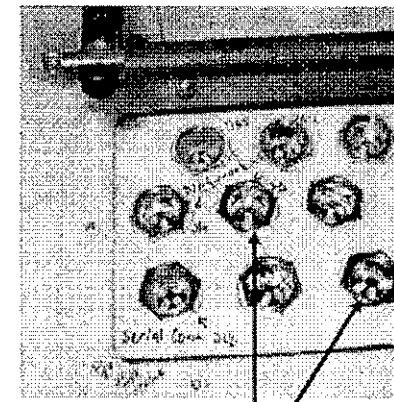
Heat release from the EICU's should not be prevented



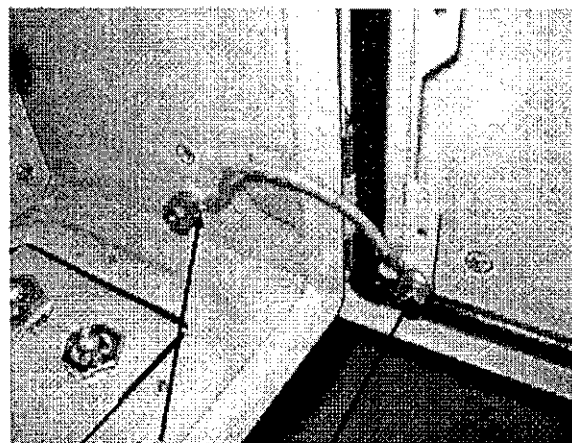
Mount wire relief and tubular spacer



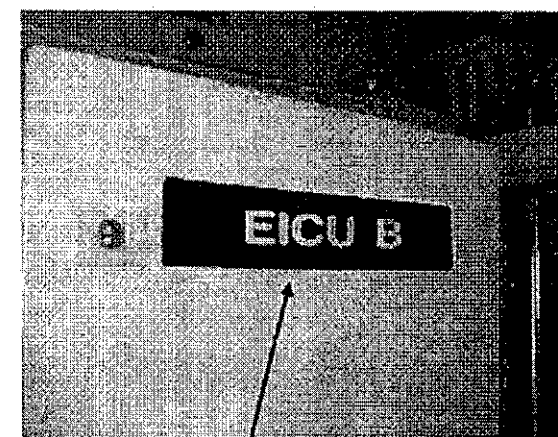
Gland plate with EMC cable glands



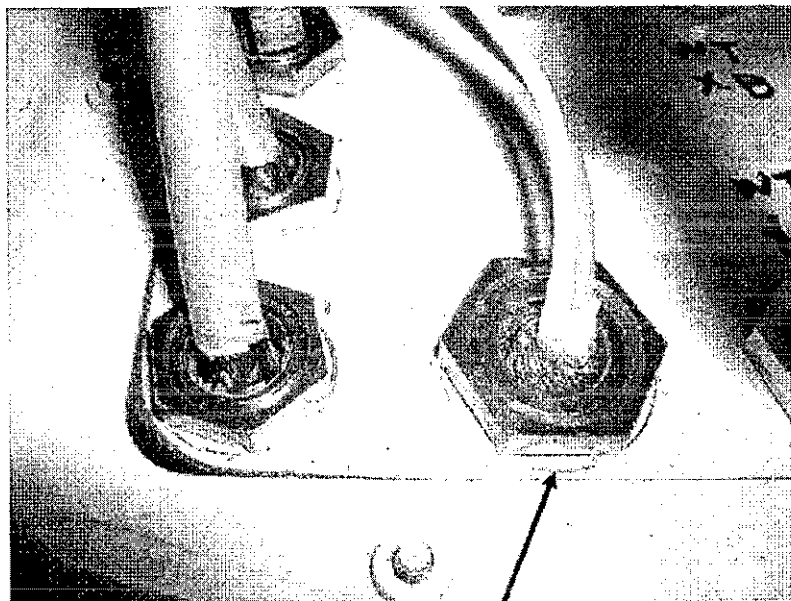
Gland plate with EMC cable glands



Earth wire connect to EICU cabinets



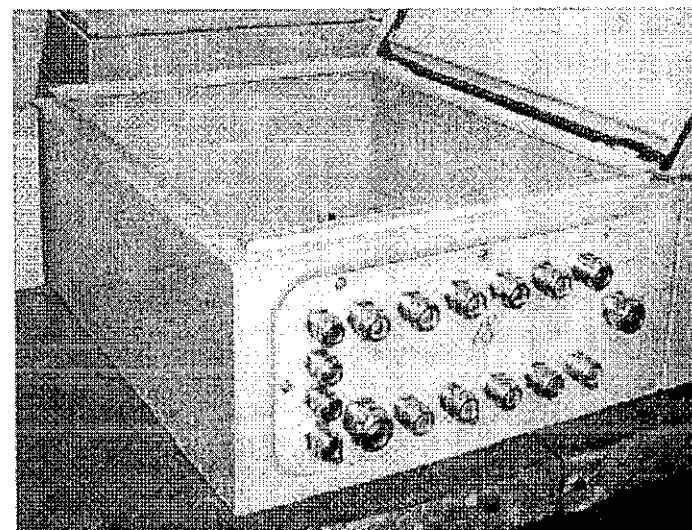
Identification sign on cabinets



- Gland nut to cut through bottom plate paint in order to ensure electrical grounding of cable screen

- All cables to EICU-A and EICU-B must be terminated in EMC cable glands at the EICU cabinet bottom plates

Cable glands are yard supply. Correct gland size depends on the cable type, and only shipyard can identify all cables

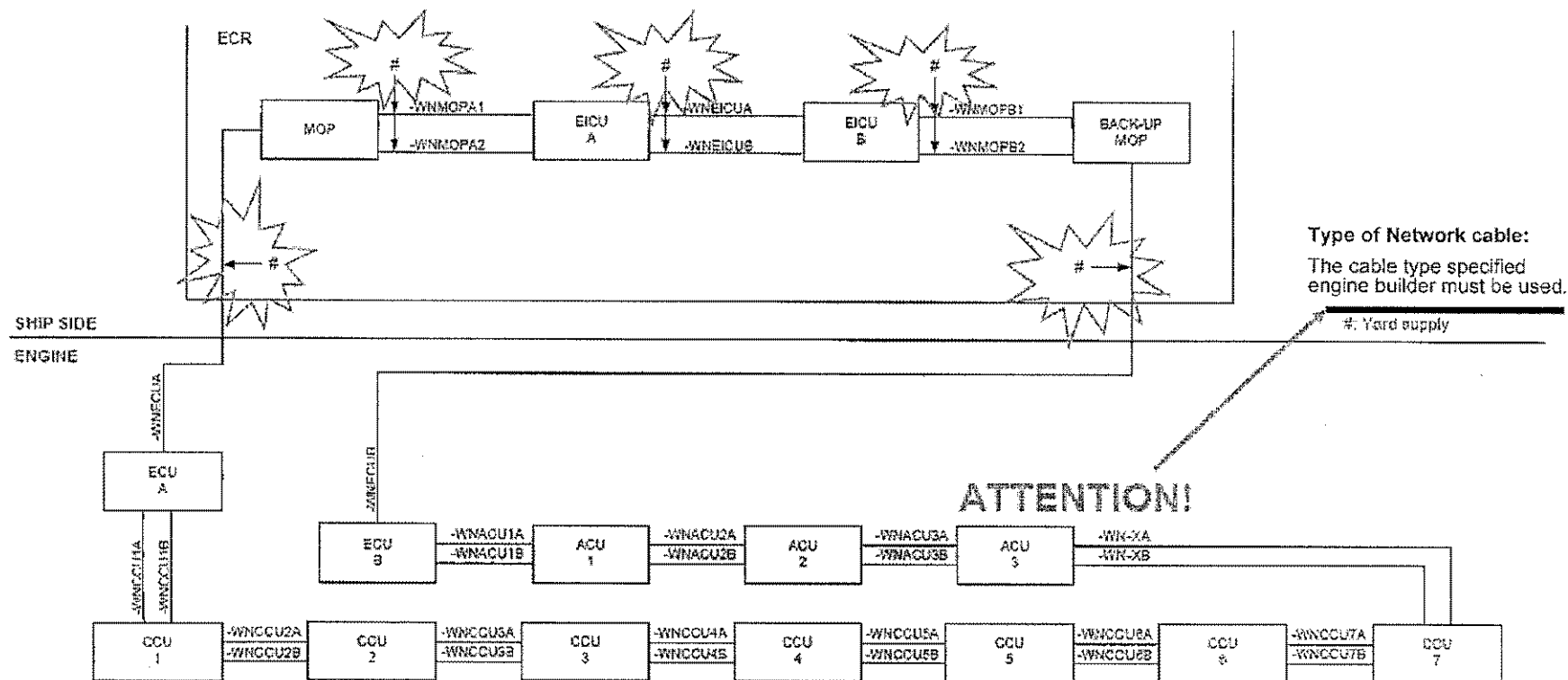


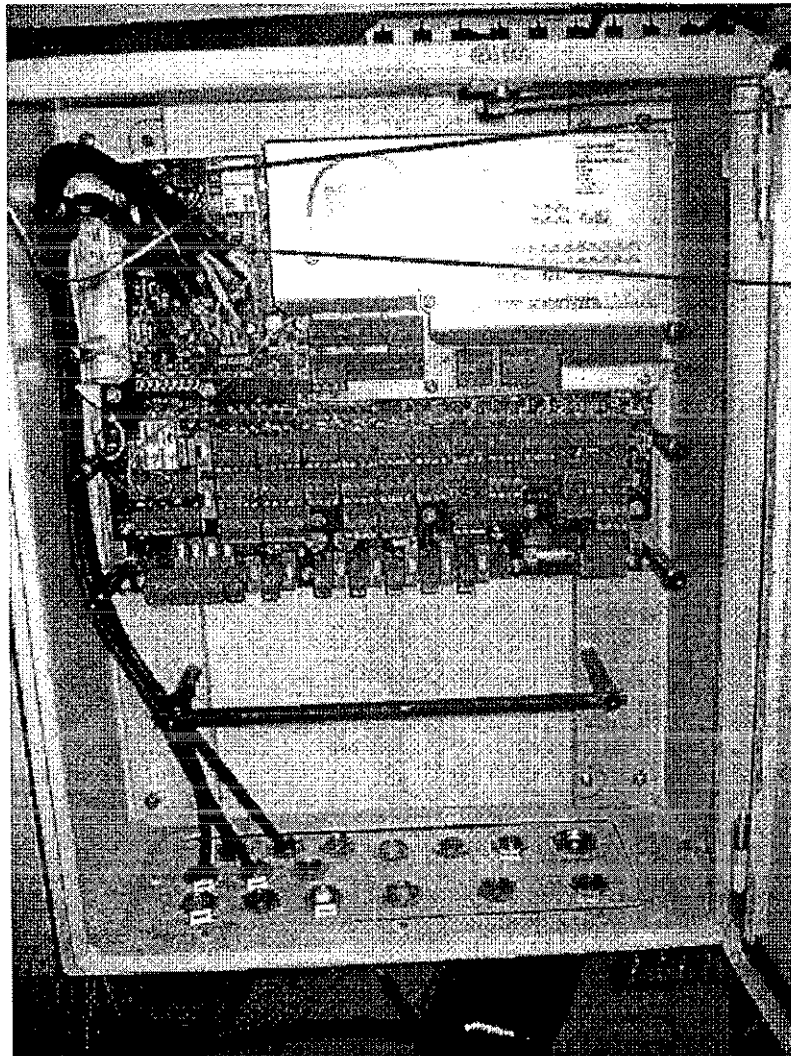


Building a better future
Global Leader

ECS WIRING REQUIREMENT FOR SHIPYARD CONNECTION

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

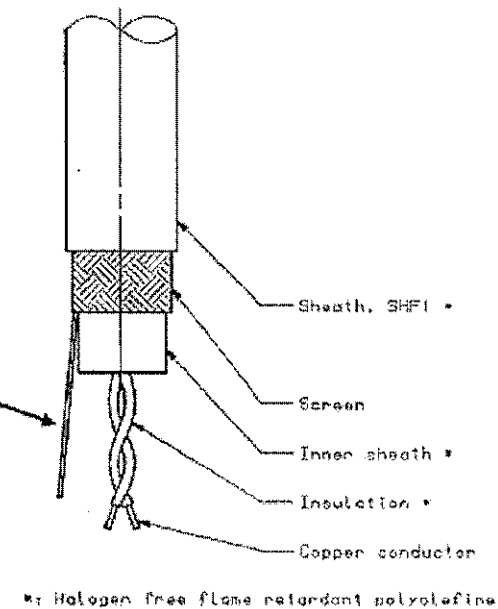
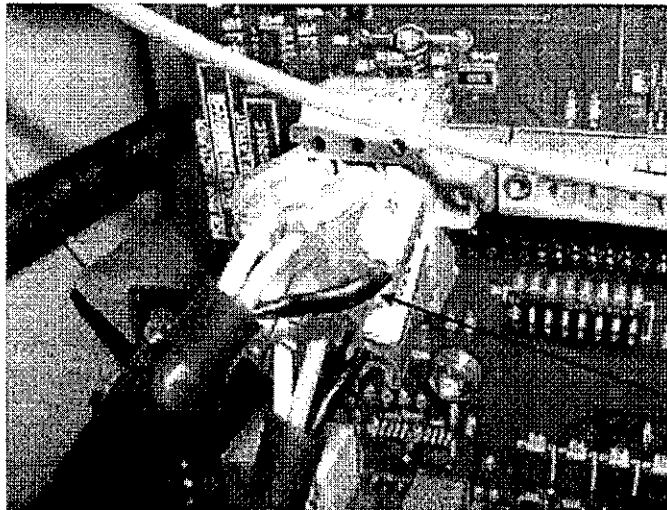




Network cables (4 pcs.) in EICU

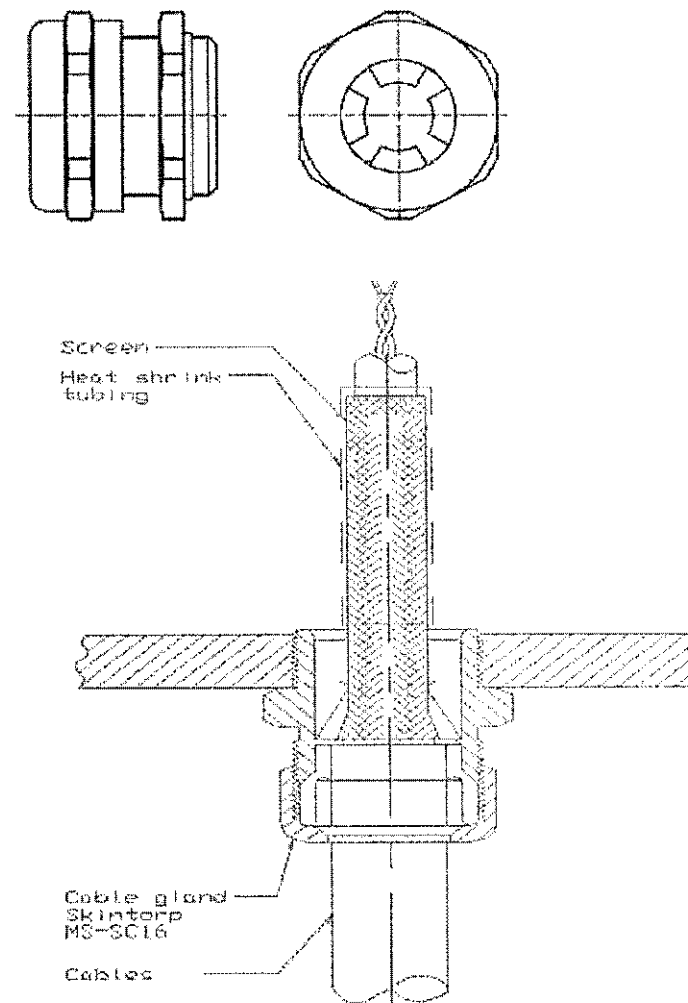
- Cable screen to be led into the EICU cabinet, as close to the termination as possible (app. 3-5 cm)
- Heat shrink tubing (or similar) to be fitted on the outside of the screen

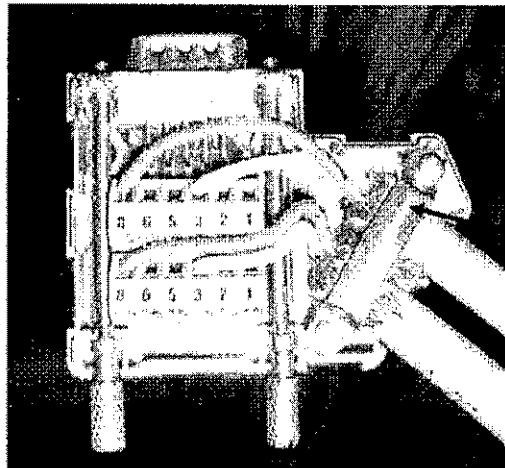
Network cables are yard supply



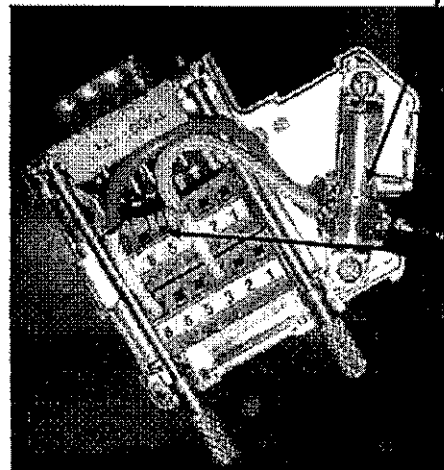
- Drain wire to be terminated on the EICU
- Heat shrink tubing to be applied on the outside of the drain wire

- Screen to be terminated at the EICU cabinet by use of cable gland with "wings"

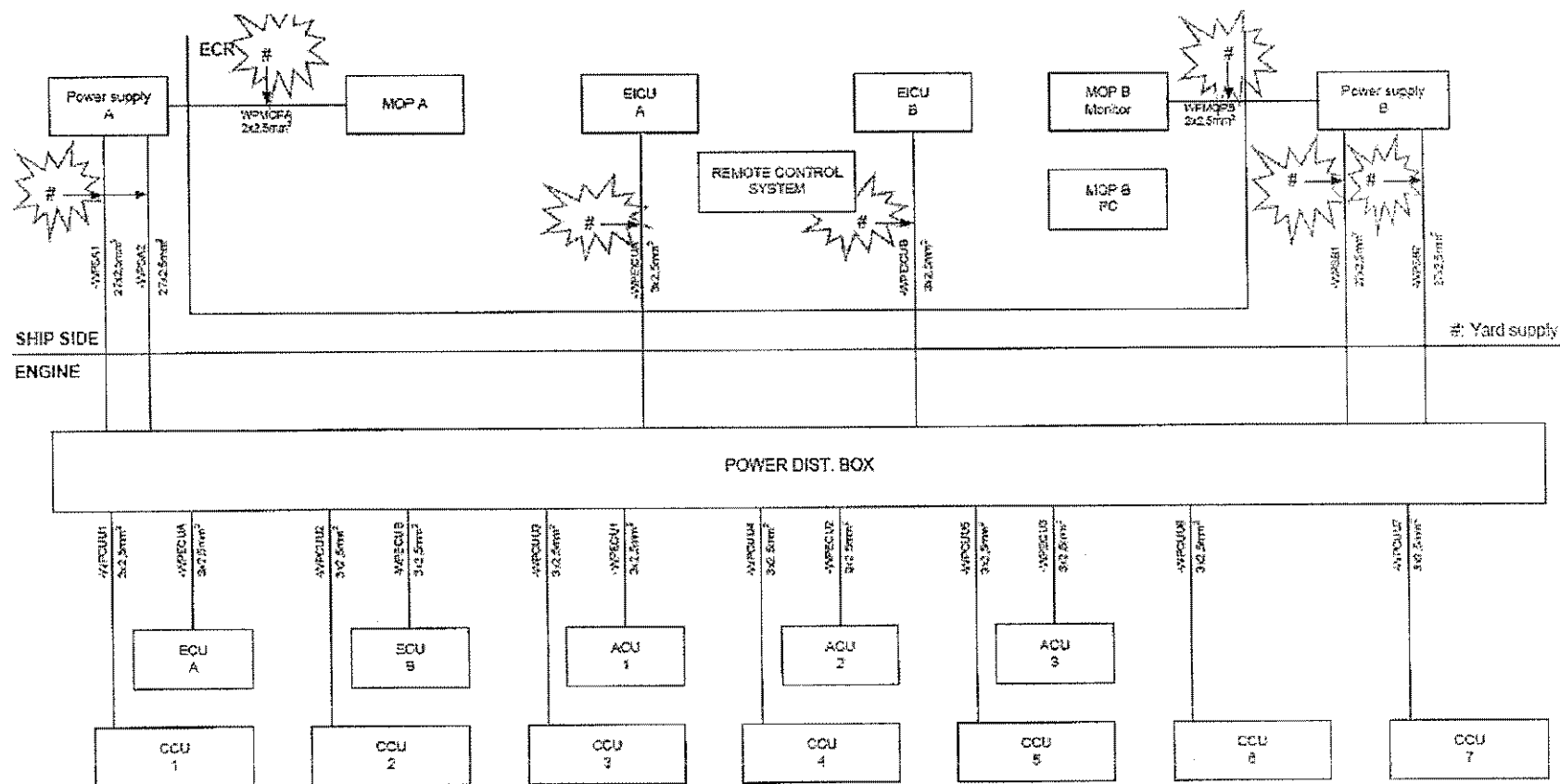


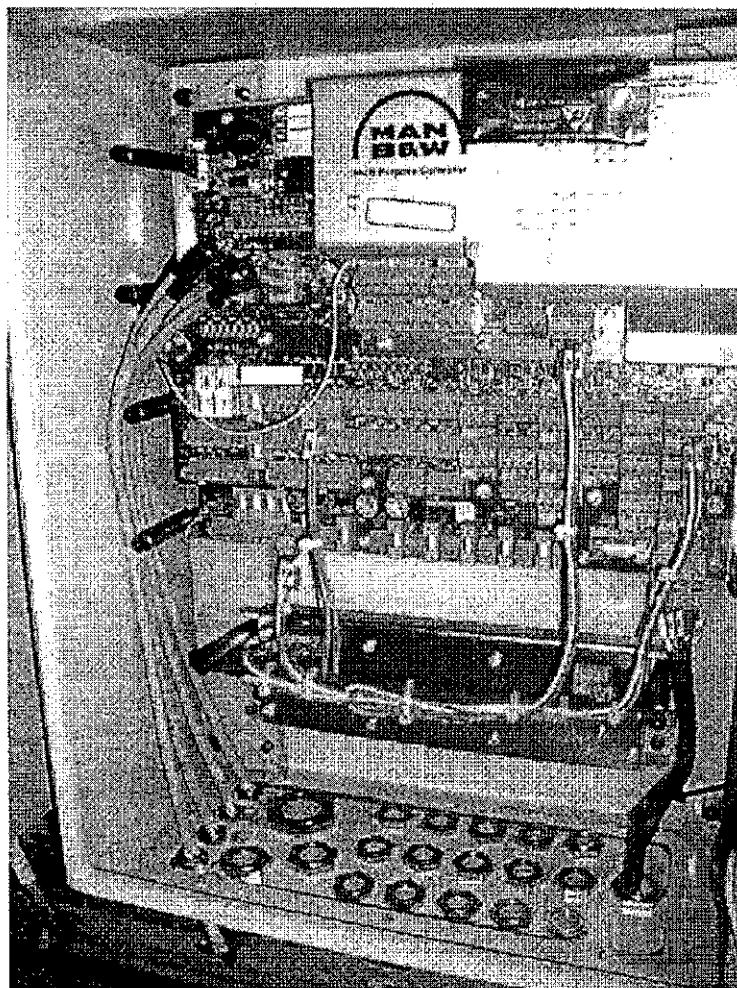


- Cable screen to be led into the SUB-D9 plug
- Cable screen to be wrapped around the cable insulation and secured in the cable strain relief fitting



- A 120 Ohm terminating resistor must be mounted in the plug at the end of each of the two network lines

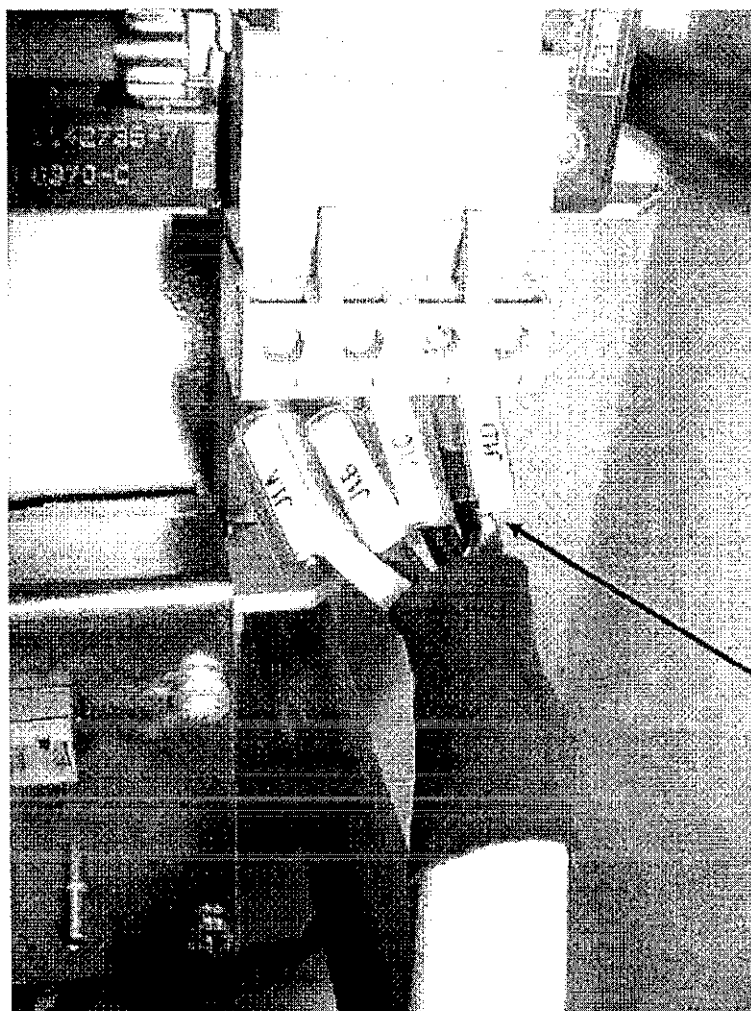




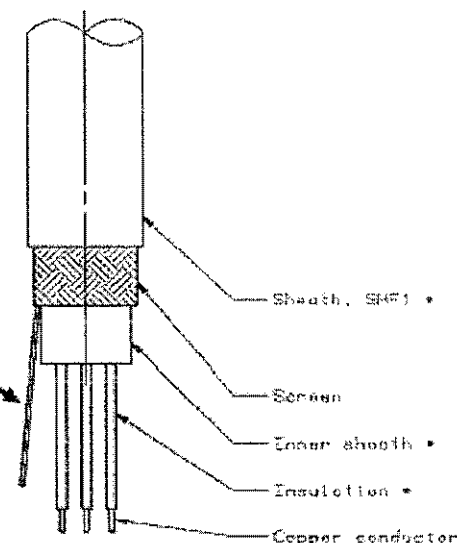
- Cable screen to be led into the EICU cabinet, as close to the termination as possible (app. 3-5 cm)
- Heat shrink tubing (or similar) to be fitted on the outside of the screen
- The Power to EICU A and B must come from the Power Distribution Box on the Control Panel on the Engine

Power cable
(1 pcs.)

Power cables are yard
supply

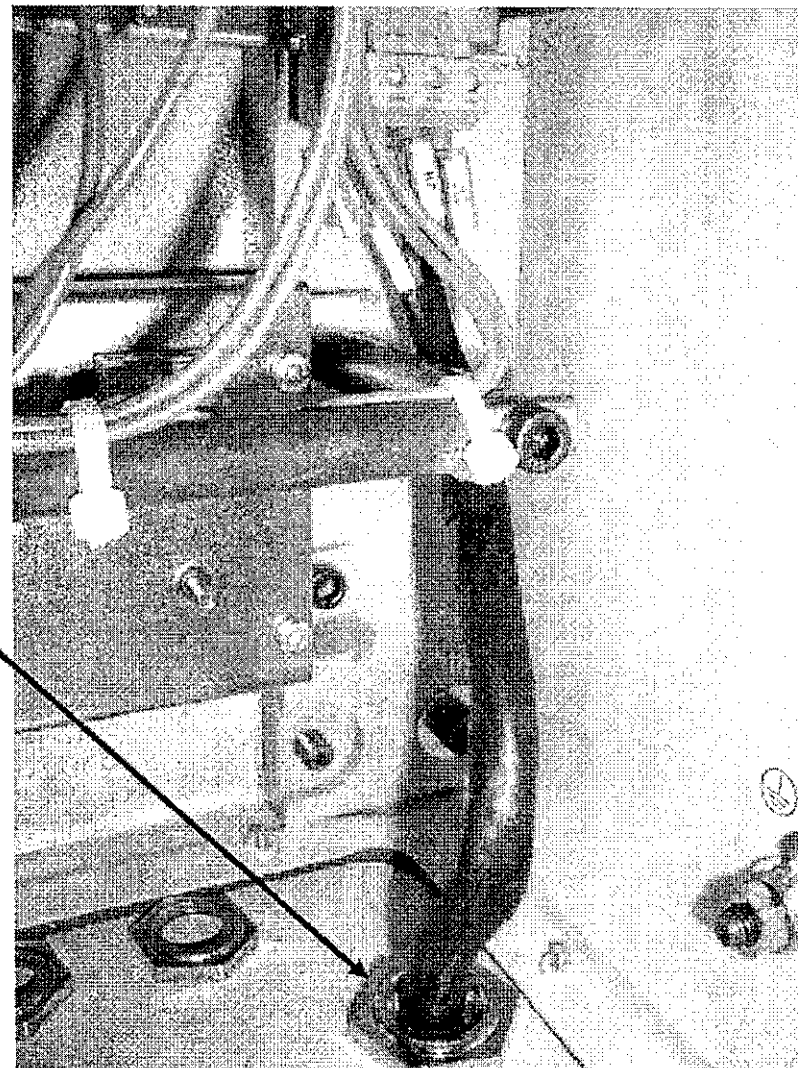
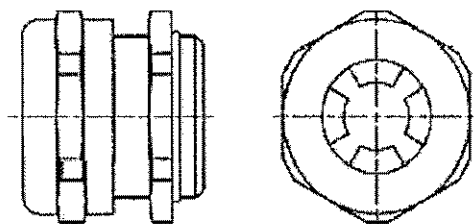


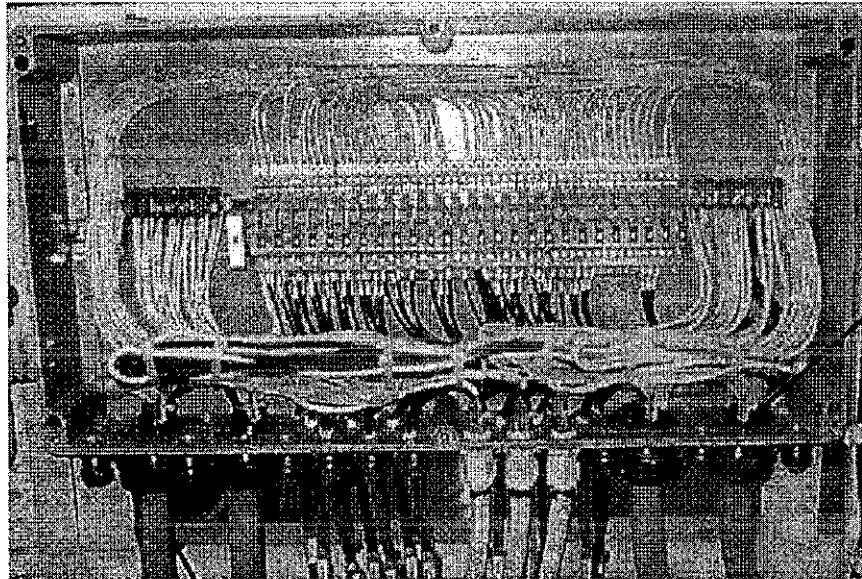
- In case of drain wire in cable;
terminate drain wire on EICU
- In case of no drain wire in cable;
twist part of the cable screen and
terminate on EICU
- Heat shrink tubing to be applied on
the outside of the drain wire/twisted
screen



*: Halogen free flame retardant polyolefine

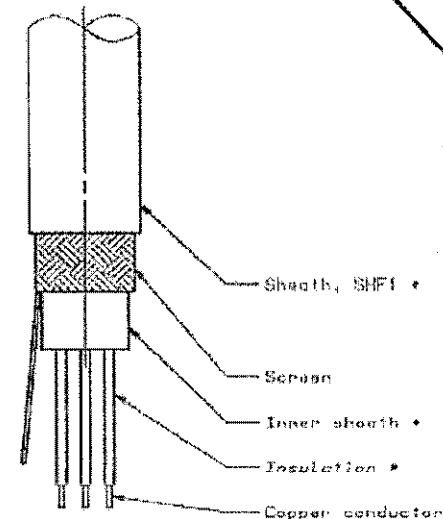
- Screen to be terminated at the EICU cabinet by use of cable gland with "wings"



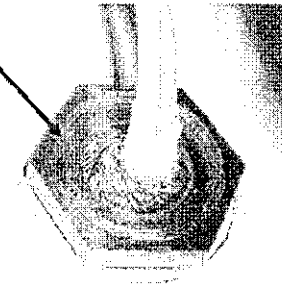


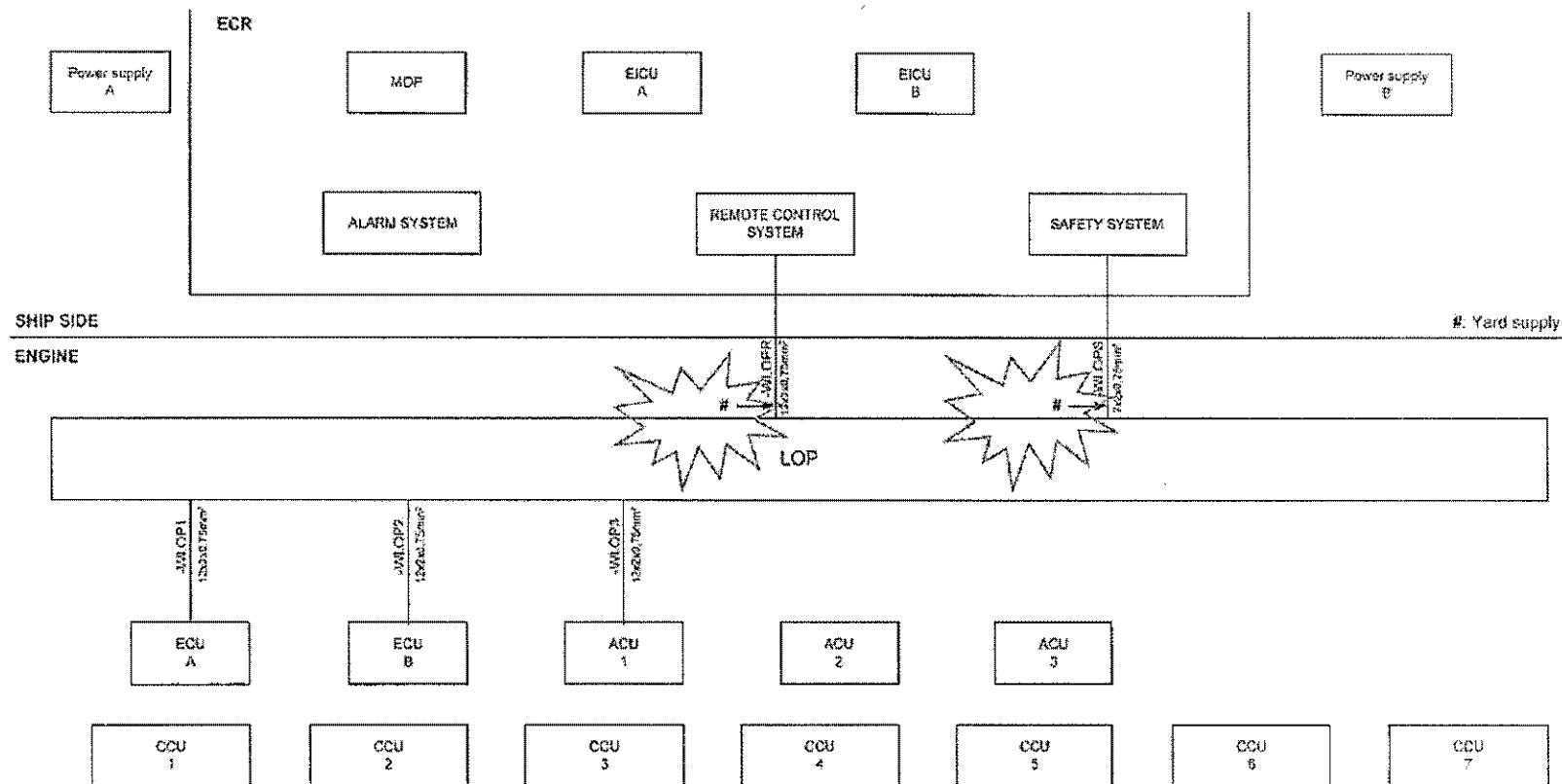
27x2.5 mm² - Yard supply

- Cable screen to be terminated in cable gland
- Cable gland without "wings"

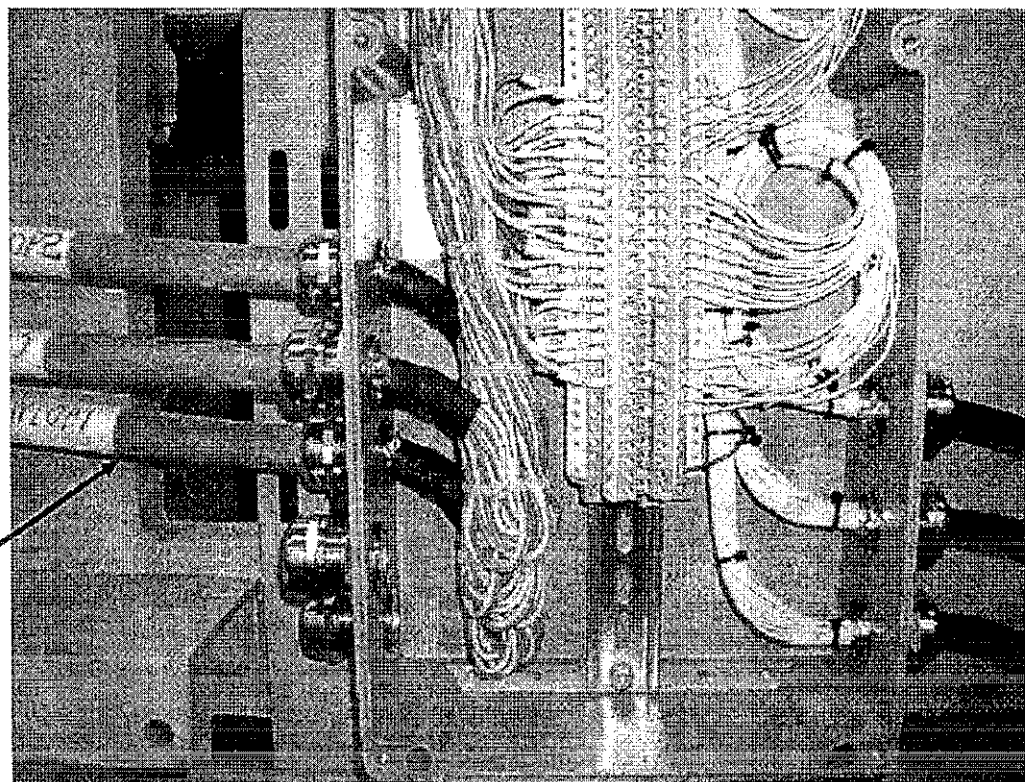


*: Halogen free flame retardant polyolefine

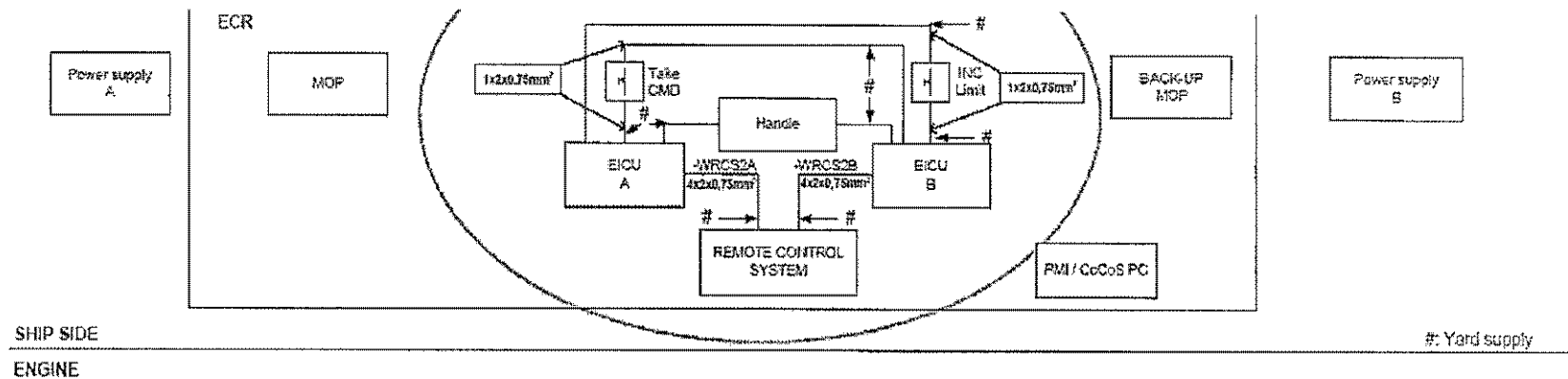




- Cable screen to be terminated at the cabinet
- Cable gland with "wings"
- Cable screen to be led 2-3 cm. into the cabinet and protected by heat shrink tubing (or similar)

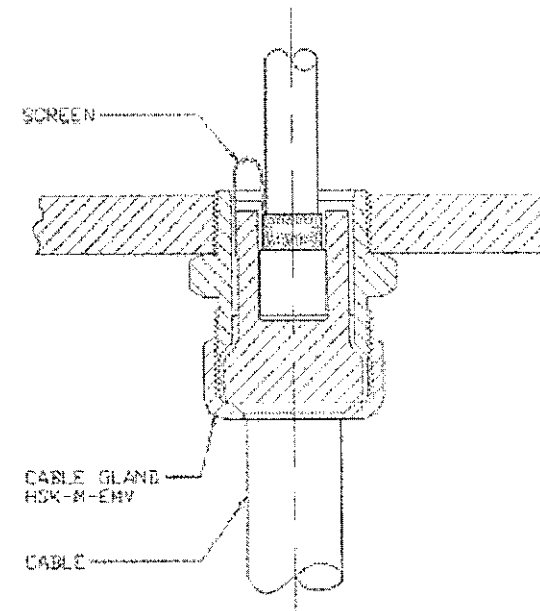
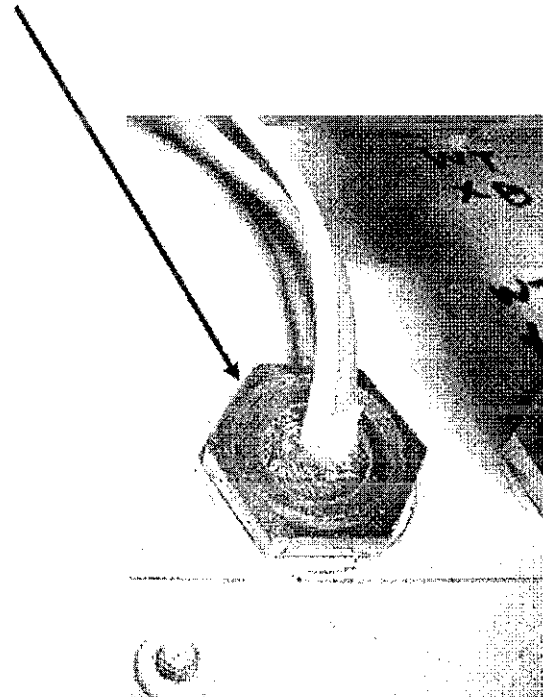
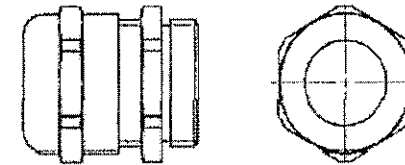


12x2x0.75 mm² – Yard supply



EICU Handle, INC Limit, Take CMD

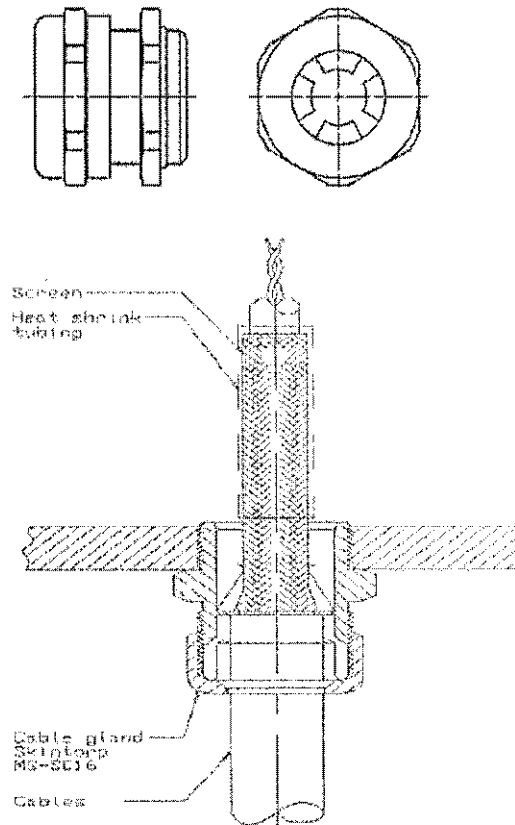
- Cable screens to be terminated at the EICU cabinet
- Cable glands without "wings"



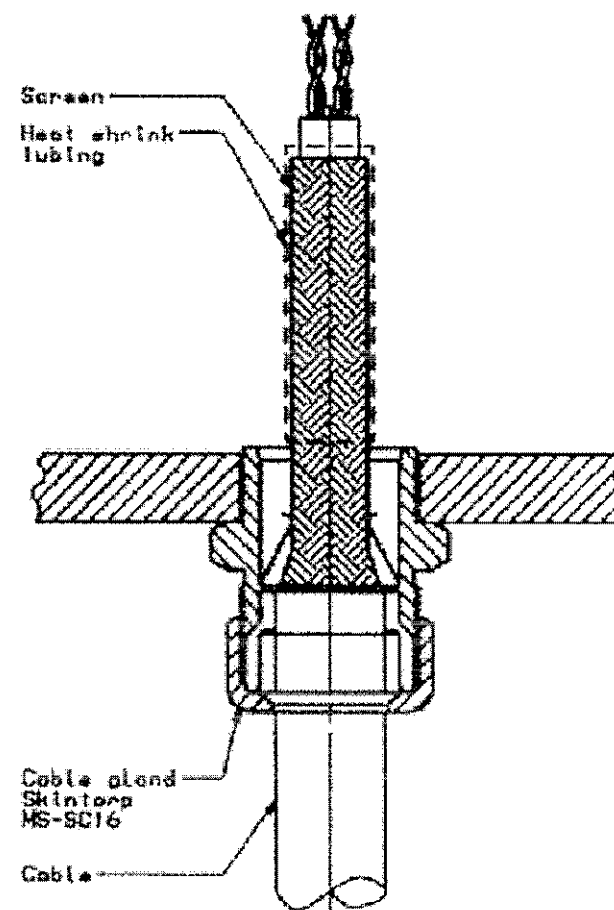
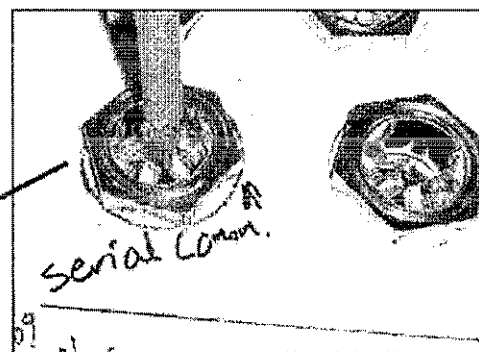
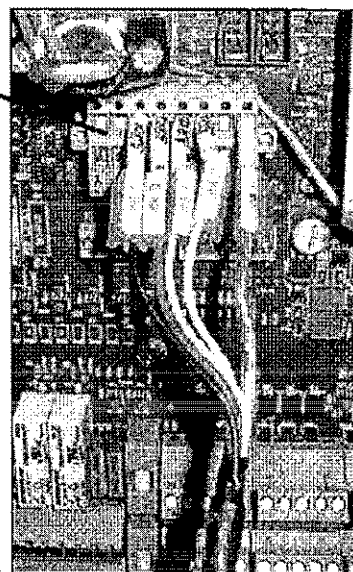
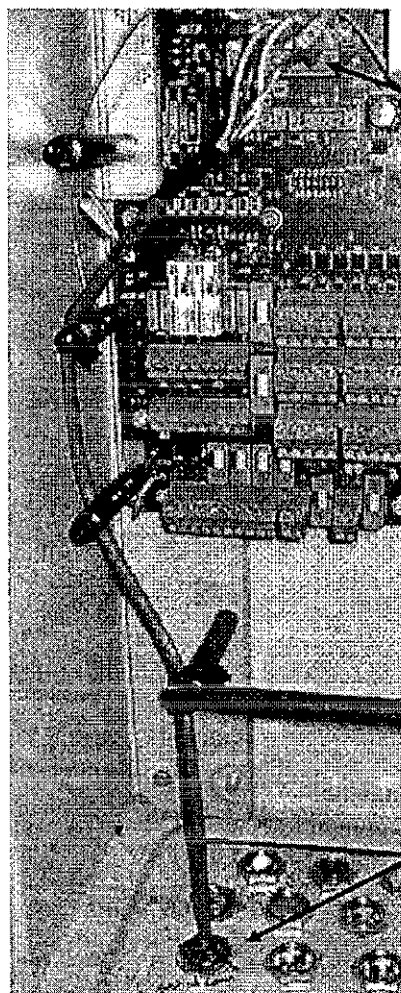
Serial communication - RS422

- Cable screen to be led into the EICU cabinet, as close to the termination as possible (approx. 3-5 cm.)
- Heat shrink tubing (or similar) to be fitted on the outside of the screen
- Drain wire to be terminated on the EICU
- Heat shrink tubing to be applied on the outside of the drain wire
- Screen to be terminated at the EICU cabinet by means of cable gland with "wings"
- See next page for correct installation for Serial Communication cable

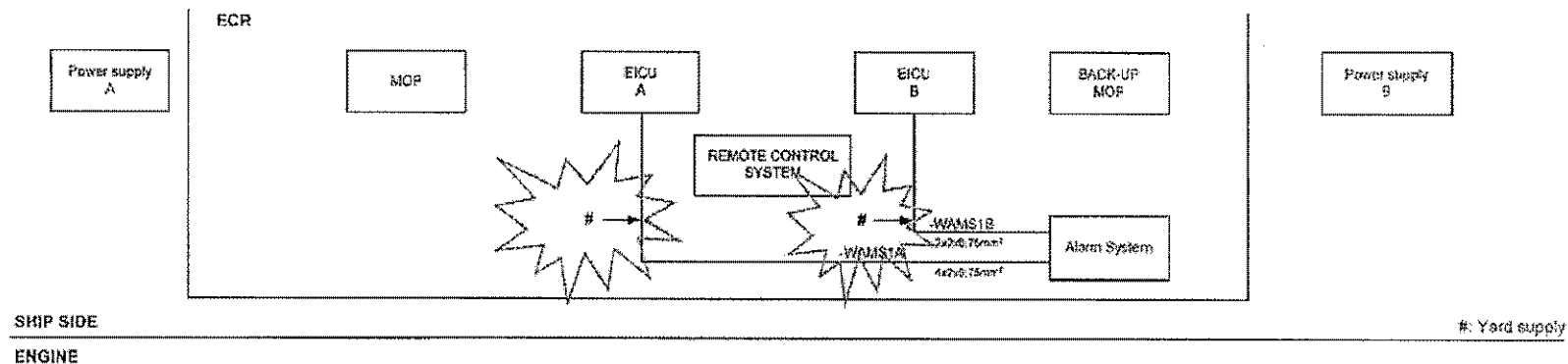
Serial communication cable is yard supply



Serial communication - RS422

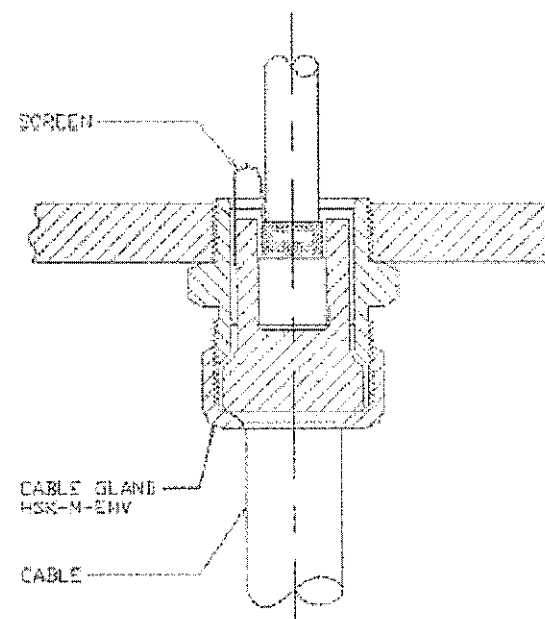
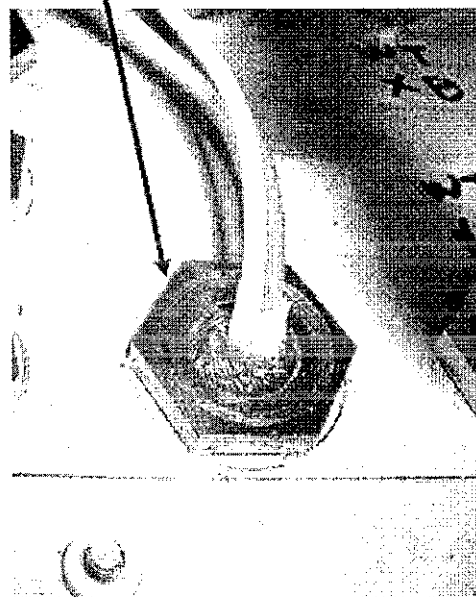
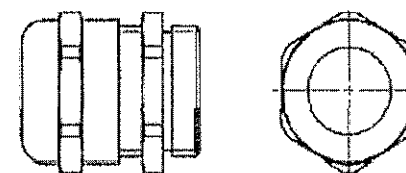


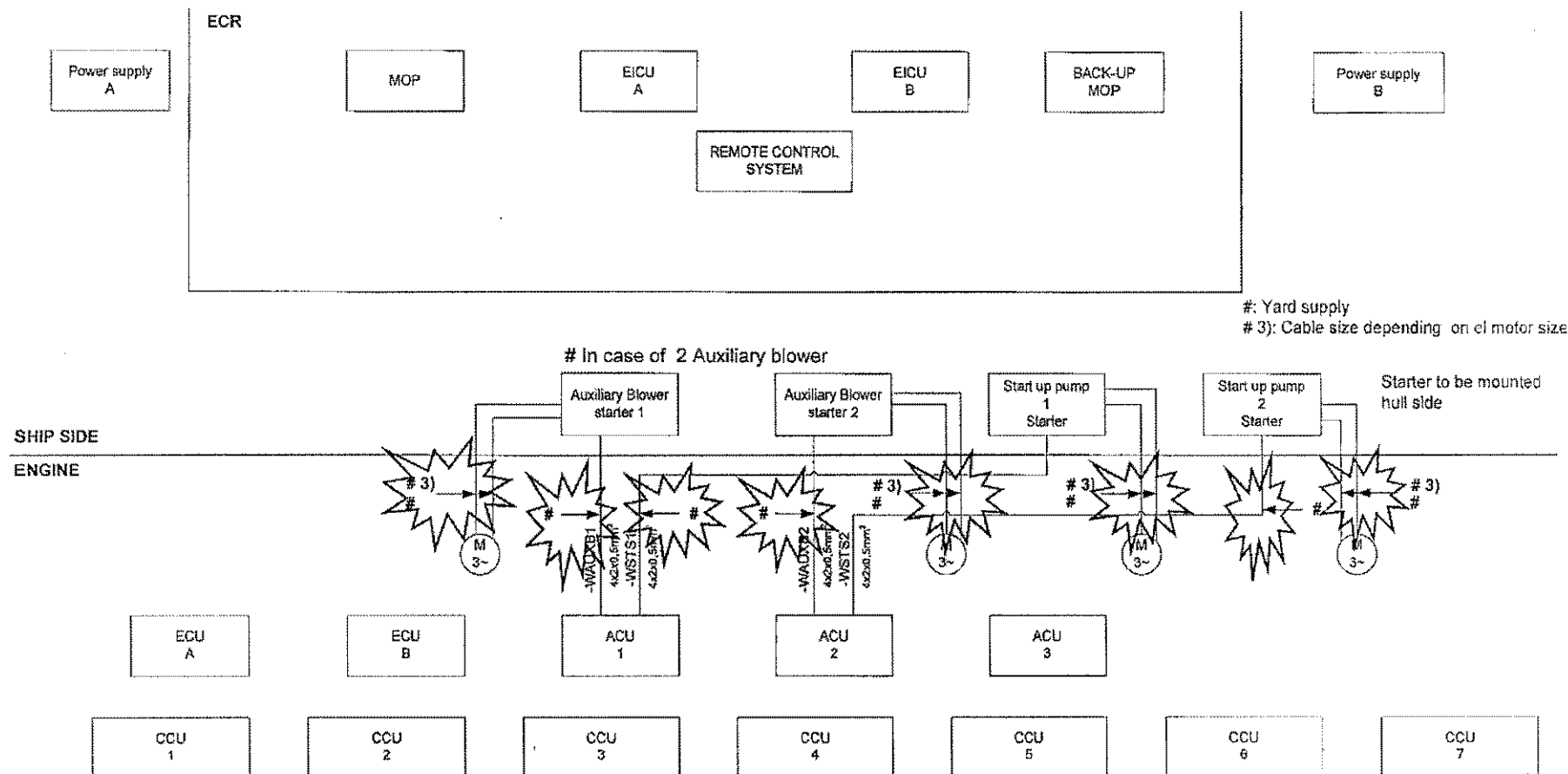
ECS WIRING REQUIREMENT FOR SHIPYARD CONNECTION



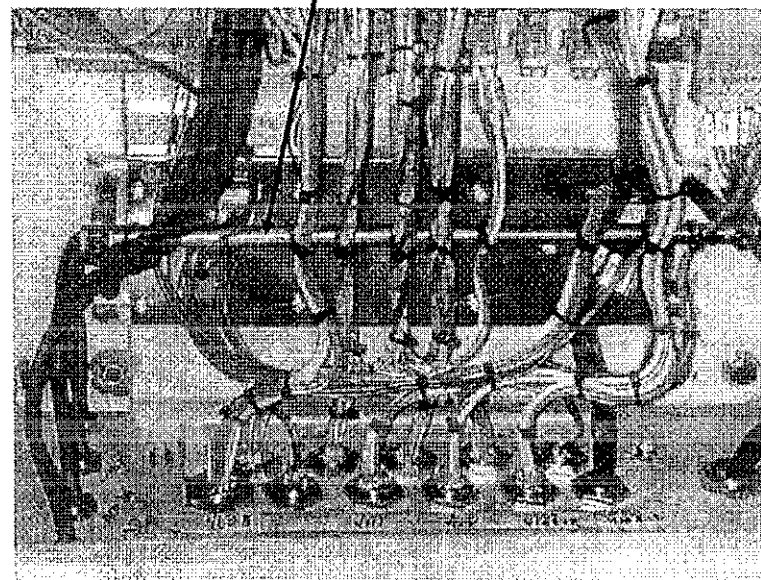
EICU Alarm System Cable

- Cable screen to be terminated at the EICU cabinet
- Cable gland without "wings"





- All wire terminals on the MPC to be tightened with a torque of 0.5 - 0.6 Nm
- All cables inside the MPC cabinets to be supported by a bar in order to reduce movement of cables



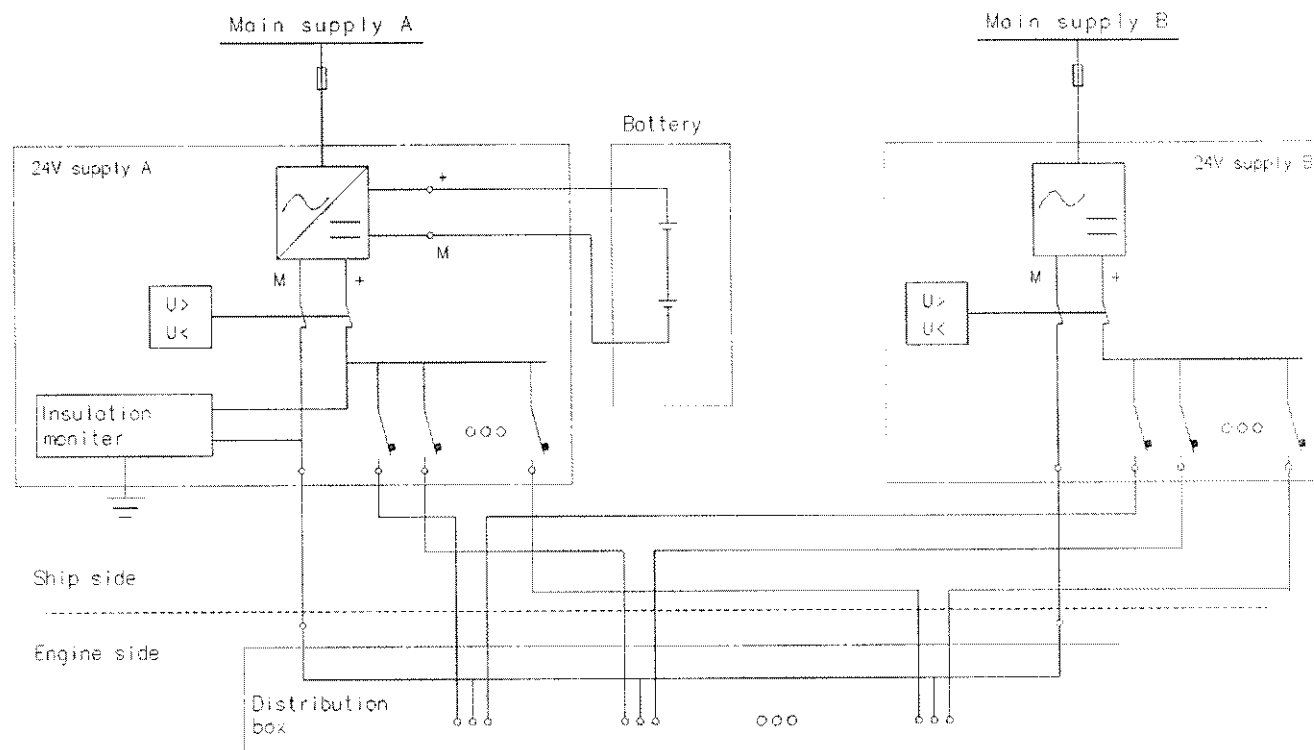
34

30

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ECS POWER CONNECTION

[illegible]



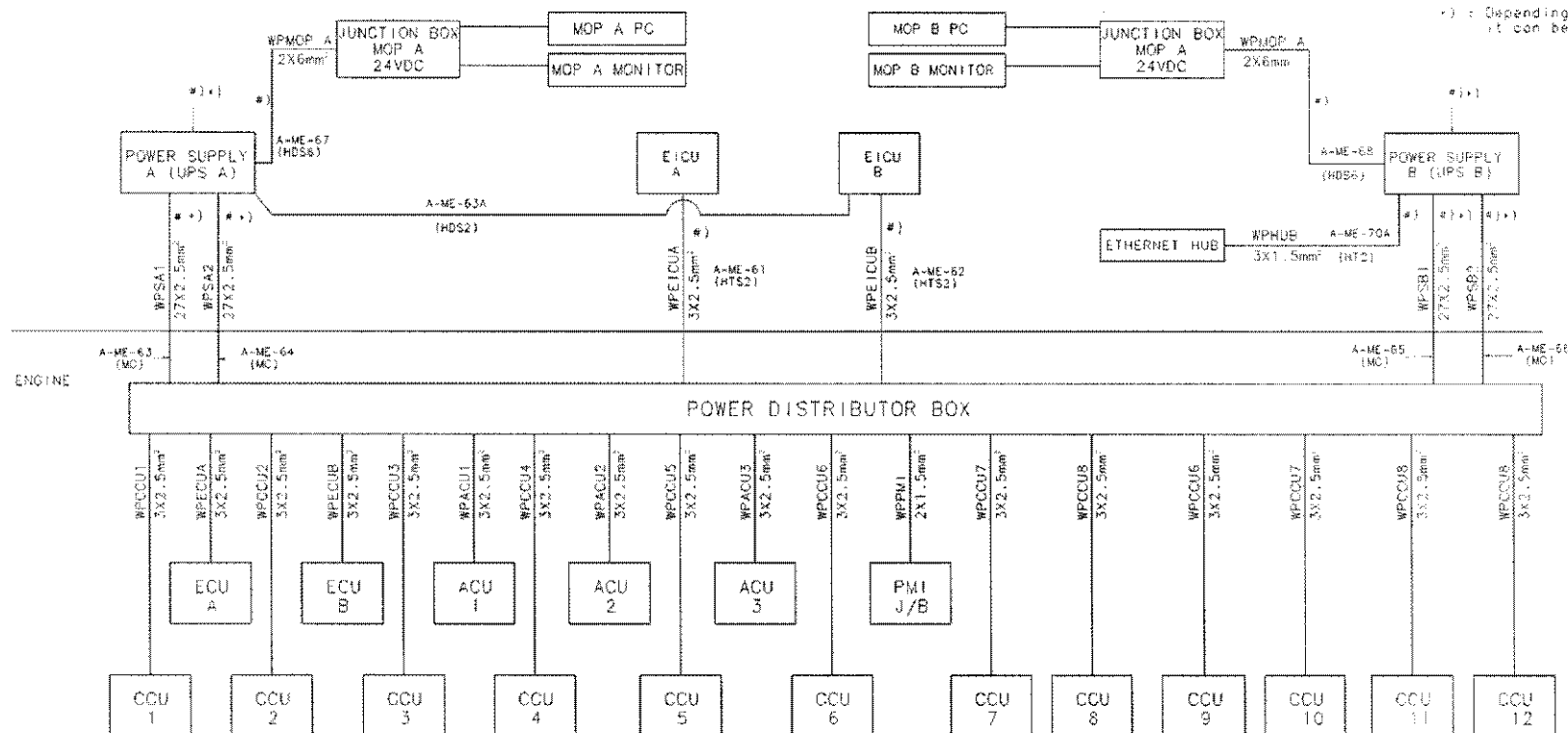
Principle diagram of power supply system ECS.

Drawing Code: 400000		Project Code: 000000	Sheet No: 000000	Revision: 000000
Drawing Title: ECS POWER CONNECTION		Drawing Date: 000000		
Drawing Scale: 1:1		Drawing Author: 000000		
Drawing Check: 000000		Drawing Date: 000000		
Drawing Approval: 000000		Drawing Date: 000000		
Drawing Code: 400000		Drawing Title: ECS POWER CONNECTION		
Drawing Scale: 1:1		Drawing Author: 000000		
Drawing Check: 000000		Drawing Date: 000000		
Drawing Approval: 000000		Drawing Date: 000000		

ECR (SHIPYARD)

: SHIPYARD SUPPLY

*) : Depending on initial contract.
It can be supplied by Engine builder

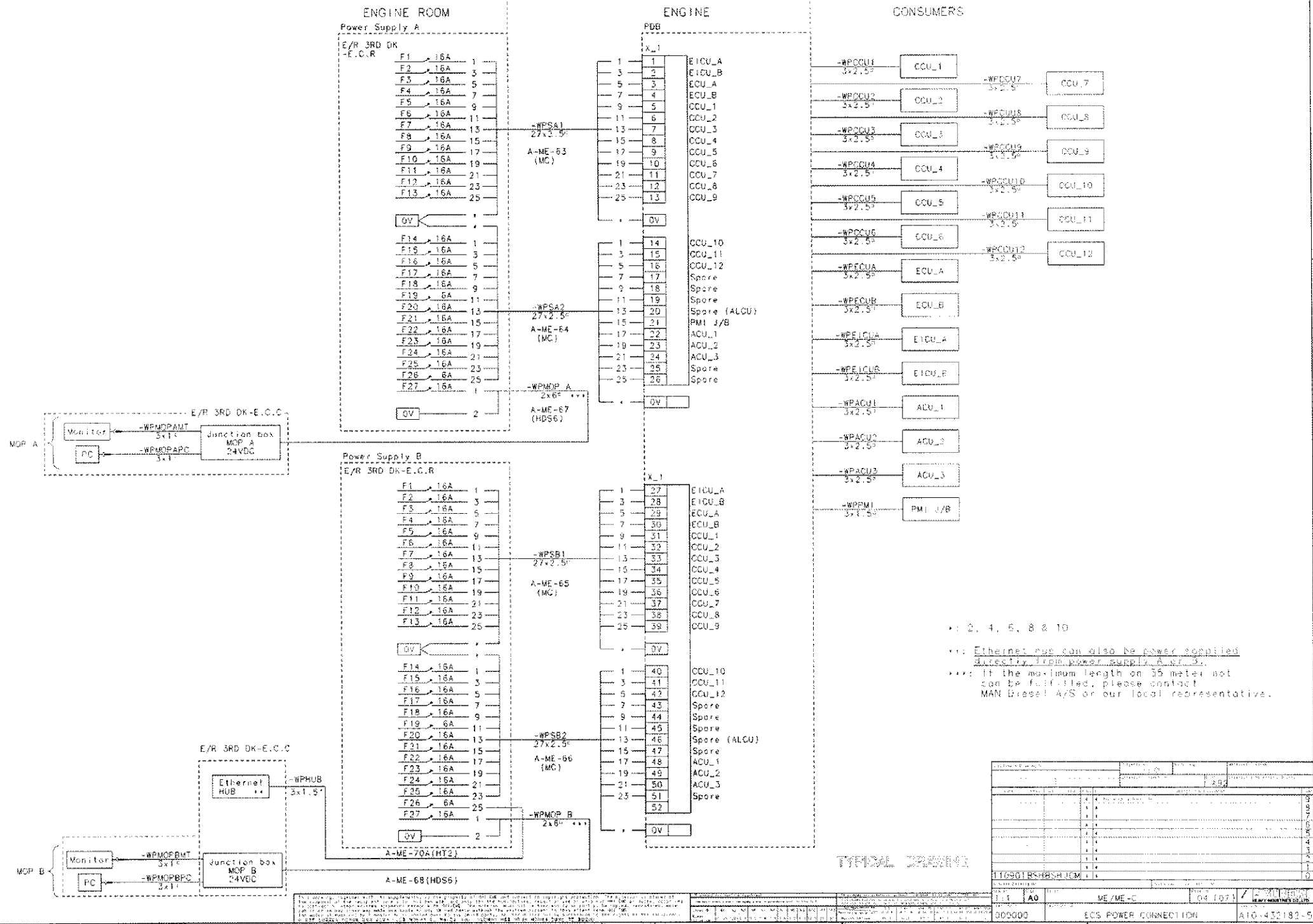


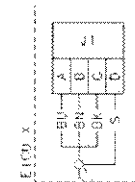
ABBREVIATIONS:

CCU : Cylinder Control Unit
ECU : Engine Control Unit
ACU : Auxiliary Control Unit
EICU : Engine Interface Control Unit
MOP : Main Operating Panel

TRIAL DESIGN **STUDY DESIGN**

[illegible]





The cable screen must be connected to the cabinet via the EMC Cable Glands. In relation to this, the screen is led into the EICU cabinets, and the screen should cover the wires all the way to its connection point where it is terminated in its individual terminal.

*** Junction box from the power supply A/B must be located near it's individual monitor and PC, due to the length of the cables from the monitor and PC. Approx. 1.5 meters.

**) If the maximum length on 35 meter not can be fulfilled, please contact MAN Diesel A/S or our local representative.

EICU : Engine Interface Control Unit
PDB : Power Distribution Box
MOP : Main Operation Panel

```

GND      : ..... GROUND
GND/YL   : ..... GREEN/YELLOW
GND       : ..... GREEN

```

```
#)      : Yard supply
*)      : Depending on initial contract
         : It can be supplied by engine builder
```




ECU : Engine Control Unit
CCU : Cylinder Control Unit
PDB : Power Distribution Box

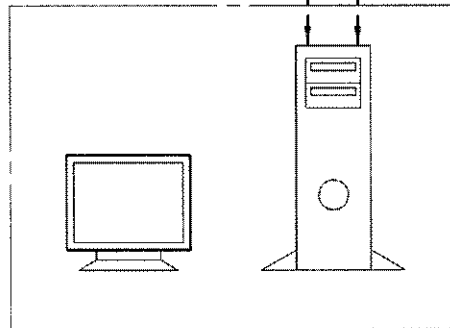
[illegible]

0 1 2 3 4 5 6 7 8 9

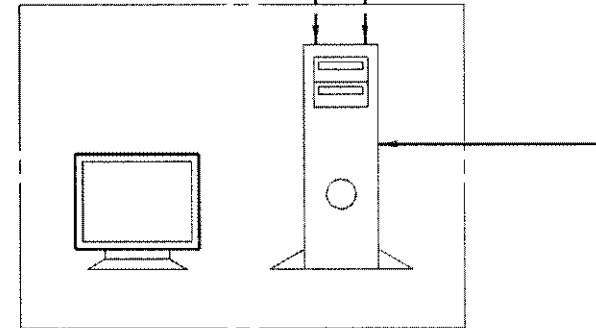
ECS Network A

ECS Network B

MOP A, Configuration

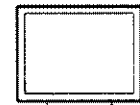


MOP B, Configuration



E/R 3RD DK-E.C.R

PMI PC



A-ME-155(LFTP4)

Ship LAN

(Option, alternative#1)

** Serial AMS

(Option, alternative#2) A-ME-153(LFTTS4)

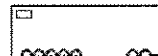
* Ethernet to AMS

(Option, alternative#3)

INTERNAL WIRING

LFTP4

Ethernet HUB



24VDC Power Supply
(From PDB on the engine control panel)

A-ME-70A

(A13-258952-9)

*Ethernet

(Shipyard supply)

INTERNAL WIRING

LFTP4

A-ME-154

*Ethernet

(Shipyard supply)

Printer

E/R 3RD DK
-E.C.R

(A12-353103-0)

#) AC220V Power supply form shipyard's UPS.

**) When the serial interface is needed

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Standard for surface roughness													Tolerances for dimensions without tolerance indication(ISO 2768-1989)				
The basic symbols and class numbers are in accordance with ISO 1502-1978.													This standard states the permissible deviations for dimensions without direct tolerance indication on metallic components manufactured by machining.				
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	Permissible deviations	0.8	0.5	0.3	0.2
R _a max.	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50	Medium series	±0.1	±0.2	±0.3	±0.5

Supplement Drawing no.:					Projection:		Mass (kg):		Material / Blank:		
					Licensor's Ident. no.:		Dist.:		Licensor's Material / Blank:		
					1881495-6						
Date	Des.	Chk.	Appd.	A.D.	E	Change / Replacement					Ch. No.
				*	*	Replaced by Ident. No.:					9
				*	*						8
				*	*						7
				*	*						6
				*	*						5
				*	*						4
				*	*						3
				*	*						2
				*	*						1
				*	*						0
110901BSHBSHJCM											
Similar Drawing No.:					Replacement of Ident. No.:						
Scale:		Size:		Type:		Page No.:					
N/S		A3		Ethernet, ME-ECS		01 (01)					
Info No.:		7B4230		Description:		NETWORK				Ident. No.:	
										A13-432175-5	

HSEF-k210-012(R1)

현대중공업 (주) 엔진사업본부

A3: 420mm x 297mm (16.5" x 11.7")

CAD Drawing - do not correct by hand

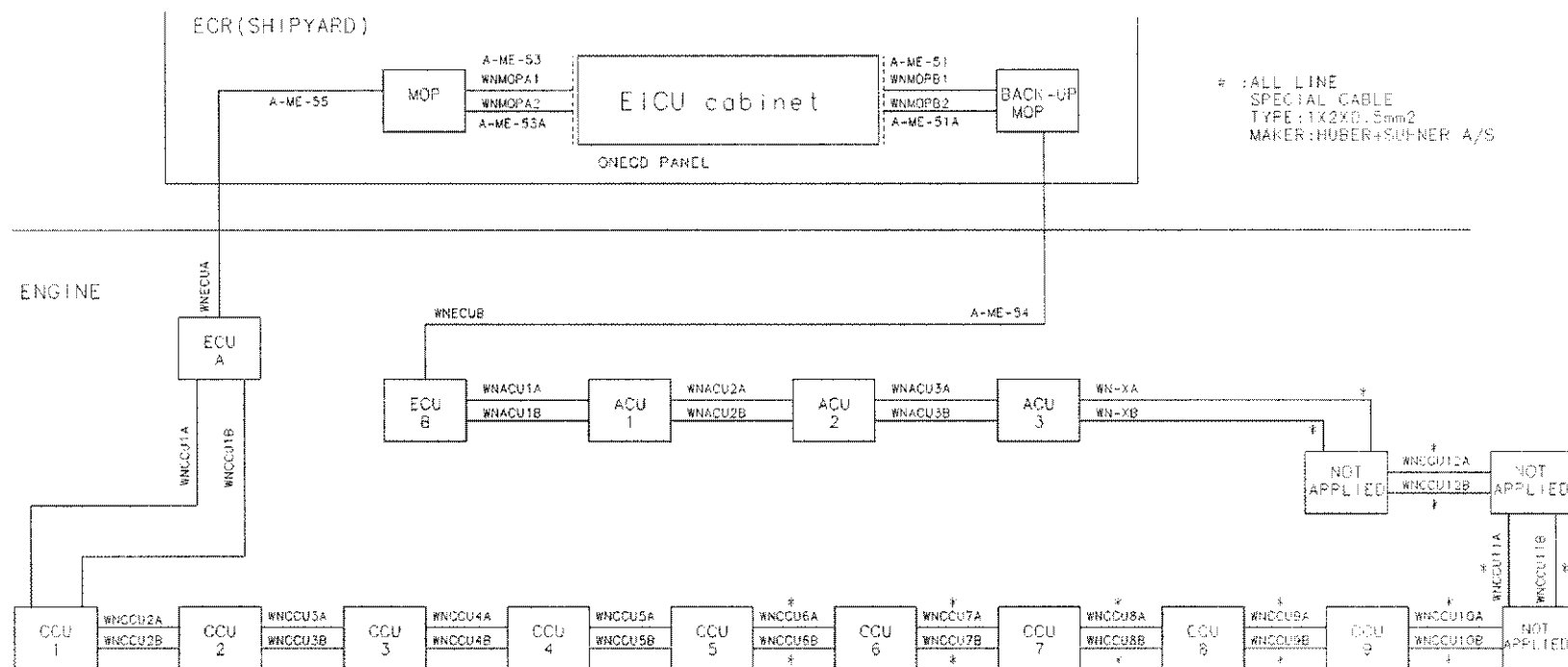
ECS NETWORK CONNECTION

1. The user is responsible for the accuracy of the information provided in this document. The user is also responsible for the accuracy of the information provided in this document. The user is also responsible for the accuracy of the information provided in this document.

2. The user is responsible for the accuracy of the information provided in this document. The user is also responsible for the accuracy of the information provided in this document. The user is also responsible for the accuracy of the information provided in this document.

3. The user is responsible for the accuracy of the information provided in this document. The user is also responsible for the accuracy of the information provided in this document. The user is also responsible for the accuracy of the information provided in this document.

1.1		A0		NE/ME-C		01/06/03		A10-435062-0	
ECS NETWORK CONNECTION									



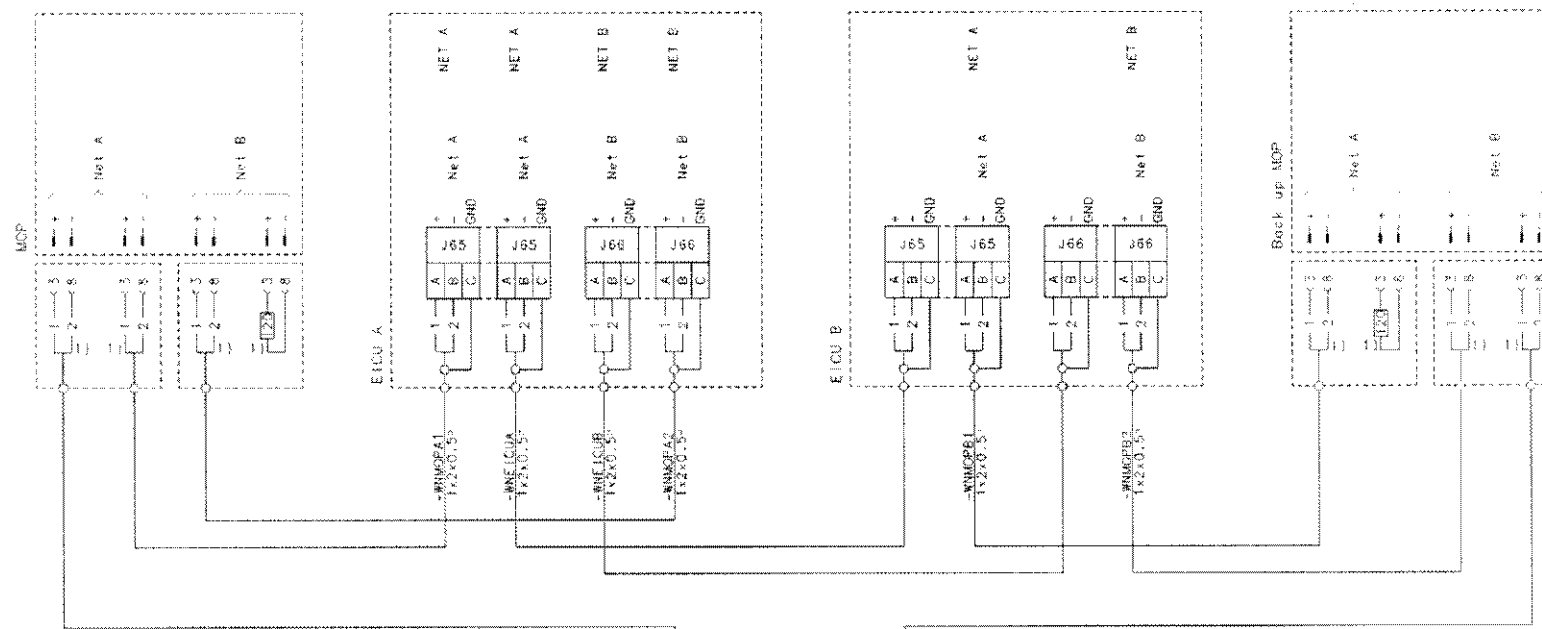
ABBREVIATIONS:

CCU : Cylinder Control Unit
ECU : Engine Control Unit
ACU : Auxiliary Control Unit
EICU : Engine Interface Control Unit
MOP : Main Operating Panel

* The Connections depend on Engine type.

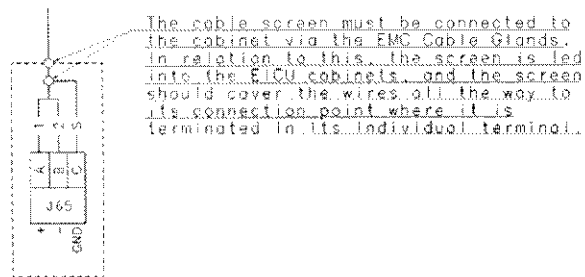
ex) In case of 9 cylinder Engine,
It is only connected from CCU1 to CCU9
then, CCU9 is directly connected to ACU3.

Order No.	Rev.	Page	Total
1000000	1.0	1	1
ECS NETWORK CONNECTION			
1.1	A0	ME/ME-C	02.10.00
000000		ECS NETWORK CONNECTION	A10-435062-0



Cable: TEMA-TA 1x2x0.5

ECR
ENGINE

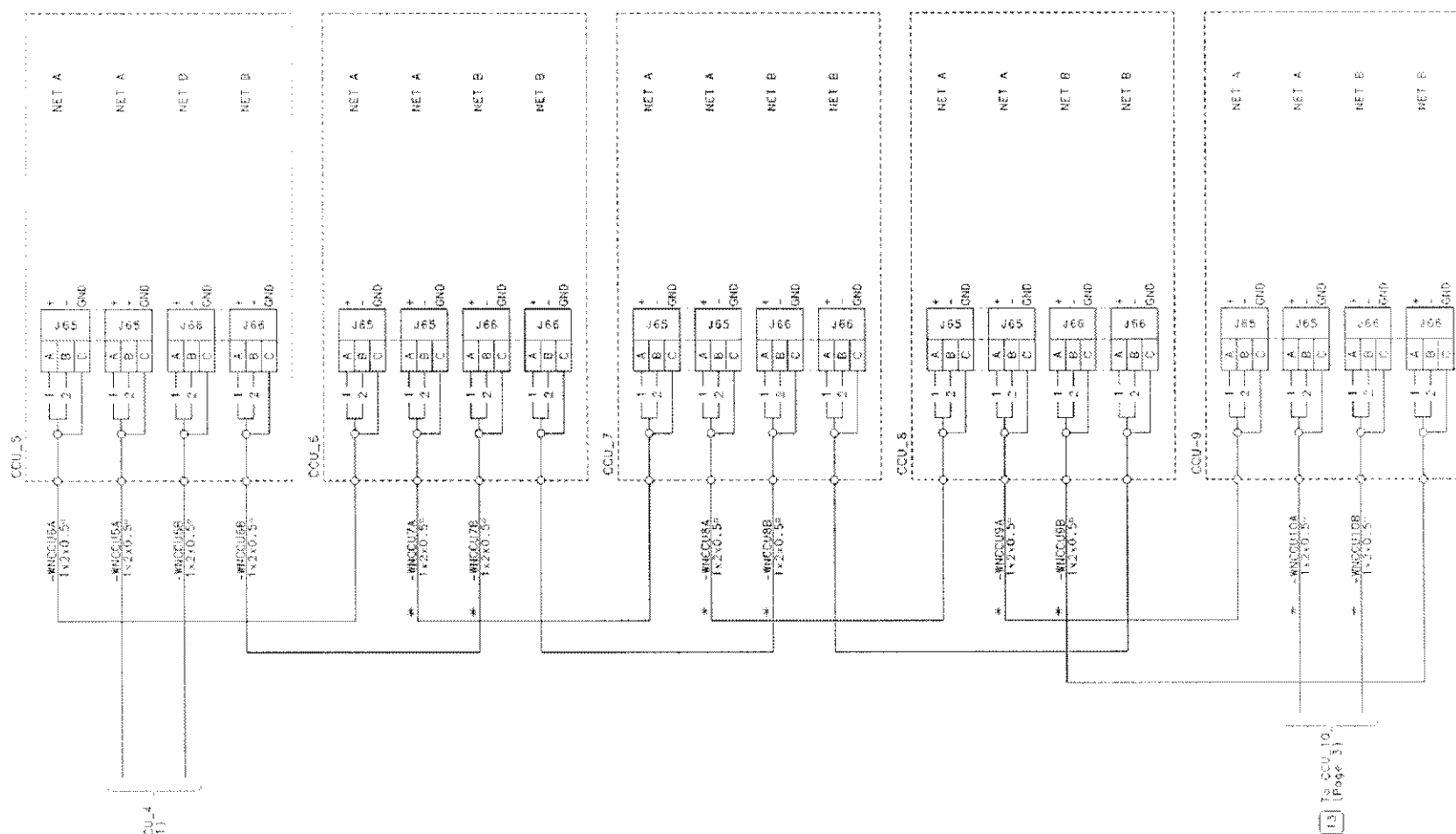


1) Screen to be terminated in net plug.

ABBREVIATIONS:

- EICU : Engine Interface Control Unit
- MOP : Main Operating Panel
- ECU : Engine Control Unit

Project Name: A0		Date: 07.1987	
Drawing No: 000005		Revision: 1	
Title: ECR NETWORK CONNECTION		A10-435062-0	



*The Connections depend on Engine type.
 ex) In case of 9 cylinder Engine,
 it is only connected from CCU1 to CCU9
 then, CCU9 is directly connected to ACU3.

ABBREVIATIONS:

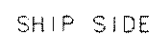
CCU: Cylinder Control Unit
 ECU: Engine Control Unit

Approved For Use		Revision		Date	
1.1		AD		ME/ME-C	
000000		ECS NETWORK CONNECTION		A10-435062-0	

ECS AUXILIARY UNIT CONNECTION

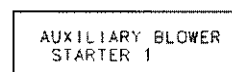
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REVISIONS									
Rev.	By	Date	Description	Rev.	By	Date	Description	Rev.	By
1	1	1970-08-01	Initial issue	2	1	1970-08-01	Initial issue	3	1
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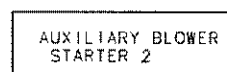


+IF AUX.BLOWER 3 IS USED

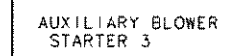
*IF AUX.BLOWER 4 IS USED



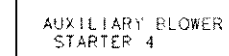
WAXB1



WAXB2



Στοιχεία



ACU

ACU

ACU

WALXB4

ABBREVIATIONS:

ACU: Auxiliary Control Unit

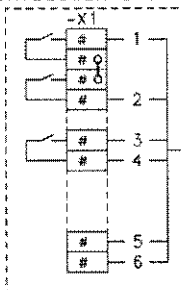
REMARK :

- 1) STARTER TO BE MOUNTED HULL SIDE
2) CABLE : SHIPYARD SUPPLY

1. <u>Organization</u> <u>State No.</u> <u>City</u> <u>State</u> <u>Zip</u>		2. <u>Product</u> <u>Code</u> <u>Year</u>		3. <u>Order</u> <u>Code</u>		4. <u>Customer</u> <u>Code</u>	
5. <u>Customer</u> <u>Name</u>		6. <u>Product</u> <u>Name</u>		7. <u>Order</u> <u>Date</u>		8. <u>Customer</u> <u>Address</u>	
9. <u>Date</u>		10. <u>Time</u>		11. <u>Time</u>		12. <u>Time</u>	
13. <u>Time</u>		14. <u>Time</u>		15. <u>Time</u>		16. <u>Time</u>	
17. <u>Time</u>		18. <u>Time</u>		19. <u>Time</u>		20. <u>Time</u>	
21. <u>Time</u>		22. <u>Time</u>		23. <u>Time</u>		24. <u>Time</u>	
25. <u>Time</u>		26. <u>Time</u>		27. <u>Time</u>		28. <u>Time</u>	
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33. <u>Time</u>		34. <u>Time</u>		35. <u>Time</u>		36. <u>Time</u>	
37. <u>Time</u>		38. <u>Time</u>		39. <u>Time</u>		40. <u>Time</u>	
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65. <u>Time</u>		66. <u>Time</u>		67. <u>Time</u>		68. <u>Time</u>	
69. <u>Time</u>		70. <u>Time</u>		71. <u>Time</u>		72. <u>Time</u>	
73. <u>Time</u>		74. <u>Time</u>		75. <u>Time</u>		76. <u>Time</u>	
77. <u>Time</u>		78. <u>Time</u>		79. <u>Time</u>		80. <u>Time</u>	
81. <u>Time</u>		82. <u>Time</u>		83. <u>Time</u>		84. <u>Time</u>	
85. <u>Time</u>		86. <u>Time</u>		87. <u>Time</u>		88. <u>Time</u>	
89. <u>Time</u>		90. <u>Time</u>		91. <u>Time</u>		92. <u>Time</u>	
93. <u>Time</u>		94. <u>Time</u>		95. <u>Time</u>		96. <u>Time</u>	
97. <u>Time</u>		98. <u>Time</u>		99. <u>Time</u>		100. <u>Time</u>	

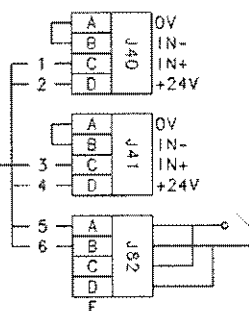
[illegible]

AUX.BLOWER ST.1



-WAUXB1
7x0.75SQ

ACU_1

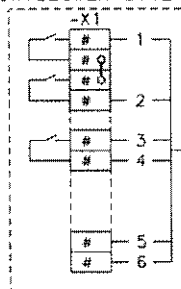


REMOTE/LOCAL FAIL
AUX.BLOWER MOTOR

BLOWER RUNNING

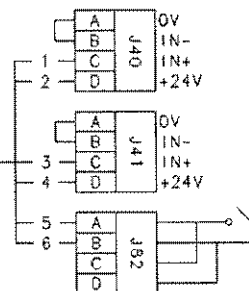
START/STOP
AUX.BLOWER MOTOR

AUX.BLOWER ST.2



-WAUXB1
7x0.75SQ

ACU_2



REMOTE/LOCAL FAIL
AUX.BLOWER MOTOR

BLOWER RUNNING

START/STOP
AUX.BLOWER MOTOR

Refer to the Aux. blower starter panel Drawing.

ABBREVIATIONS:

ACU: Auxiliary Control Unit

Drawing No.		Revision		Date	
1000		A1		10/10/00	
Title		Description		Author	
ECS AUXILIARY BLU 1 CONNECT		ECS AUXILIARY BLU 1 CONNECT		ECS AUXILIARY BLU 1 CONNECT	
Part No.		Part Name		Part Description	
1000		ECS AUXILIARY BLU 1 CONNECT		ECS AUXILIARY BLU 1 CONNECT	
Material		Material		Material	
Steel		Steel		Steel	
Quantity		Quantity		Quantity	
1		1		1	
Unit		Unit		Unit	
EA		EA		EA	
Remarks		Remarks		Remarks	
ECS AUXILIARY BLU 1 CONNECT		ECS AUXILIARY BLU 1 CONNECT		ECS AUXILIARY BLU 1 CONNECT	

[illegible]

ACU: Auxiliary Control Unit

[illegible]

SHIP SIDE

ENGINE SIDE

START UP PUMP
STARTER 1

START UP PUMP
STARTER 2

WS1S1

M
3~

WS1S2

M
3~

ACU
1

ACU
2

ABBREVIATIONS:

ACU: Auxiliary Control Unit

REMARK :
1) STARTER TO BE MOUNTED HULL SIDE
2) CABLE : SHIPYARD SUPPLY

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REVISIONS									
Rev.	By	Date	Description	Rev.	By	Date	Description	Rev.	By
01	...	...	...	02	...	...	...	03	...

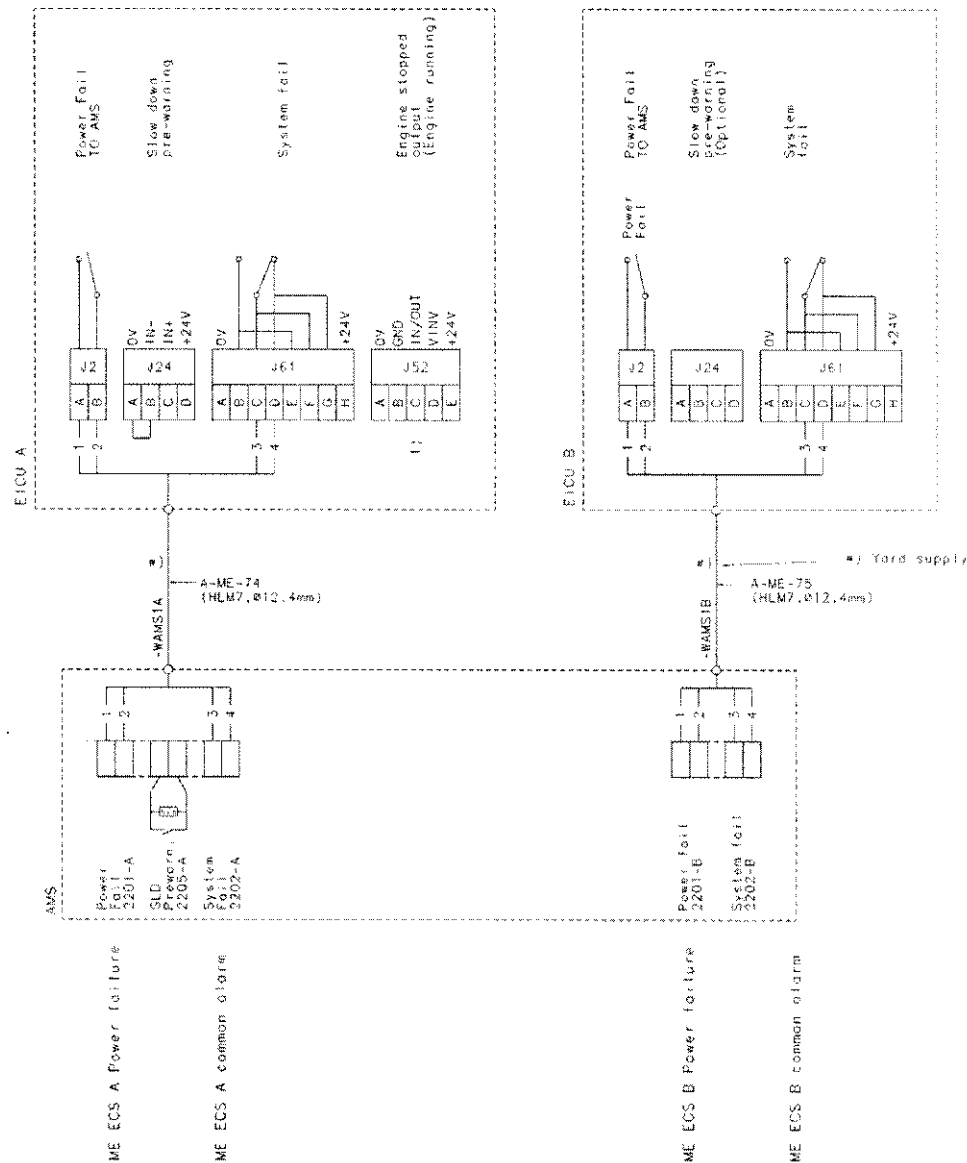
REVISIONS									
Rev.	By	Date	Description	Rev.	By	Date	Description	Rev.	By
01	...	...	...	02	...	...	...	03	...

Drawing No.		Revision		Date		Sheet No.	
01		A1		01.01.2000		1	
Title				Description			
COS AUXILIARY UNIT CONNECTION				...			
Author				Checked			
...				...			
Date				Date			
01.01.2000				01.01.2000			

BMS & AMS CONNECTION

[illegible]

- 1) Signal can be
a) powered from ECS
b) powered from external user.
see suppl. drawing.



ABBREVIATIONS:

AMS : Alarm Monitoring System
EICU : Engine Interface Control Unit

Doc No.	Rev.	Page	Of
000000	AD	01	03
BMS & AMS CONNECTION			
A10 432180-1			

Interface to External Systems

FPP Serial Interface

Abbreviations:

EICU = Engine Interface Control Unit
 ECU = Engine Control Unit
 AMS = Alarm Monitoring System
 RCS = Remote Control System
 PMS = Power Management System
 ECR = Engine Control Room
 S = Screen
 #: Yard Supply
 #: Makers terminal number

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Date	Des.	Chk.	A.C.	Revision change	Orig. Not.	Rev.
20110601	JYA	JYA	Z3	2202-A/B connected		-07
20110222	JYA	JYA	Z3	EICU-A J53 connected		-06
20110203	CAHV	JYA	X2	AI Isometer monitoring added	005479	05
20051213	HKP	JHV				00

Basic Standards (NEO 99):		Suppl. Drawing No.:	
EN21F-m Tolerances	EN21C Surf. roughness		
Material / Blank:		Final User Material:	Mass (kg):
Scale:	Size:	Product Type:	Projection: Page No.:
	A3	Interface FPP Serial	1 (12)
Info. No.:	Item Name:		Item Id.:
7B4244	Remote control system		0791461-9
Final User Info. No.:	Final User Description:		Final User Ident. No.:
			A14-349162-0.2

Drawing - do not correct by hand - PCS Drawing

=EICU A

=AMS

-WAMS1
7x6.75mm²

-WAMS2
2x6.75mm²

=AMS/Safety System

-WECPANELA1
2x6.75mm²

-WECPANELA2
2x6.75mm²

-WECPANELA3
2x6.75mm²

=ECR Panel

-WECHANDLEA1
5x6.75mm²

-WECHANDLEA2
2x6.75mm²

=ECR Handle

-WRCSA1
4x2x6.75mm²

=RCS

-WPMSA1
7x6.75mm²

=PMS

-WVWAA1
5x6.75mm²

=Wrong Way Alarm

Abbreviations:

EICU = Engine Interface Control Unit

ECU = Engine Control Unit

AMS = Alarm Monitoring System

RCS = Remote Control System

PMS = Power Management System

ECR = Engine Control Room

W = Screen

MS = Vard Supply

* Making terminal number

The Cable screen must have connection to an EMC cable gland in both ends.

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Date	Des.	Chk.	A.C.	Revision change	Chg. Nbr.	Rev.
20110601	JYA	JYA	Z3	2202-A/B corrected		-07
Scale:	Size:	Product Type:	Interphase FPP Serial			
	A3					
Info. No.:	Item Name:		Item Id.:			
7B4244	Remote control system		0791461-9			
Final User Info. No.:	Final User Description:		Final User Ident. No.:			

1965A3b2
DAD Drawing - do not correct by hand - PDS Drawing

=EICU B

=AIS

-MAMSD1
7xø.75mm²

-MAMSB2
2xø.75mm²

-MECRPANEL B1
2xø.75mm²

-MECRPANEL B2
2xø.75mm²

-MECRHANDLE B1
5xø.75mm²

-MECRHANDLE B2
2xø.75mm²

-MPCSB1
5xø.75mm²

-MPMSB1
7xø.75mm²

-MPANON
2xø.75mm²

=AIS/Safety System

=ECR Panel

=ECR Handle

=RCS

=PMS

=ME-ECS Power Supply A

Abbreviations:

EICU = Engine Interface Control Unit
ECU = Engine Control Unit
AMS = Alarm Monitoring System
RCS = Remote Control System
PMS = Power Management System
ECR = Engine Control Room
S = Screen

#:: Yard Supply

*: Makers terminal number

The cable screen must have connection to an EMC cable gland in both ends.

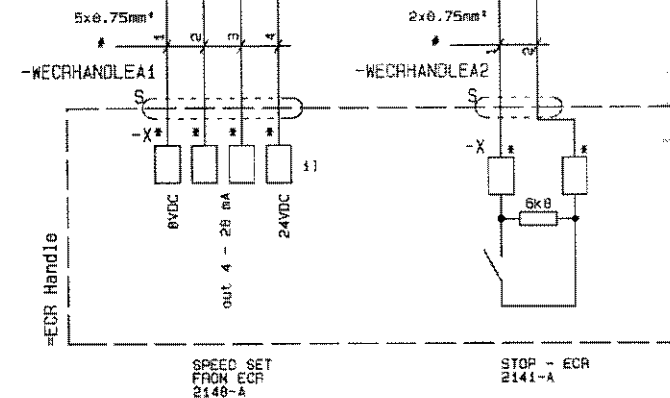
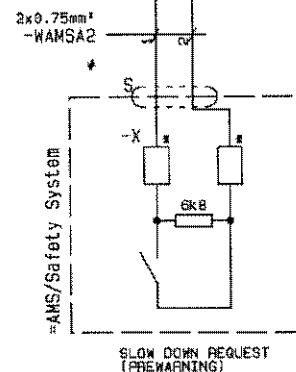
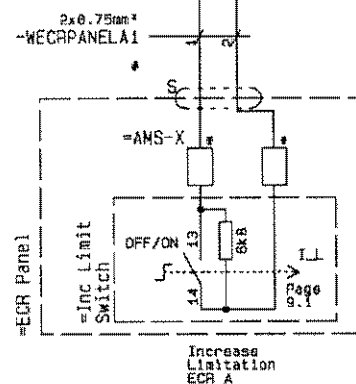
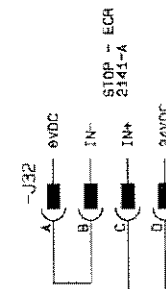
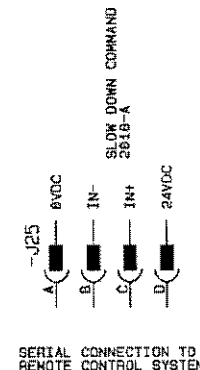
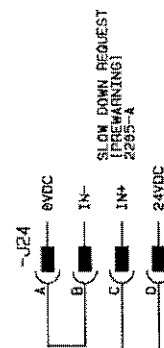
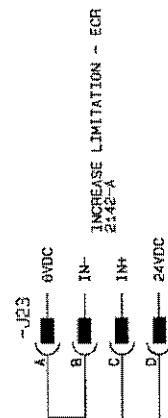
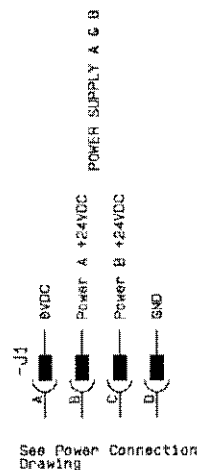
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Date	Des.	Chk.	A.C.	Revision change	Chg. Not.	Rev.
20110601	JYA	JYA	Z3	2202-A/B corrected		-0
Scale:	Size:	Product Type:			Projection:	Page No.:
	A3	Interface FPP Serial				3 (12)
Info. No.:	Item Name:			Item Id.:		
7B4244	Remote control system			0791461-9		
Final User Info. No.:	Final User Description:				Final User Ident. No.:	

CAD Drawing - do not extract by hand - PCS Drawing

=EICU A



1) Signal can be connected as 2,3 or 4 wire, see Suppl. drawing

Abbreviations:

EICU = Engine Interface Control Unit
ECU = Engine Control Unit
AMS = Alarm Monitoring System
RCS = Remote Control System
PMS = Power Management System
ECR = Engine Control Room
S = Screen
*: Yord Supply
#: Makers terminal number

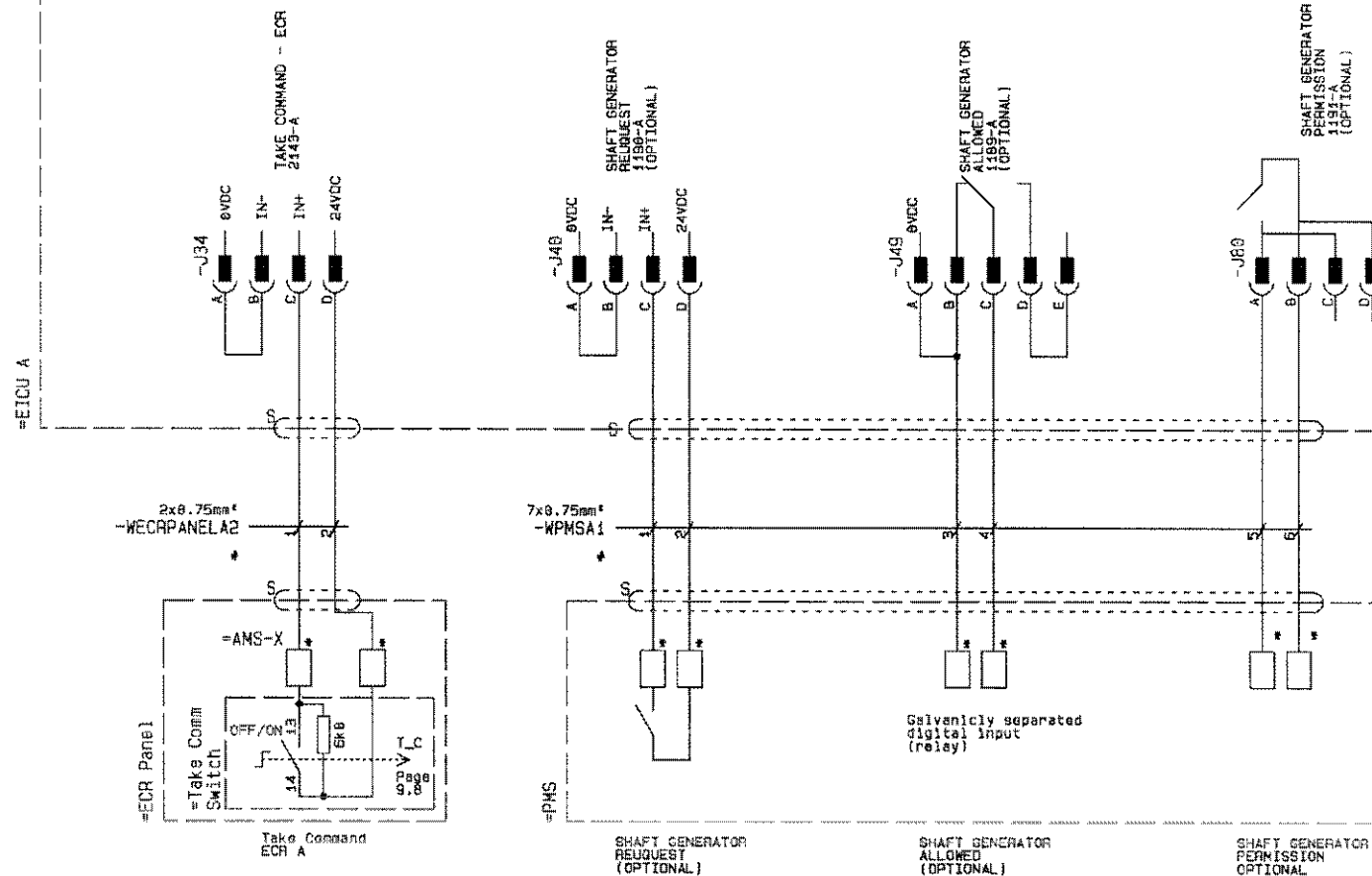
The Cable screen must have connection to an ENC cable gland in both ends.



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Date	Des.	Chk.	A.C.	Revision change	Chg. Not.	Rev.
20110601	JYA	JYA	Z3	2202-A/B corrected		-07
Scale:	Size: A3	Product Type:	Interface FPP Serial			
Info. No.: 7B4244	Item Name:	Remote control system				Page No.: 4 (12)
Final User Info. No.:	Final User Description:	Item Id.: 0791461-9				Final User Ident. No.:

CAD Drawing - do not correct by hand - PCS Drawing



Abbreviations:

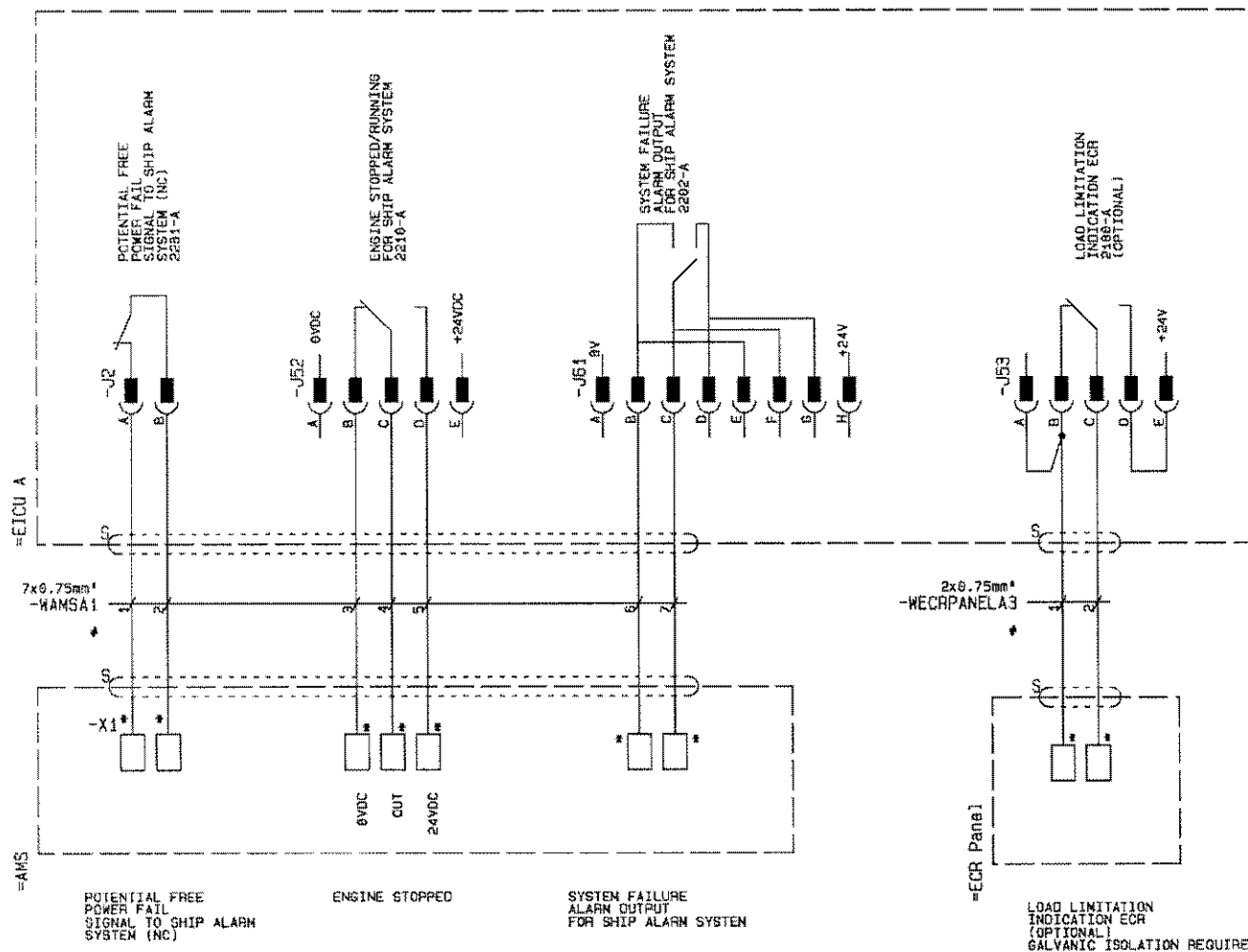
EICU = Engine Interface Control Unit
 ECU = Engine Control Unit
 AMS = Alarm Monitoring System
 RCS = Remote Control System
 PMS = Power Management System
 ECR = Engine Control Room
 S = Screen
 #: Yard Supply
 #: Makers terminal number

The Cable screen must have connection to an EMC cable gland in both ends.

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Date	Des.	Chk.	A.C.	Revision change	Chg. Nat.	Rev.
20110601	JYA	JYA	Z3	2202-A/B corrected		-07
Scale:	Size: A3	Product Type:	Interface FPP Serial			Projection:  Page No.: 5 (12)
Info. No.: 7B4244	Item Name:	Remote control system			Item Id.: 0791461-9	
Final User Info. No.:	Final User Description:				Final User Ident. No.:	



Abbreviations:

EICU = Engine Interface Control Unit
 ECU = Engine Control Unit
 AMS = Alarm Monitoring System
 RCS = Remote Control System
 PMS = Power Management System
 ECR = Engine Control Room
 S = Screen
 #: Yard Supply
 *: Makers terminal number

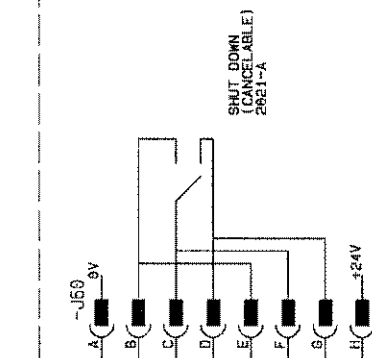
The Cable screen must have connection to an EMC cable gland in both ends.

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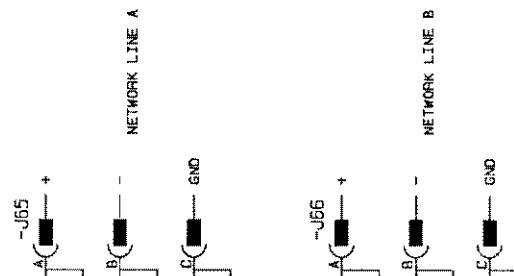


Date	Des.	Chk.	A.C.	Revision change	Orig. No.	Rev.
20110601	JYA	JYA	Z3	2202-A/B corrected		-07
Scale:	Size:	Product Type:	Projection:			
	A3	Interface FPP Serial	Page No.: 6 (12)			
Info. No.:	Item Name:		Item Id.:			
7B4244	Remote control system		0791461-9			
Final User Info. No.:	Final User Description:		Final User Ident. No.:			

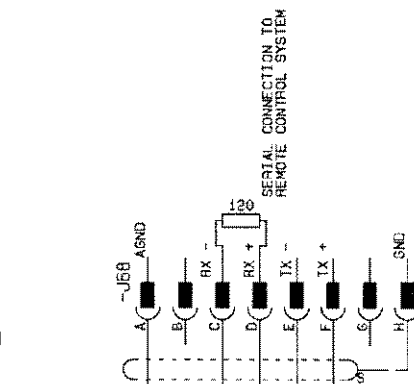
CAD Drawing - do not contact by hand - PDS Unwinding



See Safety System drawing

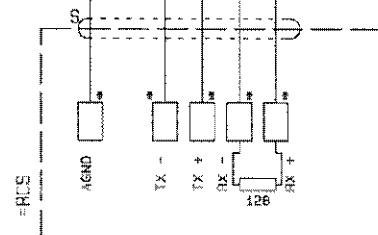


See network connection drawing



4x2x8.75mm²

-WRCSA1



SERIAL CONNECTION TO
REMOTE CONTROL SYSTEM

Abbreviations:

EICU = Engine Interface Control Unit
ECU = Engine Control Unit
AMS = Alarm Monitoring System
RCS = Remote Control System
PMS = Power Management System
ECR = Engine Control Room
S = Screen
#: Yard Supply
#: Makers terminal number

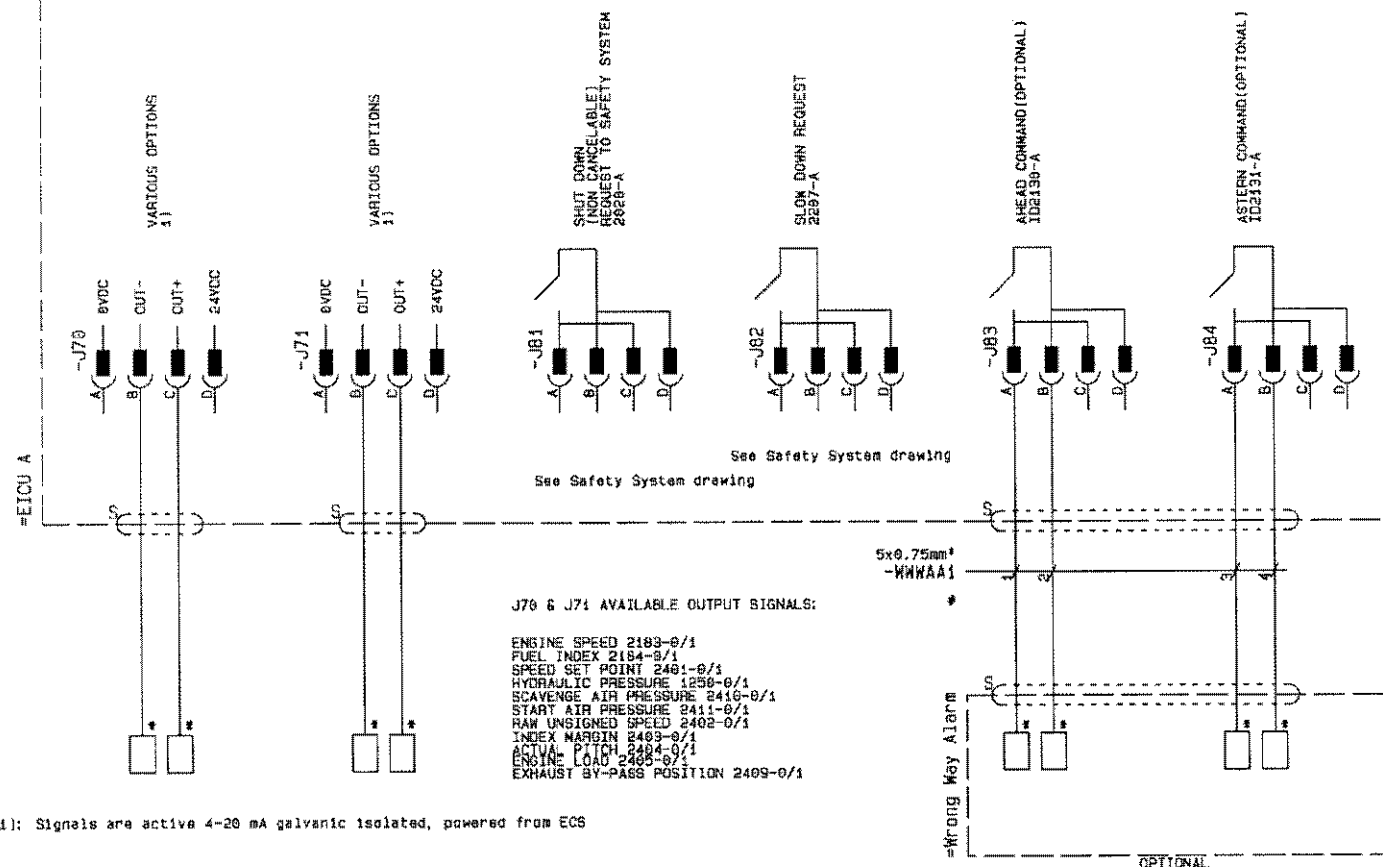
The Cable screen must have connection to an EMC cable gland
in both ends.

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Date	Des.	Chk.	A.C.	Revision change	Chg. Not.	Rev.
20110601	JYA	JYA	Z3	2202-A/B corrected		-07
Scale:	Size:	Product Type:			Projection:	Page No.:
	A3	Interface FPP Serial				7 (12)
Info. No.:	Item Name:				Item Id.:	
7B4244	Remote control system				0791461-9	
Final User Info. No.:	Final User Description:				Final User Ident. No.:	

CAD Drawing - do not correct by hand - PCS Drawing



11: Signals are active 4-20 mA galvanic isolated, powered from ECS

Abbreviations:

EIOU = Engine Interface Control Unit
 ECU = Engine Control Unit
 AMS = Alarm Monitoring System
 RCS = Remote Control System
 PMS = Power Management System
 ECR = Engine Control Room
 S = Screen
 #: Yard Supply
 #: Makers terminal number

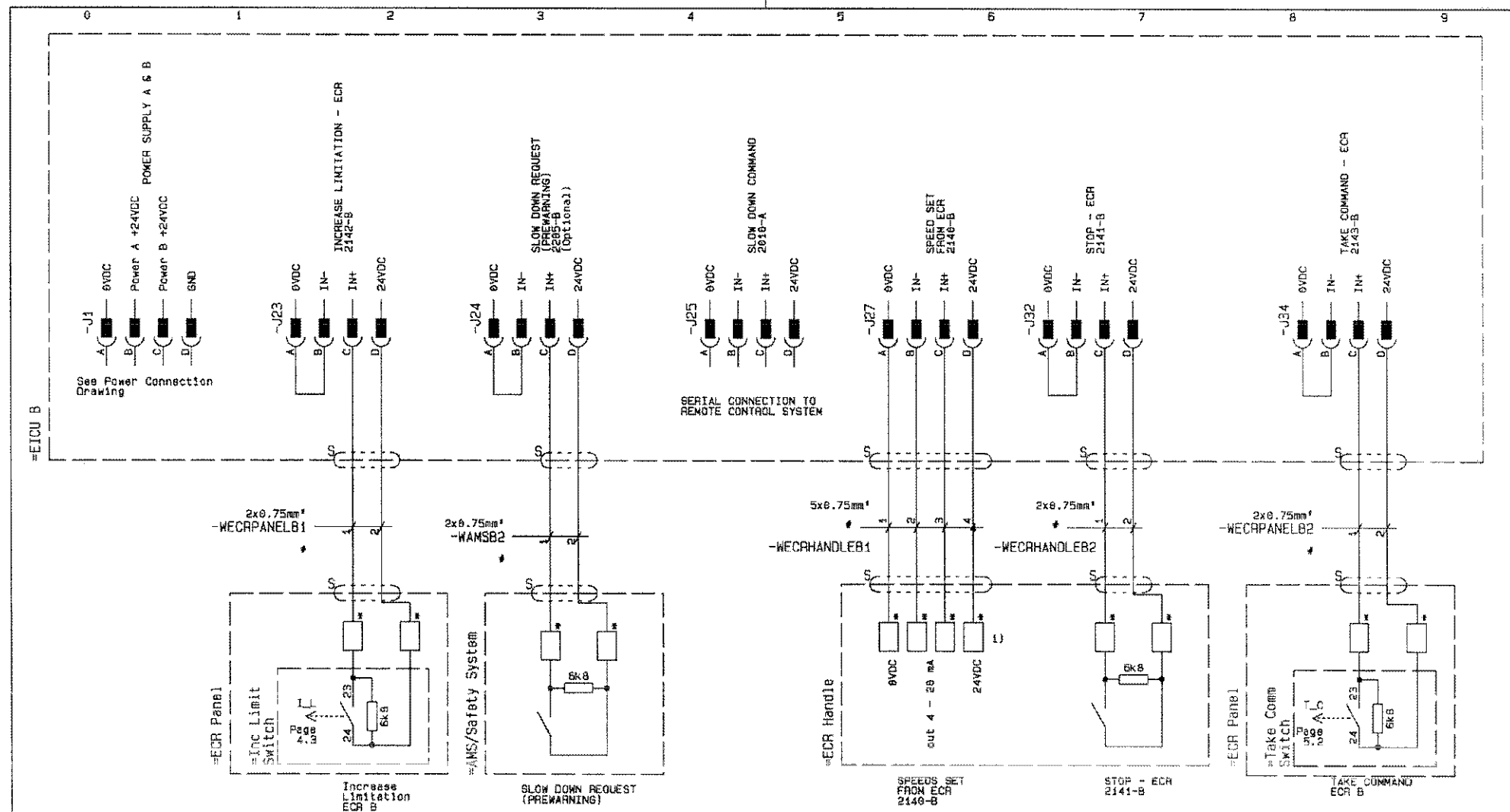
The Cable screen must have connection to an EMC cable gland in both ends.

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Date	Des.	Chk.	A.C.	Revision change	Eng. Not.	Rev.
20110601	JYA	JYA	Z3	2202-A/B corrected		-07
Scale:	Size:	Product Type:	Interface FPP Serial			
	A3		Page No.: 8 (12)			
Info. No.:	Item Name:		Item Id.:			
7B4244	Remote control system		0791461-9			
Final User Info. No.:	Final User Description:		Final User Ident. No.:			

DAB Drawing - do not correct by hand - PDS Drawing



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Date		Des.	Chk.	A.C.	Revision change		Chg. No.	Rev.
20110601		JYA	JYA	Z3	2202-A/B corrected			-0
Scale:	Size:	Product Type:				Projection:	Page No.:	
	A3	Interface FPP Serial					9 (12)	
Info. No.:		Item Name:				Item Id.:		
7B4244		Remote control system				0791461-9		
Final User Info. No.:		Final User Description:				Final User Ident. No.:		

=EICU B

7x0.75mm²
-WPMSB1

=PMS

WHR REQUEST
(OPTIONAL)

WHR ALLOWED
(OPTIONAL)

WHR PERMISSION
(OPTIONAL)

Galvanically separated
digital input
(relay)

Abbreviations:

EICU = Engine Interface Control Unit
ECU = Engine Control Unit
AMS = Alarm Monitoring System
RCS = Remote Control System
PMS = Power Management System
ECR = Engine Control Room
S = Screen
#: Yard Supply
*: Makers terminal number

The Cable screen must have connection to an ENC cable gland
in both ends.

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7x0.75mm²
-WAMSB1

=AMS

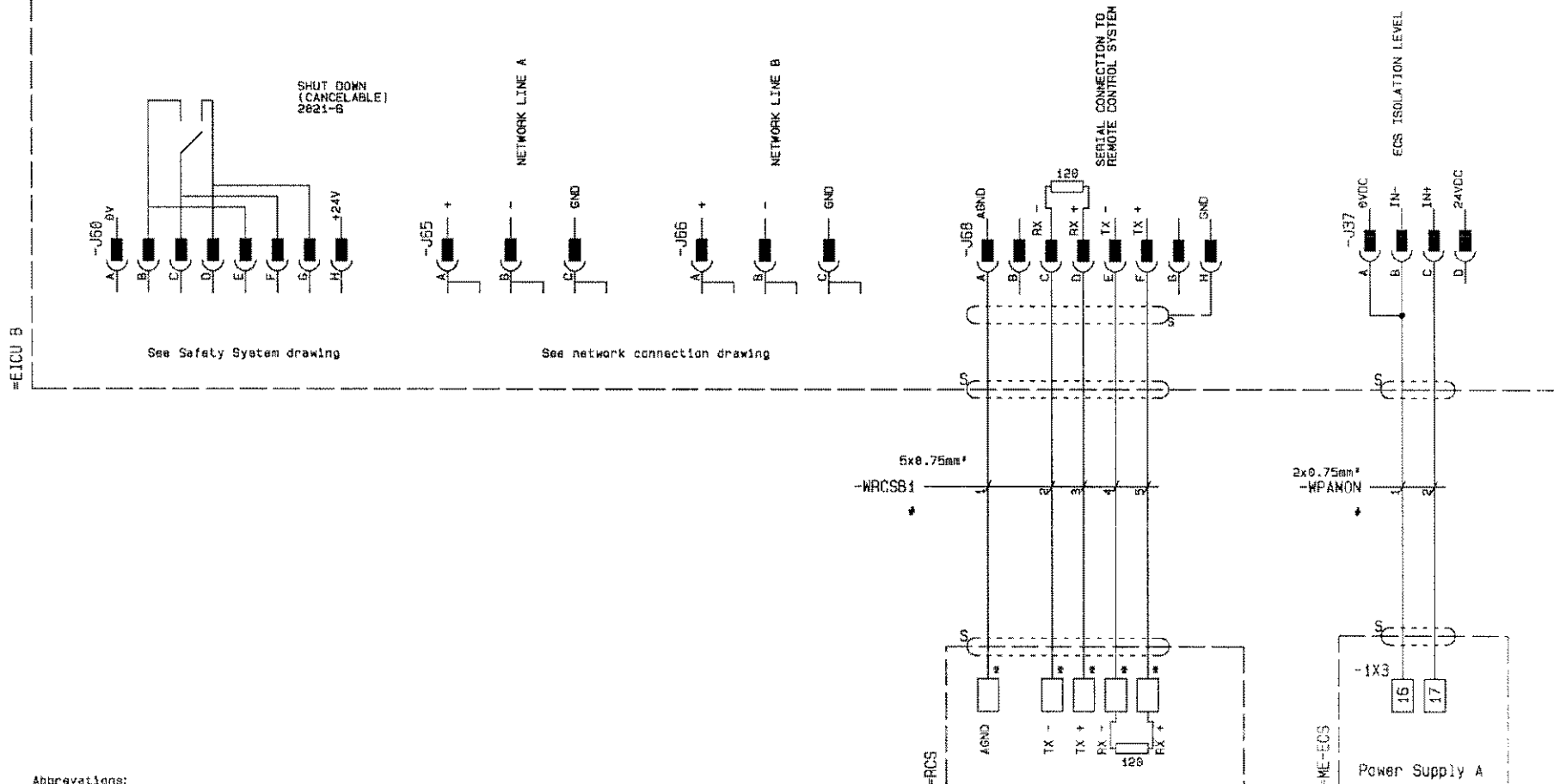
POTENTIAL FREE
POWER FAIL
SIGNAL TO SHIP ALARM
SYSTEM (INC)

ENGINE STOPPED
(OPTIONAL)

SYSTEM FAILURE
ALARM OUTPUT
FOR SHIP ALARM SYSTEM

Date	Des.	Chk.	A.C.	Revision change	Orig. No.	Rev.
20110601	JYA	JYA	Z3	2202-A/B corrected		-0
Scale:	Size:	Product Type:	Projection:			Page No.:
	A3	Interface FPP Serial				10 (12)
Info. No.:	Item No.:	Item Id.:				
7B4244		Remote control system			0791461-9	
Final User Info. No.:	Final User Description:				Final User Ident. No.:	

CAD Drawing - do not correct by hand - PDS Drawing



Abbreviations:

EICU = Engine Interface Control Unit
 ECU = Engine Control Unit
 AMS = Alarm Monitoring System
 RCS = Remote Control System
 PMS = Power Management System
 ECR = Engine Control Room
 S = Screen
 #: Yard Supply
 #: Makers terminal number

The Cable screen must have connection to an EMC cable gland in both ends.

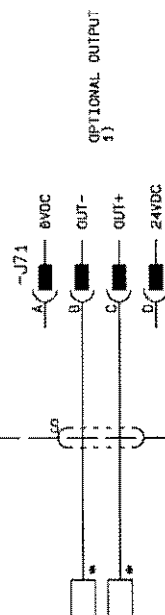
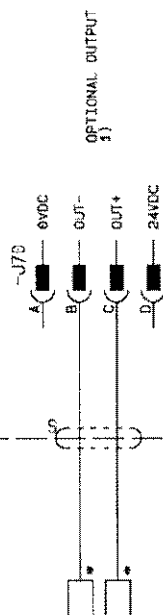
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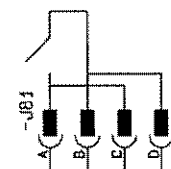
Date	Des.	CHK.	A.C.	Revision change	Chg. Not.	Rev.
20110601	JYA	JYA	Z3	2202-A/B corrected		-07
Scale:	Size:	Product Type:	Projection:			
	A3		11 (12)			
Info. No.:	Item Name:		Item Id.:			
7B4244	Interface FPP Serial		0791461-9			
Final User Info. No.:	Final User Description:		Final User Ident. No.:			
	Remote control system					

DAD Drawing - do not correct by hand - PCS Drawing

=EICU B



OPTIONAL OUTPUT
1)



See Safety system drawing

See Safety system drawing

J70 & J71 AVAILABLE OUTPUT SIGNALS:

ENGINE SPEED 2103-0/1
FUEL INDEX 2104-0/1
SPEED SET POINT 2401-0/1
HYDRAULIC PRESSURE 1250-0/1
SCAVENGE AIR PRESSURE 2410-0/1
START AIR PRESSURE 2411-0/1
MAN UNSIGNED SPEED 2402-0/1
INDEX MARGIN 2403-0/1
ACTUAL PITCH 2404-0/1
ENGINE LOAD 2405-0/1
EXHAUST BY-PASS POSITION 2409-0/1

DEFAULT SETTINGS FOR WHR:

J70 ENGINE LOAD 2405-0/1
J71 EXHAUST BY-PASS POSITION 2409-0/1

1): Signals are active 4-20 mA galvanic isolated, powered from ECS

Abbreviations:

EICU = Engine Interface Control Unit
ECU = Engine Control unit
AMS = Alarm Monitoring System
RCS = Remote Control System
PMS = Power Management System
ECR = Engine Control Room
S = Screen
#: Yard Supply
*: Makars terminal number

The Cable screen must have connection to an EMC cable gland in both ends.

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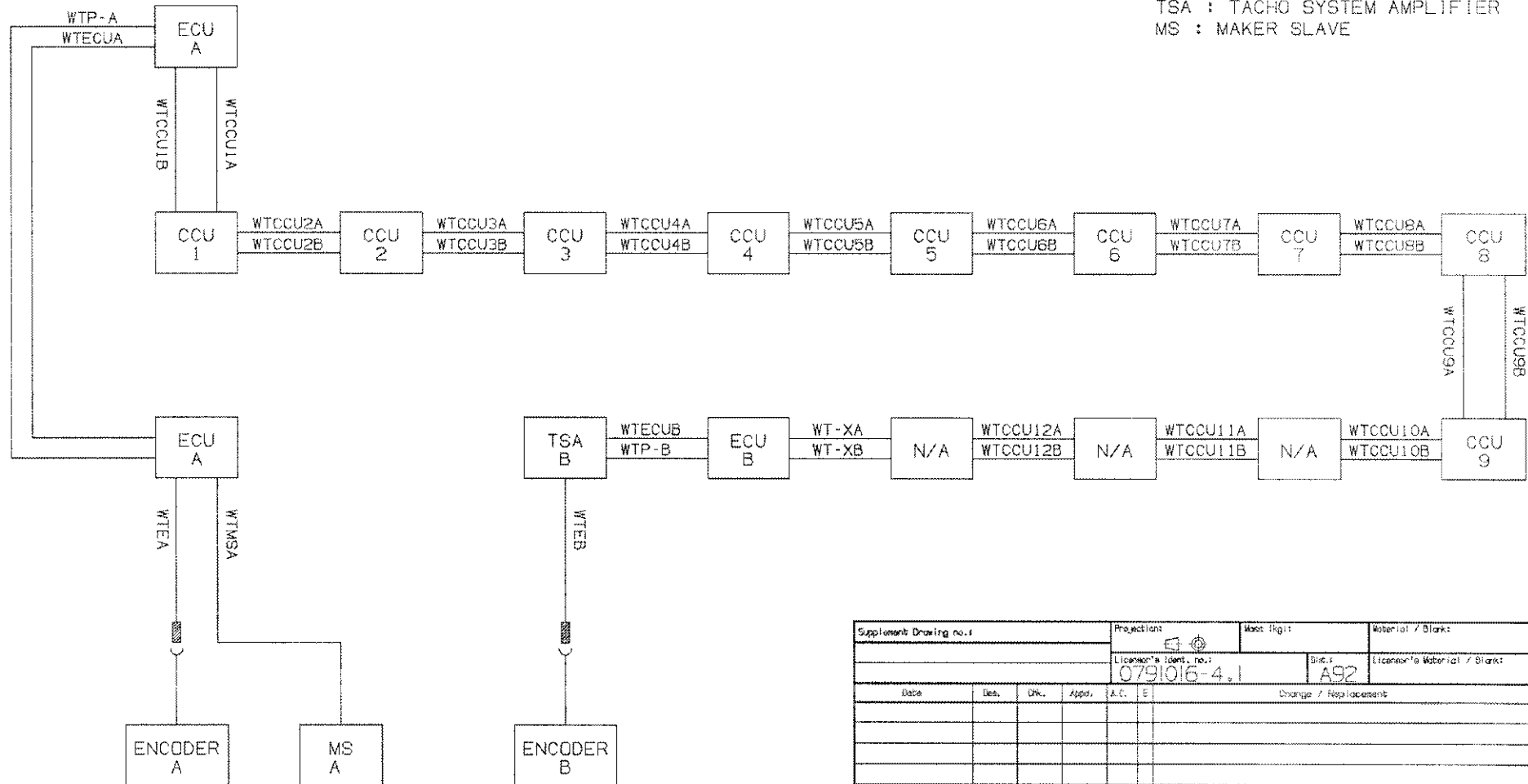
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Info. No.:	Item Name:			Item Id.:		
7B4244	Remote control system			0791461-9		
Final User Info. No.:	Final User Description:				Final User Ident. No.:	

CAD Drawing - no not contact by hand - PCS Drawing

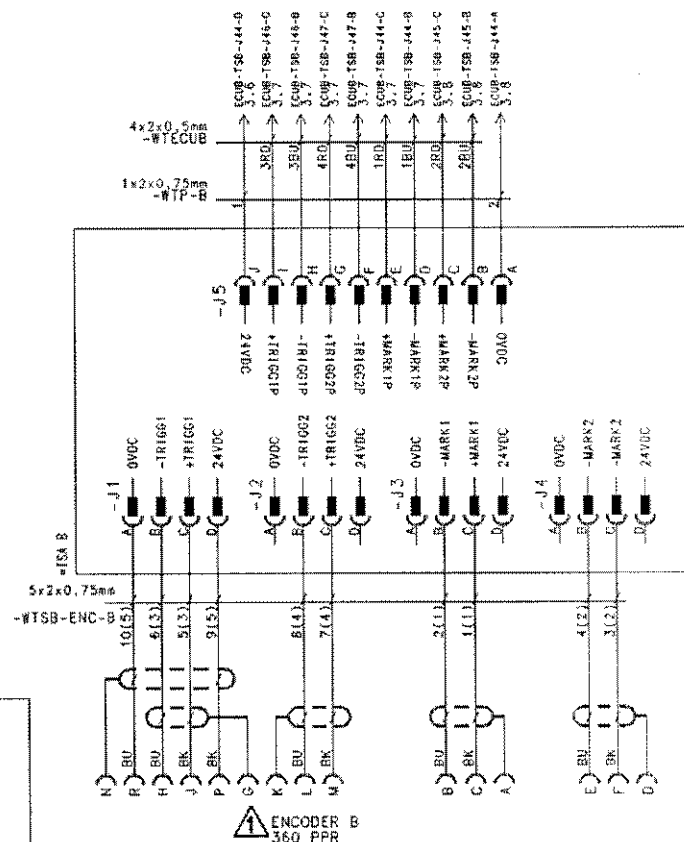
ECS WIRING ON ENGINE

[illegible]

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CCU : CYLINDER CONTROL UNIT
ECU : ENGINE CONTROL UNIT
TSA : TACHO SYSTEM AMPLIFIER
MS : MASTER SLAVE
```

[illegible]

Standard for surface roughness													Tolerances for dimensions without tolerance indication (ISO 1206-1998)												
The basic symbols and class numbers are in accordance with ISO 1302-1997.													This standard defines the permissible deviations for dimension without direct tolerance indication for metric and inch dimensions manufactured by turning.												
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	Permissible deviation												
max. value	0.025	0.063	0.1	0.2	0.4	0.63	1	3.2	6.3	12.5	25	50	Metric series												
													over 1 over 1.6 over 2.5 over 4 over 6.3 over 10 over 16 over 25 over 40 over 63 over 100												
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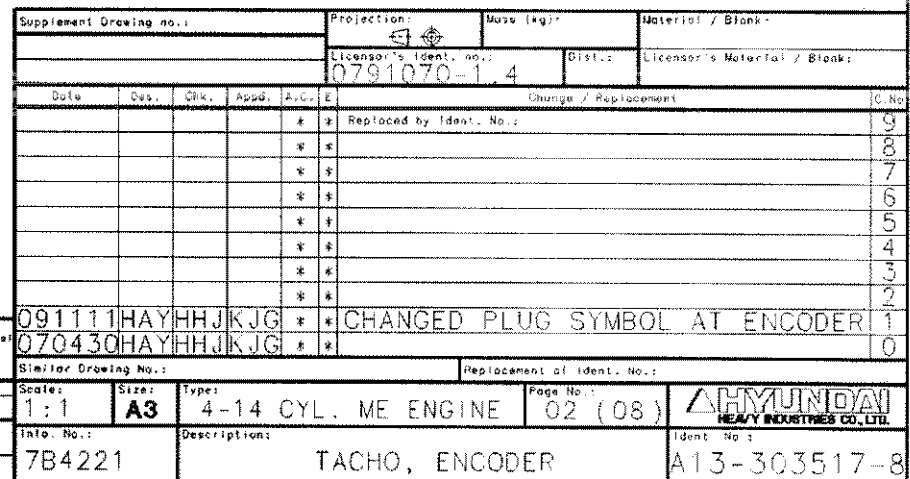
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Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
R _{max}	0,025	0,05	0,1	0,2	0,4	0,8	1,6	3,2	6,3	12,5	25	50

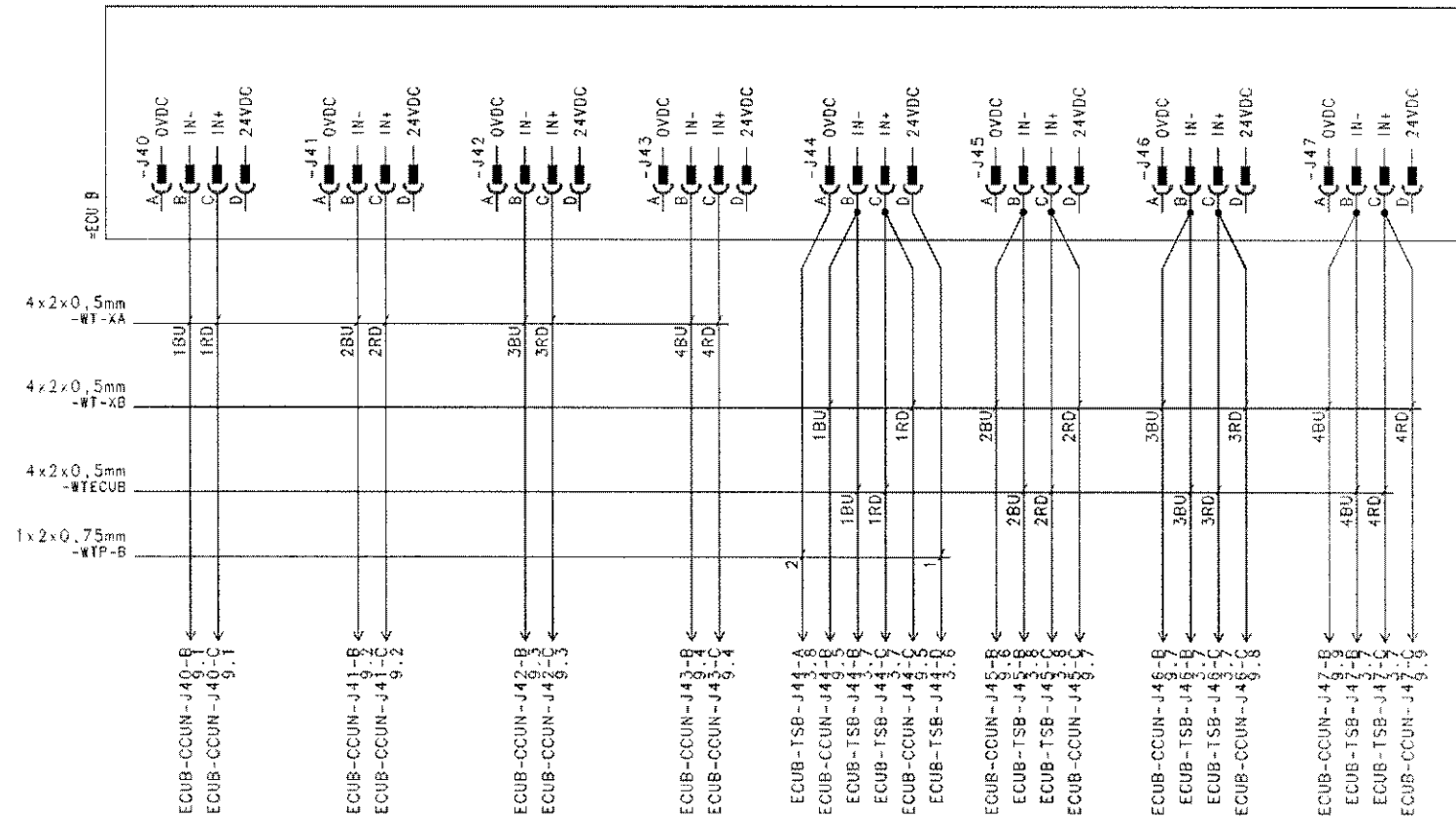
Tolerances for dimensions without tolerance indication (ISO 2768-1989)						
This standard states the permissible deviations for dimensions without direct tolerances for individual cast metallic components manufactured by machine.						
Dim. measurement	0,5	over 6	over 30	over 120	over 315	over 1000
Permissible deviations	up to 6	up to 30	up to 120	up to 315	up to 1000	up to 2000
Medium series	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2

Supplement Drawing no.:				Projection:		Mass (kg):		Material / Blank:	
									
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				*	*				
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070430	HAY	HHJ	KJG	*	*				
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Info. No.:			Description:			Ident. No.:			
7B4221			TACHO, ENCODER			A13-303517-8			



CAO Drawing - do not correct by hand

0 1 2 3 4 5 6 7 8 9



N = Cylinder number

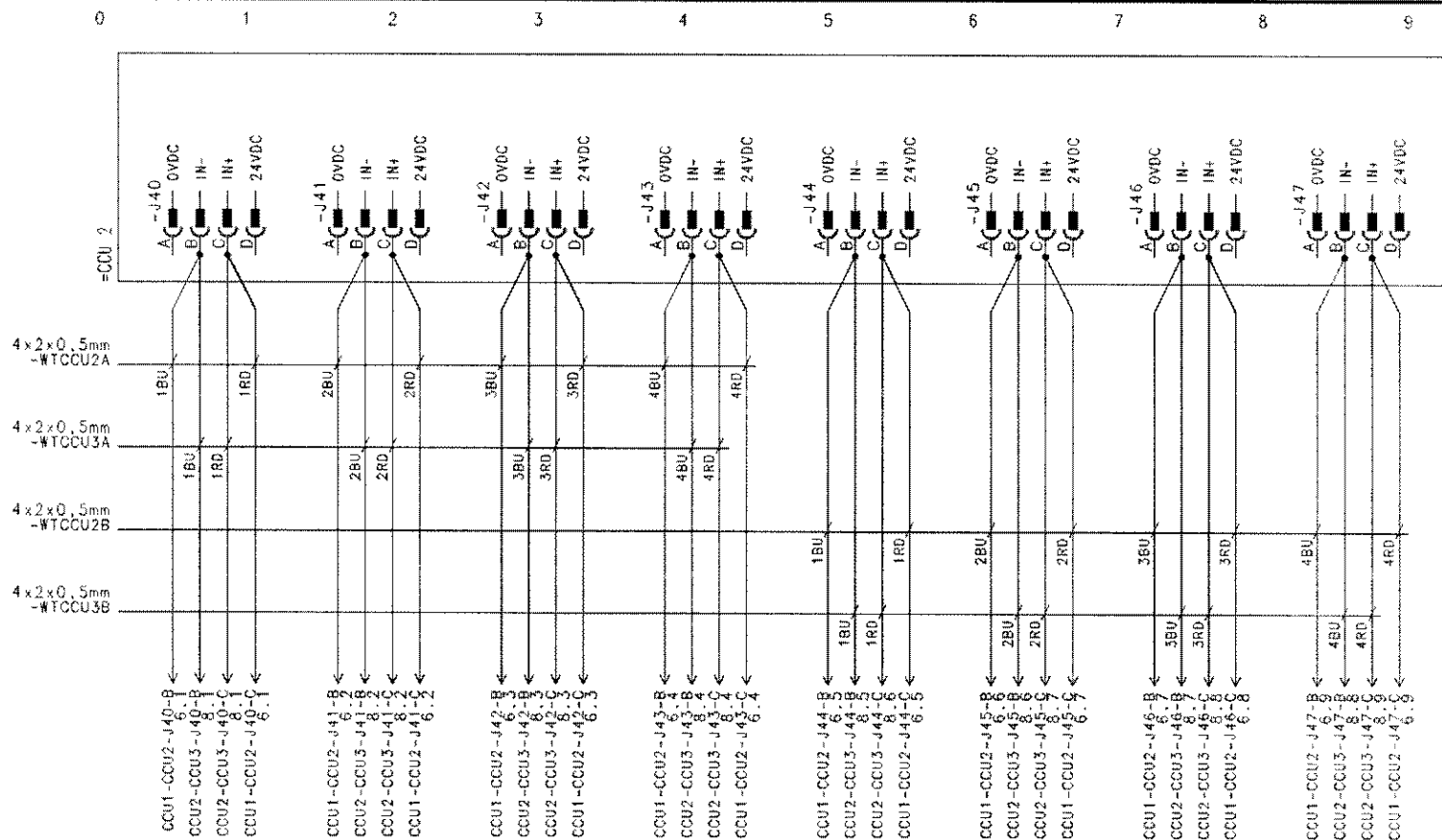
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091111HAYHHJKJG						* * CHANGED SYMBOL AT ENCODER					
070430HAYHHJKJG						* *					
Similar Drawing No.:						Replacement of Ident. No.:					
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Info. No.:						Description:			Ident. No.:		
7B4221						TACHO, ENCODER			A13-303517-8		

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Standard for surface roughness												
The basic symbols and class numbers are in accordance with ISO 1302-1978.												
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
R _a max. value in µm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50

Tolerances for dimensions without tolerance indication (ISO 2768-1989)						
This standard states the permissible deviations for dimensions without direct tolerance indication on metallic components manufactured by machining.						
Non-measurement	0.5	over 0.5	over 30	over 120	over 315	over 1000
Permissible deviations	up to 6	up to 30	up to 120	up to 315	up to 1000	up to 2500
Medium series	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2

Do not correct by hand



Supplement Drawing No.:					Projection:		Mass (kg):		Material / Blank:		
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										7	
										6	
										5	
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										2	
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070430HAYHHJKJG										0	
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Info. No.: 7B4221					Description: TACHO, ENCODER					Ident. No.: A13-303517-8	

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Standard for surface roughness

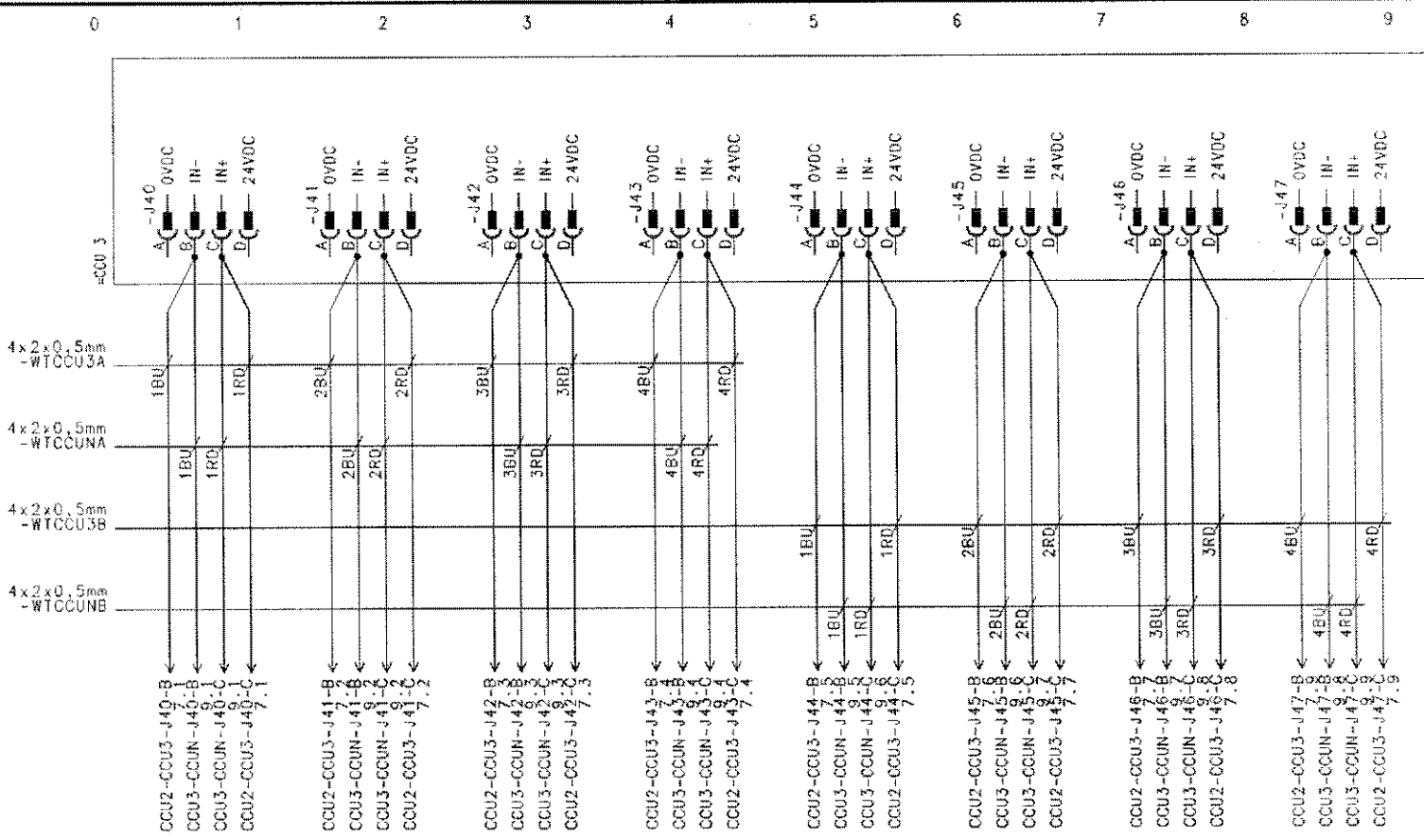
The basic symbols and class numbers are in accordance with ISO 1302-1978.

Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
R _a max. value μ m	0,025	0,05	0,1	0,2	0,4	0,8	1,6	3,2	6,3	12,5	25	50

Tolerances for dimensions without tolerance indication (ISO 2768-1S89)

Two standards specify the permissible deviations for dimensions without direct indication: indications on metric components manufactured by machines.

Permissible deviations	0.5	over 0.5	over 30	over 120	over 315	over 1000
Medium series	$\pm 0,1$	$\pm 0,2$	$\pm 0,3$	$\pm 0,5$	$\pm 0,8$	$\pm 1,2$



N = Cylinder number

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Standard for surface roughness

The basic symbols and class numbers are in accordance with ISO 1302-1975.

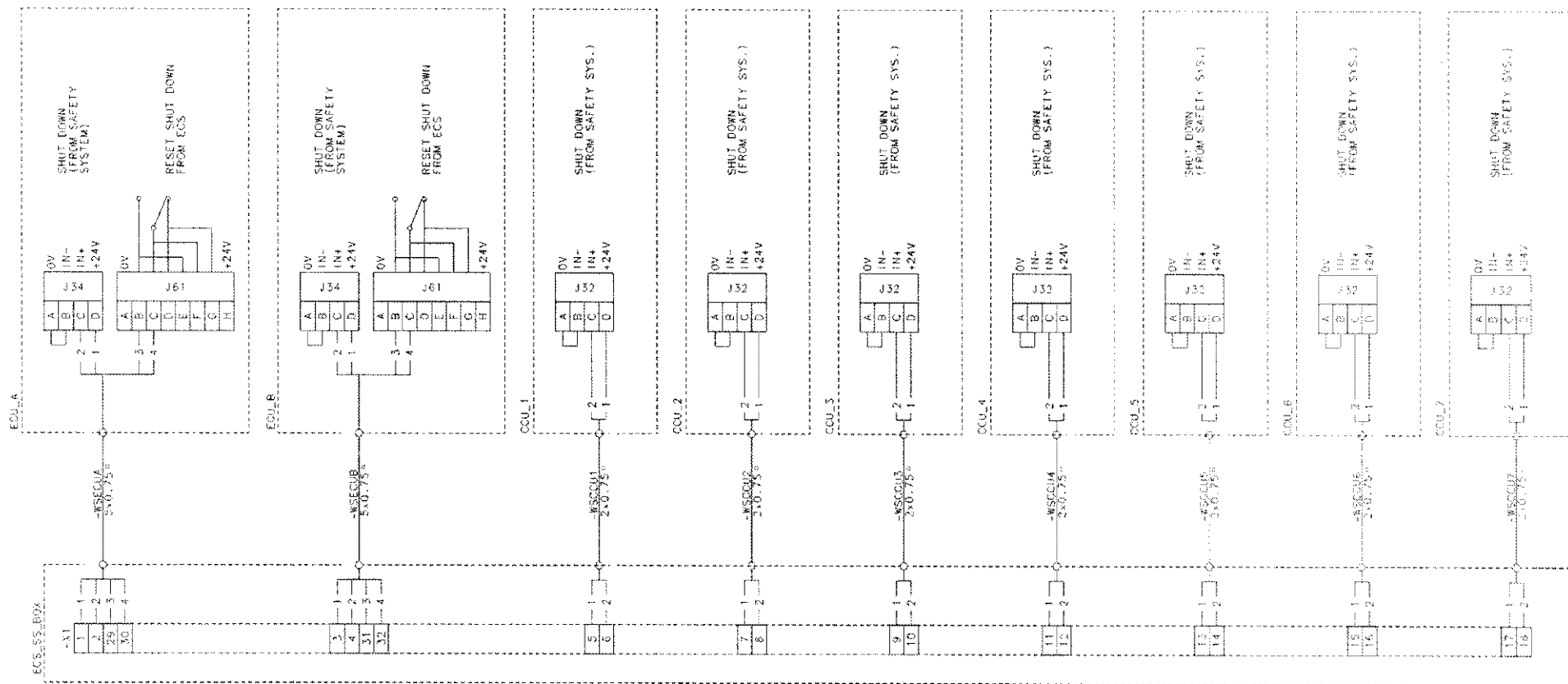
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
R _a max. value, μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50

Tolerances for dimensions without tolerance indication (ISO 2768-1989)

This standard states the permissible deviations for dimensions without direct tolerance indications on metallic components manufactured by machining.

Dim. measurement	0,5	over 0,5	over 30	over 120	over 315	over 1000	over 2500
Permissible deviation	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±1,6

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Info. No.:		7B4221					



Connection from
ECS-SS-B04
to ECS-SS-B04
see word related

Abbreviations:

CCU: Cylinder Control Unit
ECU: Engine Control Unit

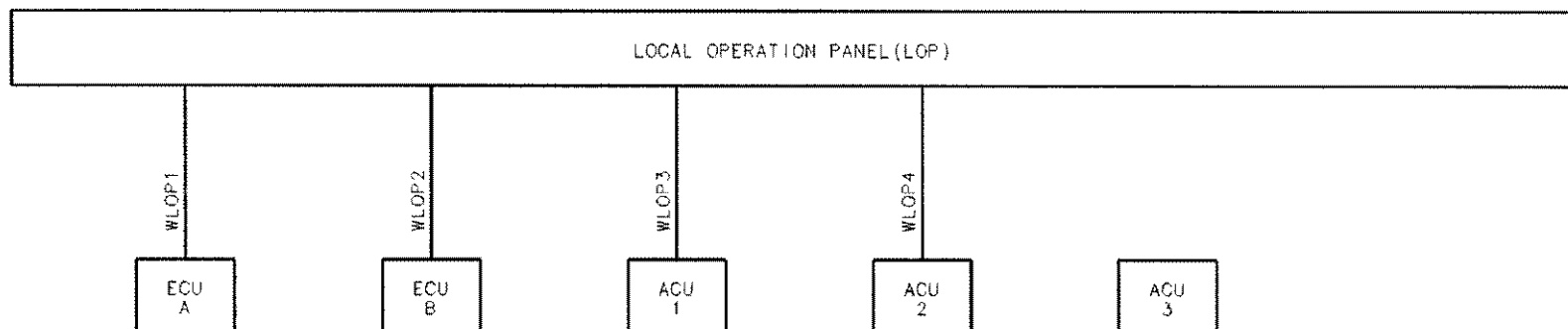
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CCU: Cylinder Control Unit
ECU: Engine Control Unit

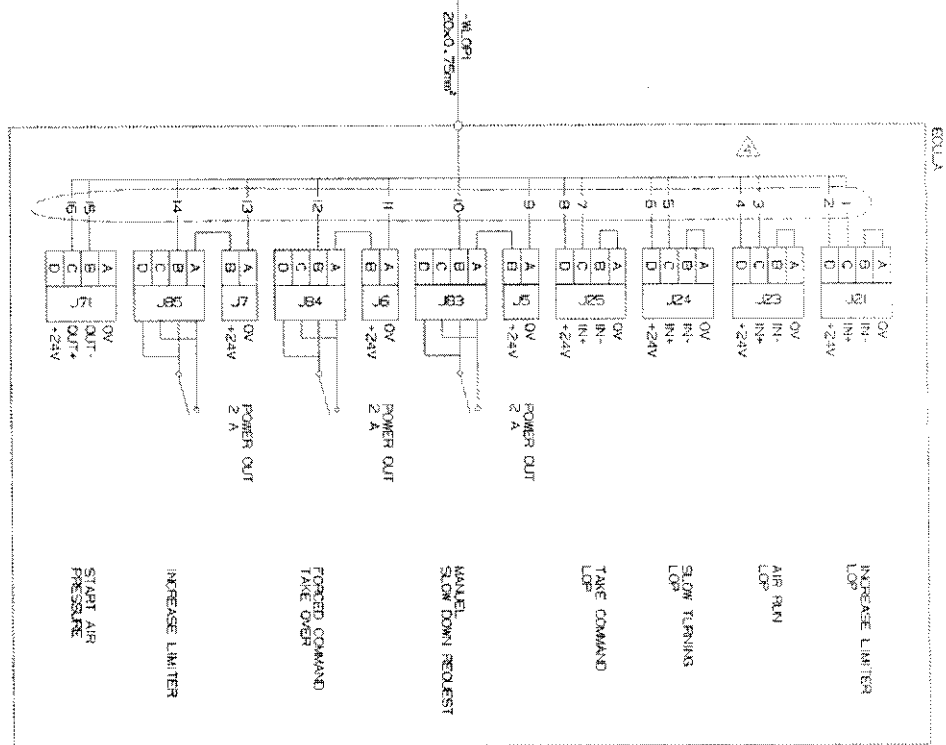
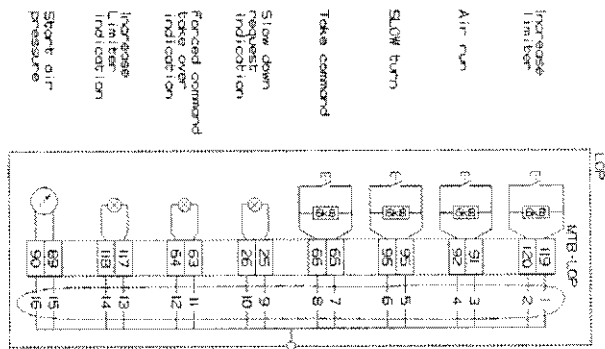
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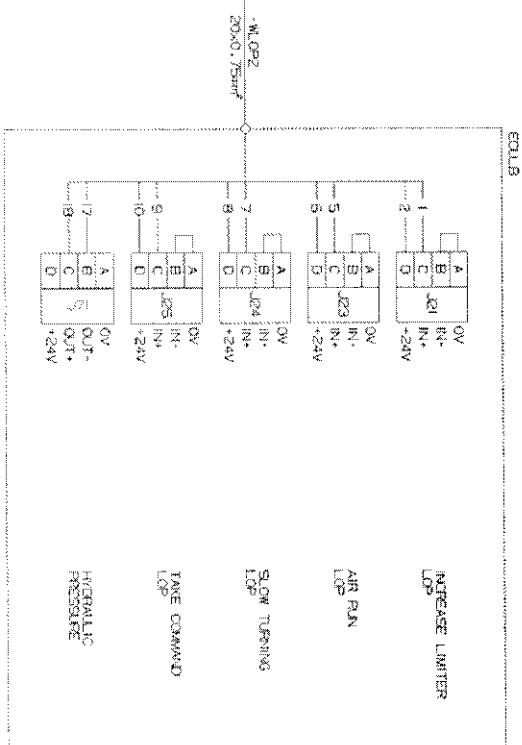
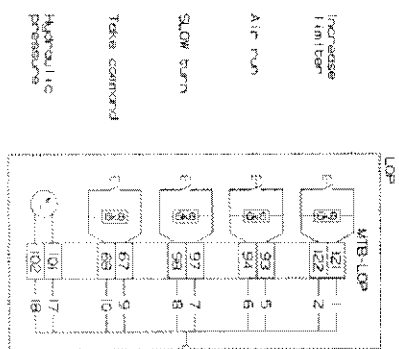
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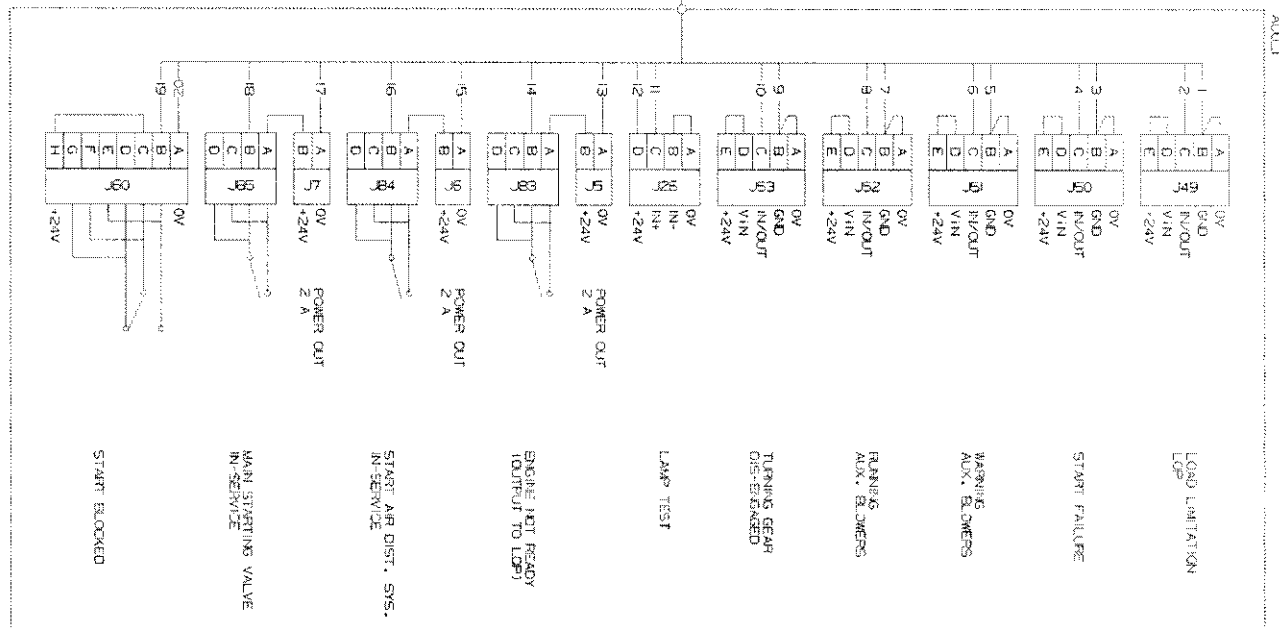
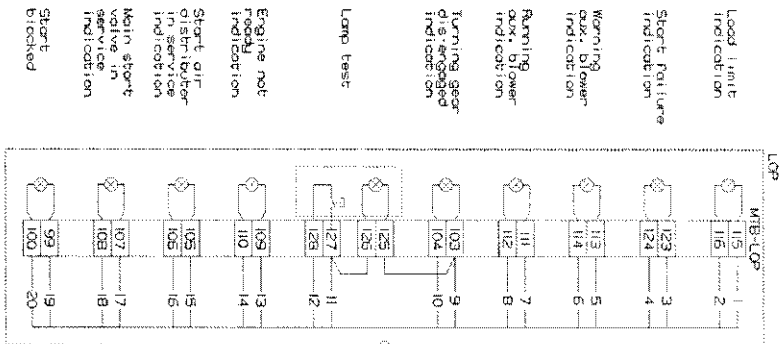
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Abbreviations :

LCP : Local Control Panel
 ACU : Auxiliary Control Unit
 ECU : Engine Control Unit

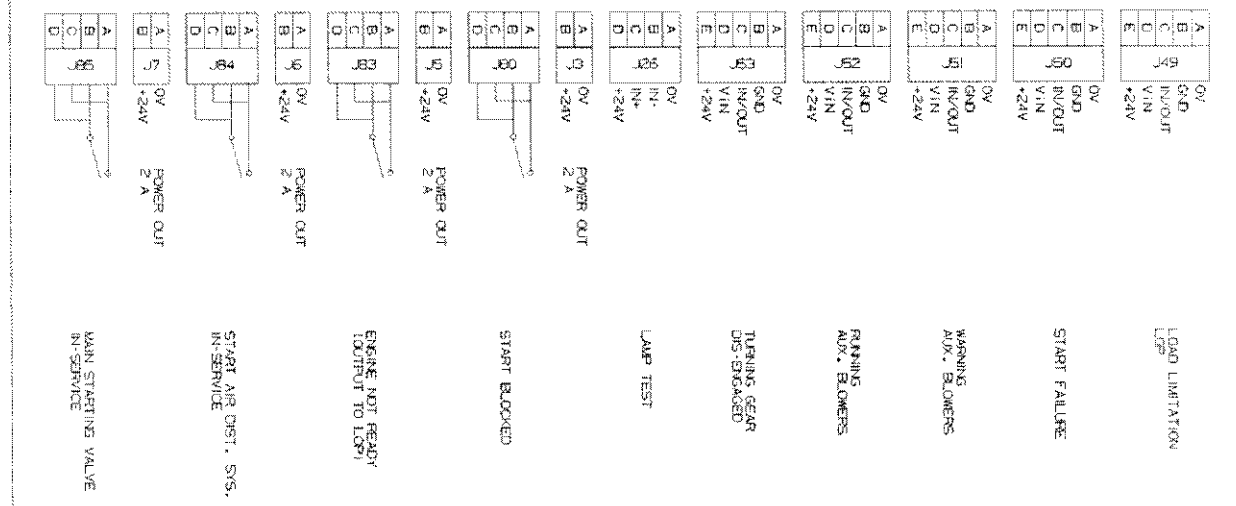
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Abbreviations :

LCP : Local Control Panel
 ACU : Auxiliary Control Unit
 ECU : Engine Control Unit

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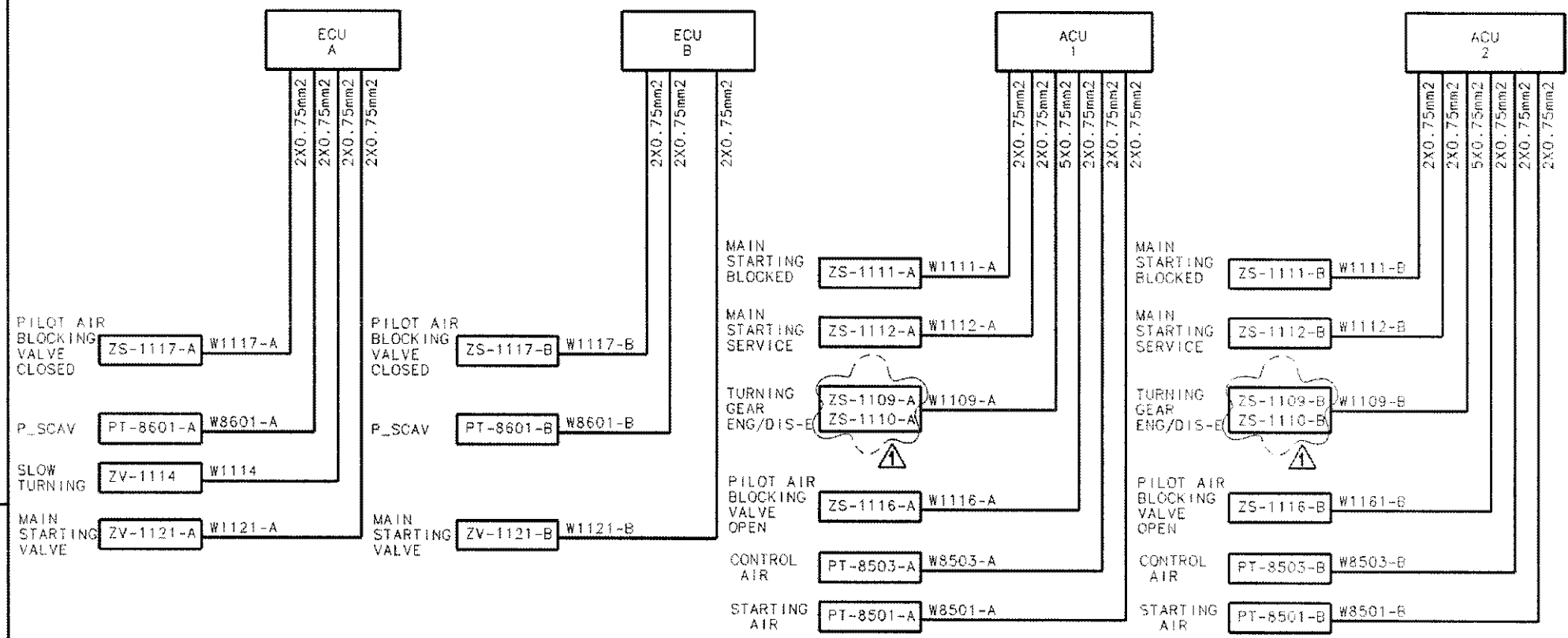


Abbreviations :

LCP : Local Control Panel
ACU : Auxiliary Control Unit
ECU : Engine Control Unit

1. <u>NAME OF THE VESSEL</u> 2. <u>TYPE OF VESSEL</u> 3. <u>REGISTRATION NUMBER</u> 4. <u>DATE OF DEPARTURE</u> 5. <u>DATE OF RETURN</u> 6. <u>NAME OF THE CAPTAIN</u> 7. <u>NAME OF THE MASTER</u> 8. <u>NAME OF THE FIRST OFFICER</u> 9. <u>NAME OF THE SECOND OFFICER</u> 10. <u>NAME OF THE THIRD OFFICER</u> 11. <u>NAME OF THE FOURTH OFFICER</u> 12. <u>NAME OF THE FIFTH OFFICER</u> 13. <u>NAME OF THE SIXTH OFFICER</u> 14. <u>NAME OF THE SEVENTH OFFICER</u> 15. <u>NAME OF THE EIGHTH OFFICER</u> 16. <u>NAME OF THE NINTH OFFICER</u> 17. <u>NAME OF THE TENTH OFFICER</u> 18. <u>NAME OF THE ELEVENTH OFFICER</u> 19. <u>NAME OF THE TWELFTH OFFICER</u> 20. <u>NAME OF THE THIRTEENTH OFFICER</u> 21. <u>NAME OF THE FOURTEENTH OFFICER</u> 22. <u>NAME OF THE FIFTEENTH OFFICER</u> 23. <u>NAME OF THE SIXTEENTH OFFICER</u> 24. <u>NAME OF THE SEVENTEENTH OFFICER</u> 25. <u>NAME OF THE EIGHTEENTH OFFICER</u> 26. <u>NAME OF THE NINETEENTH OFFICER</u> 27. <u>NAME OF THE TWENTIETH OFFICER</u> 28. <u>NAME OF THE TWENTY-FIRST OFFICER</u> 29. <u>NAME OF THE TWENTY-SECOND OFFICER</u> 30. <u>NAME OF THE TWENTY-THIRD OFFICER</u> 31. <u>NAME OF THE TWENTY-FOURTH OFFICER</u> 32. <u>NAME OF THE TWENTY-FIFTH OFFICER</u> 33. <u>NAME OF THE TWENTY-SIXTH OFFICER</u> 34. <u>NAME OF THE TWENTY-SEVENTH OFFICER</u> 35. <u>NAME OF THE TWENTY-EIGHTH OFFICER</u> 36. <u>NAME OF THE TWENTY-NINTH OFFICER</u> 37. <u>NAME OF THE THIRTIETH OFFICER</u> 38. <u>NAME OF THE THIRTY-FIRST OFFICER</u> 39. <u>NAME OF THE THIRTY-SECOND OFFICER</u> 40. <u>NAME OF THE THIRTY-THIRD OFFICER</u> 41. <u>NAME OF THE THIRTY-FOURTH OFFICER</u> 42. <u>NAME OF THE THIRTY-FIFTH OFFICER</u> 43. <u>NAME OF THE THIRTY-SIXTH OFFICER</u> 44. <u>NAME OF THE THIRTY-SEVENTH OFFICER</u> 45. <u>NAME OF THE THIRTY-EIGHTH OFFICER</u> 46. <u>NAME OF THE THIRTY-NINTH OFFICER</u> 47. <u>NAME OF THE FORTIETH OFFICER</u> 48. <u>NAME OF THE FORTY-FIRST OFFICER</u> 49. <u>NAME OF THE FORTY-SECOND OFFICER</u> 50. <u>NAME OF THE FORTY-THIRD OFFICER</u> 51. <u>NAME OF THE FORTY-FOURTH OFFICER</u> 52. <u>NAME OF THE FORTY-FIFTH OFFICER</u> 53. <u>NAME OF THE FORTY-SIXTH OFFICER</u> 54. <u>NAME OF THE FORTY-SEVENTH OFFICER</u> 55. <u>NAME OF THE FORTY-EIGHTH OFFICER</u> 56. <u>NAME OF THE FORTY-NINTH OFFICER</u> 57. <u>NAME OF THE FIFTIETH OFFICER</u> 58. <u>NAME OF THE FIFTY-FIRST OFFICER</u> 59. <u>NAME OF THE FIFTY-SECOND OFFICER</u> 60. <u>NAME OF THE FIFTY-THIRD OFFICER</u> 61. <u>NAME OF THE FIFTY-FOURTH OFFICER</u> 62. <u>NAME OF THE FIFTY-FIFTH OFFICER</u> 63. <u>NAME OF THE FIFTY-SIXTH OFFICER</u> 64. <u>NAME OF THE FIFTY-SEVENTH OFFICER</u> 65. <u>NAME OF THE FIFTY-EIGHTH OFFICER</u> 66. <u>NAME OF THE FIFTY-NINTH OFFICER</u> 67. <u>NAME OF THE SIXTIETH OFFICER</u> 68. <u>NAME OF THE SIXTY-FIRST OFFICER</u> 69. <u>NAME OF THE SIXTY-SECOND OFFICER</u> 70. <u>NAME OF THE SIXTY-THIRD OFFICER</u> 71. <u>NAME OF THE SIXTY-FOURTH OFFICER</u> 72. <u>NAME OF THE SIXTY-FIFTH OFFICER</u> 73. <u>NAME OF THE SIXTY-SIXTH OFFICER</u> 74. <u>NAME OF THE SIXTY-SEVENTH OFFICER</u> 75. <u>NAME OF THE SIXTY-EIGHTH OFFICER</u> 76. <u>NAME OF THE SIXTY-NINTH OFFICER</u> 77. <u>NAME OF THE SEVENTIETH OFFICER</u> 78. <u>NAME OF THE SEVENTY-FIRST OFFICER</u> 79. <u>NAME OF THE SEVENTY-SECOND OFFICER</u> 80. <u>NAME OF THE SEVENTY-THIRD OFFICER</u> 81. <u>NAME OF THE SEVENTY-FOURTH OFFICER</u> 82. <u>NAME OF THE SEVENTY-FIFTH OFFICER</u> 83. <u>NAME OF THE SEVENTY-SIXTH OFFICER</u> 84. <u>NAME OF THE SEVENTY-SEVENTH OFFICER</u> 85. <u>NAME OF THE SEVENTY-EIGHTH OFFICER</u> 86. <u>NAME OF THE SEVENTY-NINTH OFFICER</u> 87. <u>NAME OF THE EIGHTIETH OFFICER</u> 88. <u>NAME OF THE EIGHTY-FIRST OFFICER</u> 89. <u>NAME OF THE EIGHTY-SECOND OFFICER</u> 90. <u>NAME OF THE EIGHTY-THIRD OFFICER</u> 91. <u>NAME OF THE EIGHTY-FOURTH OFFICER</u> 92. <u>NAME OF THE EIGHTY-FIFTH OFFICER</u> 93. <u>NAME OF THE EIGHTY-SIXTH OFFICER</u> 94. <u>NAME OF THE EIGHTY-SEVENTH OFFICER</u> 95. <u>NAME OF THE EIGHTY-EIGHTH OFFICER</u> 96. <u>NAME OF THE EIGHTY-NINTH OFFICER</u> 97. <u>NAME OF THE NINETYETH OFFICER</u> 98. <u>NAME OF THE NINETY-FIRST OFFICER</u> 99. <u>NAME OF THE NINETY-SECOND OFFICER</u> 100. <u>NAME OF THE NINETY-THIRD OFFICER</u> 101. <u>NAME OF THE NINETY-FOURTH OFFICER</u> 102. <u>NAME OF THE NINETY-FIFTH OFFICER</u> 103. <u>NAME OF THE NINETY-SIXTH OFFICER</u> 104. <u>NAME OF THE NINETY-SEVENTH OFFICER</u> 105. <u>NAME OF THE NINETY-EIGHTH OFFICER</u> 106. <u>NAME OF THE NINETY-NINTH OFFICER</u> 107. <u>NAME OF THE HUNDRETH OFFICER</u> 108. <u>NAME OF THE HUNDRED-FIRST OFFICER</u> 109. <u>NAME OF THE HUNDRED-SECOND OFFICER</u> 110. <u>NAME OF THE HUNDRED-THIRD OFFICER</u> 111. <u>NAME OF THE HUNDRED-FOURTH OFFICER</u> 112. <u>NAME OF THE HUNDRED-FIFTH OFFICER</u> 113. <u>NAME OF THE HUNDRED-SIXTH OFFICER</u> 114. <u>NAME OF THE HUNDRED-SEVENTH OFFICER</u> 115. <u>NAME OF THE HUNDRED-EIGHTH OFFICER</u> 116. <u>NAME OF THE HUNDRED-NINTH OFFICER</u> 117. <u>NAME OF THE HUNDRETH OFFICER</u> 118. <u>NAME OF THE HUNDRED-FIRST OFFICER</u> 119. <u>NAME OF THE HUNDRED-SECOND OFFICER</u> 120. <u>NAME OF THE HUNDRED-THIRD OFFICER</u> 121. <u>NAME OF THE HUNDRED-FOURTH OFFICER</u> 122. <u>NAME OF THE HUNDRED-FIFTH OFFICER</u> 123. <u>NAME OF THE HUNDRED-SIXTH OFFICER</u> 124. <u>NAME OF THE HUNDRED-SEVENTH OFFICER</u> 125. <u>NAME OF THE HUNDRED-EIGHTH OFFICER</u> 126. <u>NAME OF THE HUNDRED-NINTH OFFICER</u> 127. <u>NAME OF THE HUNDRETH OFFICER</u> 128. <u>NAME OF THE HUNDRED-FIRST OFFICER</u> 129. <u>NAME OF THE HUNDRED-SECOND OFFICER</u> 130. <u>NAME OF THE HUNDRED-THIRD OFFICER</u> 131. <u>NAME OF THE HUNDRED-FOURTH OFFICER</u> 132. <u>NAME OF THE HUNDRED-FIFTH OFFICER</u> 133. <u>NAME OF THE HUNDRED-SIXTH OFFICER</u> 134. <u>NAME OF THE HUNDRED-SEVENTH OFFICER</u> 135. <u>NAME OF THE HUNDRED-EIGHTH OFFICER</u> 136. <u>NAME OF THE HUNDRED-NINTH OFFICER</u> 137. <u>NAME OF THE HUNDRETH OFFICER</u> 138. <u>NAME OF THE HUNDRED-FIRST OFFICER</u> 139. <u>NAME OF THE HUNDRED-SECOND OFFICER</u> 140. <u>NAME OF THE HUNDRED-THIRD OFFICER</u> 141. <u>NAME OF THE HUNDRED-FOURTH OFFICER</u> 142. <u>NAME OF THE HUNDRED-FIFTH OFFICER</u> 143. <u>NAME OF THE HUNDRED-SIXTH OFFICER</u> 144. <u>NAME OF THE HUNDRED-SEVENTH OFFICER</u> 145. <u>NAME OF THE HUNDRED-EIGHTH OFFICER</u> 146. <u>NAME OF THE HUNDRED-NINTH OFFICER</u> 147. <u>NAME OF THE HUNDRETH OFFICER</u> 148. <u>NAME OF THE HUNDRED-FIRST OFFICER</u> 149. <u>NAME OF THE HUNDRED-SECOND OFFICER</u> 150. <u>NAME OF THE HUNDRED-THIRD OFFICER</u> 151. <u>NAME OF THE HUNDRED-FOURTH OFFICER</u> 152. <u>NAME OF THE HUNDRED-FIFTH OFFICER</u> 153. <u>NAME OF THE HUNDRED-SIXTH OFFICER</u> 154. <u>NAME OF THE HUNDRED-SEVENTH OFFICER</u> 155. <u>NAME OF THE HUNDRED-EIGHTH OFFICER</u> 156. <u>NAME OF THE HUNDRED-NINTH OFFICER</u> 157. <u>NAME OF THE HUNDRETH OFFICER</u> 158. <u>NAME OF THE HUNDRED-FIRST OFFICER</u> 159. <u>NAME OF THE HUNDRED-SECOND OFFICER</u> 160. <u>NAME OF THE HUNDRED-THIRD OFFICER</u> 161. <u>NAME OF THE HUNDRED-FOURTH OFFICER</u> 									
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F



ACU : AUXILIARY CONTROL UNIT
ECU : ENGINE CONTROL UNIT

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Standard for surface roughness												
The basic symbols and class numbers are in accordance with ISO 1302-1978.												
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
R _a max. value in µm	0,025	0,05	0,1	0,2	0,4	0,8	1,6	3,2	6,3	12,5	25	50

Supplement Drawing no.:					Projection:		Mass (kg):		Material / Blank:		
					Licensor's Ident. no.:		Dist.:		Licensor's Material / Blank:		
0795127-6.2					A92						
Date	Des.	CHK.	Appd.	A.C.	Change / Replacement					C.No.	
					* * Replaced by Ident. No.:					9	
										8	
										7	
										6	
										5	
										4	
										3	
										2	
061120HHJISHKJG					* * CABLE TYPE HAS CHANGED.					1	
051130HAYISHKJG					* * ZS-1110-A & ZS-1110-B ARE ADDED					1	
040819BYJBKJG					* *					0	
Similar Drawing No.:					Replacement of Ident. No.:						
Scale:					Size:		Type:		Page No.:		
N/S					A3		ME/ME-C		01 (01)		
Info. No.:					Description:					Ident. No.:	
338983					E.C.S FOR ECU & ACU SENSOR					A13-255225-5	

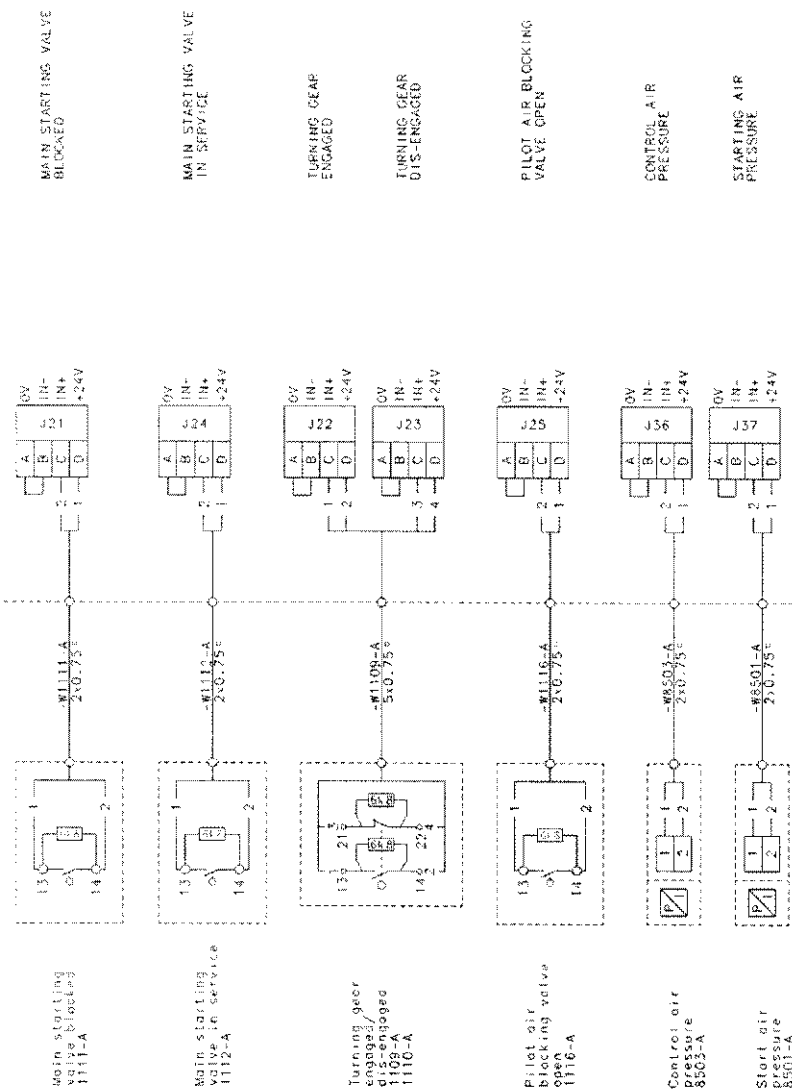
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Do not correct by hand

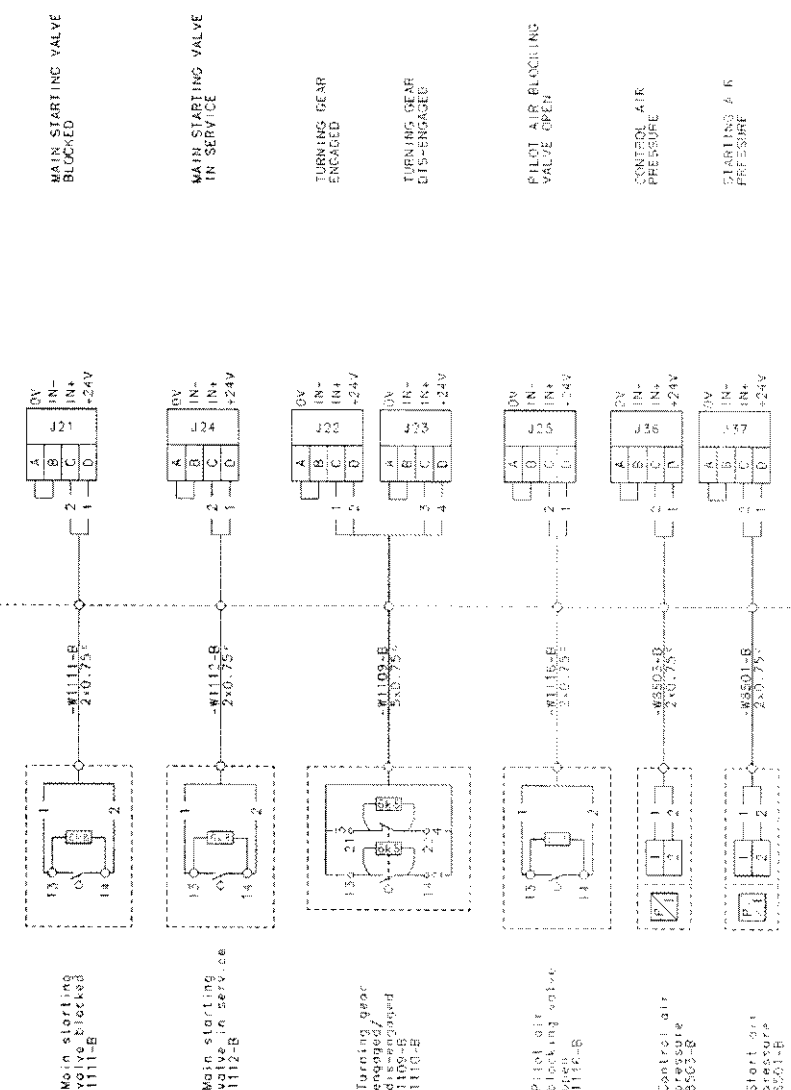
Abbreviations:

ACU: Auxiliary Control Unit
ECU: Engine Control Unit

ACU_1



ACU_2

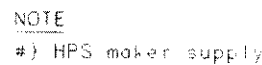


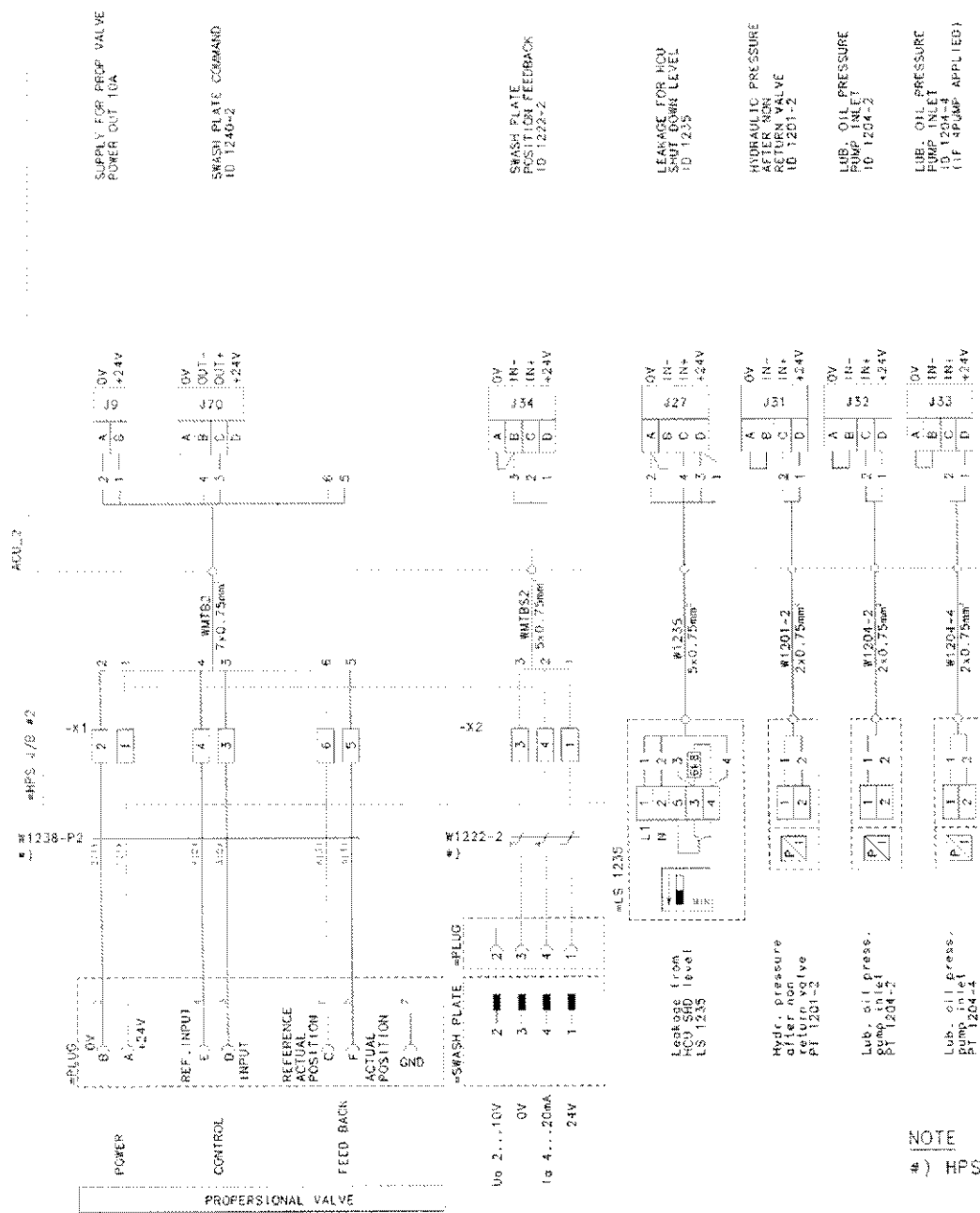
REVISION		DATE	BY	REVISION
1	1	07/01/2015	122	
CABLE TYPE HAS CHANGED				
1	A0	ME/ENGINE	01/02/2015	
000000	Eng. control sys. for ECU & SENSOR AIO-255174-B			

1 F

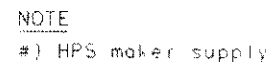


4 CAP Browing - do not correct by hand

[illegible]



1:1		AO	3/2001/17 pump, Rev. Prior prop. H. 02/04	10 1201-2
344 100	Eng. Control Sys. FOR ACU & SENSOR	A10-382075-2		



1-1		AO		302402 (3 pamps, Rex, Frmr prog.) 0 (104)		744100	
744100		Eng. Control Sys FOR ACQ & SENSOR		A19-382075-2		www.mil.aero	

0

1

2

3

4

5

6

7

8

9

MBD-FIVA

Connections to

Cylinder Control Unit

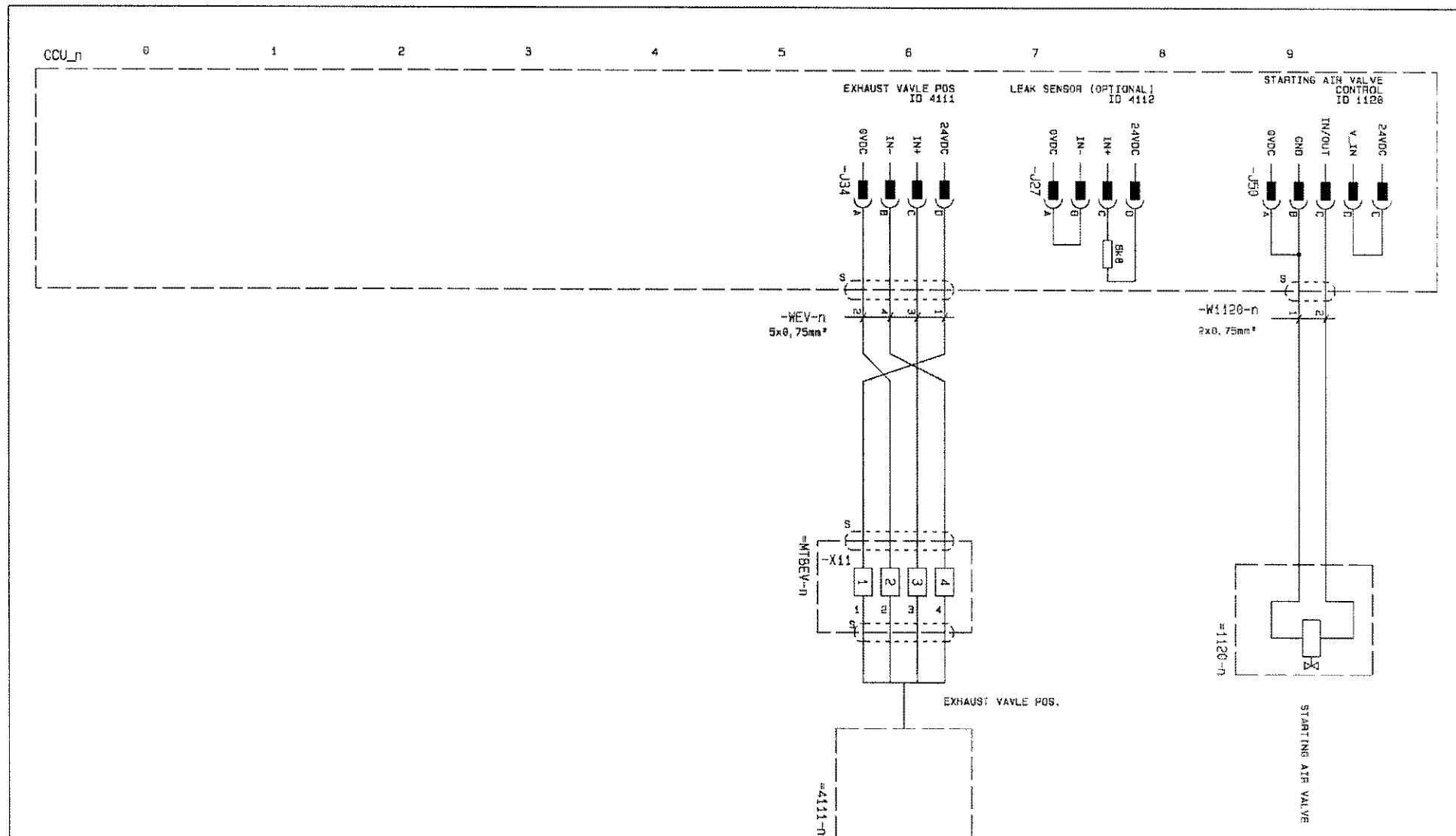
Tail solution

Basic Standards (NBO SB) & Suppl. Drawing No.:					EN24C Surf. roughness	Projection:	Material / Blank:
0788967-5					EN21F-m Tolerances		
						Weld (kg):	Final User Material:
Date	Des.	Chk.	Appd.	A.C.	Change / Replacement		
					Replaced by Ident. No.:		
					9		
					8		
					7		
					6		
					5		
					4		
20100909	AND	POP	JYA	Z2	-WHCU-N.01 type changed		005230
20100423	AND	DFA	JYA	Z3	Correction of cable no.4114-n - page 2		2
20100322	AND	DFA	JYA	Z3	FIVA/Lub/plunger connection corrected		1
20100218	AND	DFA	JYA				0
Similar Drawing No.:					Replacement for Ident. No.:		
Scale:	Size:	Type:			Page No.:	MAN B&W Diesel A/S	
1: 1	A3	MBD - FIVA			1 (4)		
Info. No.:		Description:				Ident. No.:	
7B4205		Cylinder control				5197845-5	
Final User Info. No.:		Final User Description:					
		HHI-EMD drawing no.: A10-229508-0.1					

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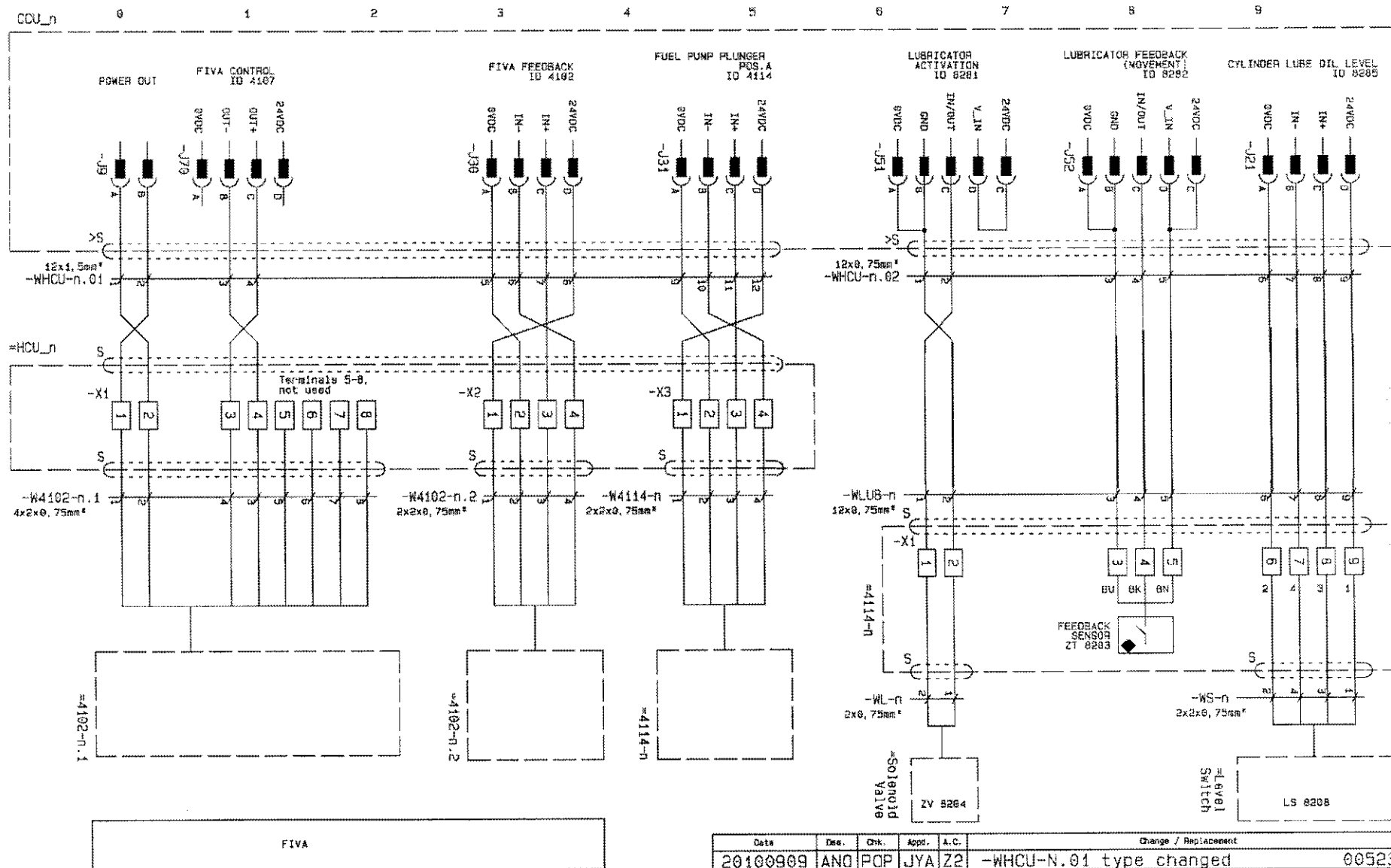


Date	Des.	Chk.	Appd.	A.C.	Change / Replacement	C. No.
20100909	ANO	POP	JYA	Z2	-WHCU-N.01 type changed	005230
Scale: 1: 1	Size: A3	Type: MBD - FIVA	Page No.: 3 (4)	MAN B&W Diesel A		
Info. No.: 7B4205	Description: Cylinder control				Ident. No.: 5197845-5	
Final User Info. No.:		Final User Description: HHI-EMD drawing no.: A10-229508-0.1				

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Date	Des.	Chk.	Appr.	A.C.	Change / Replacement		C.No.
20100909	AND	POP	JYA	Z2	-WHCU-N.01 type changed		005230 3
Scale: 1: 1	Size: A3	Type: MBD - FIVA			Page No.: 4 (4)	MAN B&W Diesel A/S	
Info. No.: 7B4205		Description: Cylinder control				Ident. No.: 5197845-5	
Final User Info. No.:		Final User Description: HHI-EMD drawing no.: A10-229508-0.1					

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130 Fore.

010 Aft.

CCU ZT 4111

CCU ZV 1120

CCU ZV 1120

ECS PT 8601 A+B

PT 8601 A+B ECS

PNEUMATIC FOR LOP

PT 1201 1-3 HPS

ZV 1202 A+B HPS

XC 1222 HPS

XS 1236 HPS

PT 1204 1-3 HPS

ZS 1109 A+B ECS

ZS 1110 A+B ECS

HPS LS 1235

HPS LS 1236

PLACED ON THIS SIDE OR OPPOSITE

TS4 B
TACHO
SYSTEM

TS4 A
TACHO
SYSTEM

CONTROL PANEL

LS 1235 HPS

LS 1236 HPS

PLACED ON THIS SIDE OR OPPOSITE

CCU ZT 4114

CCU XC 4102

LS 8208 CCU

ZT 8203 CCU

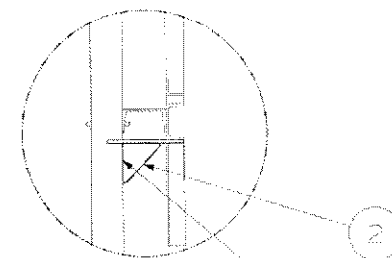
CCU XC 4107

ZT 8204 CCU

PT 8503 A+B ECS

PNEUMATIC FOR LOP
SEE STRUCTURE 21-7025

B
Hydraulic Cylinder Unit



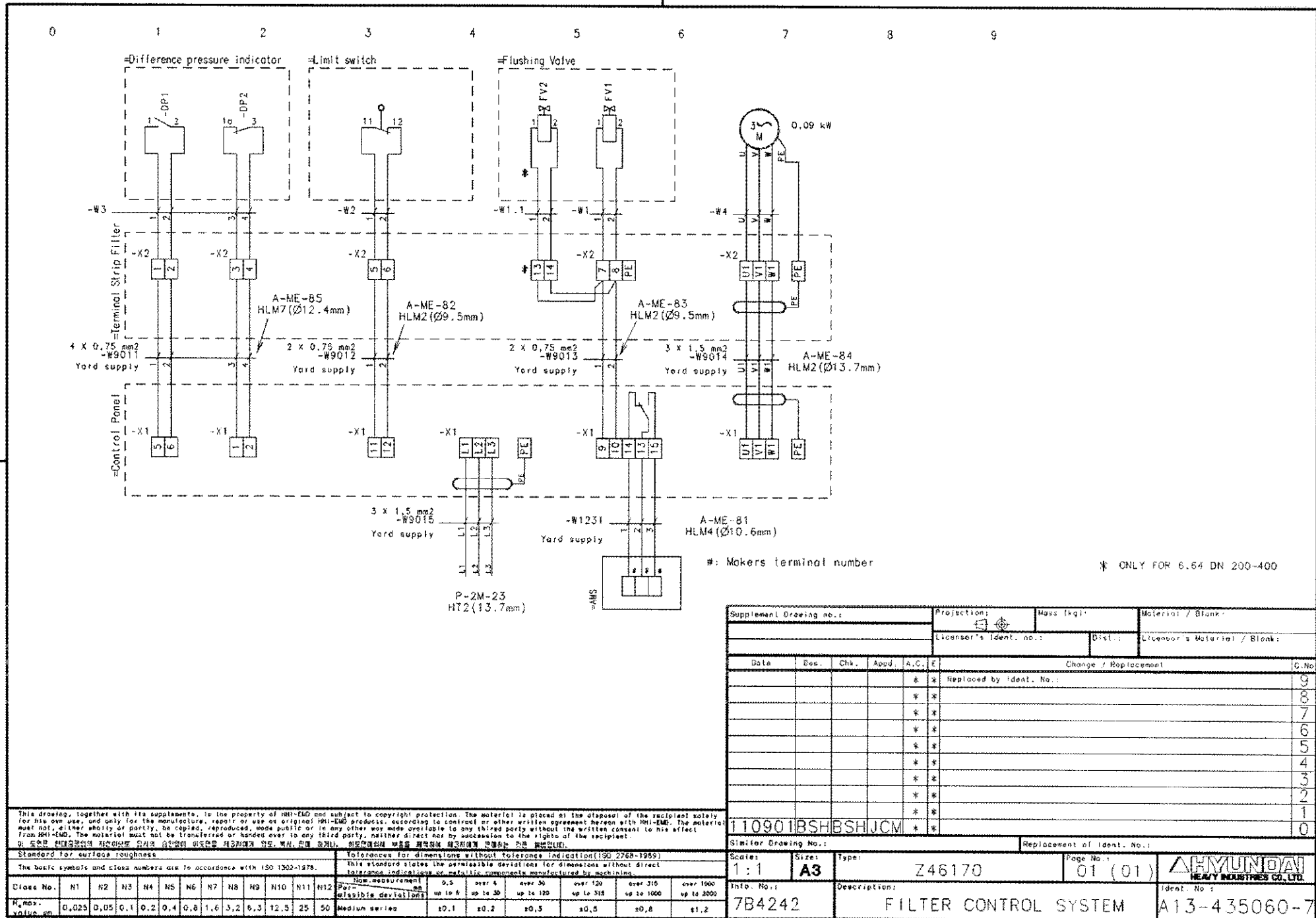
BN601 M
163 All over.

		S. PAGE	T. PAGE
PLAN HISTORY	ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2	
	MESSRS.	H.H.I.	
	RULE	LR + UMS	
	SHIP NO.	2585/86/87/88/89	
	ENG. NO.	AA4624/25/26/27/28	

TITLE : AUTO FILTER CONTROL PANEL

Date	Des.	Dsk.	Appd.	A.E.	Replaced by Ident.no.:	Replacement for Ident.no.:	R
20110718	BSH	BSH	JCM		FOR WORKING.		I
20110217	BSH	BSH	JCM				O
Licensor Ident.no.:		Type:		6S90ME-C			
Info.no.:		Description:		AUTO FILTER CONTROL PANEL		Ident.no.:	
Page.no.:		Security:				A14-413499-5	
(01) 01		C					

3D CAD Drawing - do not correct by hand



GENERAL SPECIFICATION

1. PROJECT : 2585/2586/2587/2588/2589
2. CLASS & RULE : LR+UMS
3. AMBIENT TEMP. : 45°C
4. CONSTRUCTION OF PANEL
 - MOUNTING METHOD : WALL MOUNTING
 - MATERIAL : SHEET STEEL 2.3t
 - PAINT COLOR : RAL 7032
 - PROTECTION EDGREE OF ENCLOSURE : IP44
5. LETTER OF DOCUMENT & DRAWING : ENGLISH
6. NAME PLATE
 - LETTER : ENGLISH
 - MATERIAL : PHENOLIC
7. ELECTRIC SOURCE
 - AC440V 3PH 60Hz x 1FEEDER
8. CABLE (INTERNAL)
 - POWER CIRCUIT : 660V, SYP-2.0mm² ~ 4.0mm²
 - CONTROL CIRCUIT : 660V, SYP-1.25mm² & 0.75mm²
FLAME RETARDANT TYPE
9. DISTINGUISH BETWEEN COLOR OF CABLE LUG CAP
 - D.C POWER CIRCUIT : P (RED), N (BLUE)
 - A.C POWER CIRCUIT : U (RED), V (WHITE), W (BLACK)
 - CONTROL CIRCUIT : WHITE WITH NUMBERING
10. SCOPE OF SUPPLY : HYDAULIC AUTO FILTER CONTROL PANEL 1SET/SHIP
 - A. HYDAULIC AUTO FILTER CONTROL PANEL : 1SET/SHIP

Date	Des.	Chk.	Apod.	A.C	Replace by Ident.no.	R
				*		5
				*		4
				*		3
				*		2
111205	CJH	CJH	YJH	*	For working (PAGE. 4)	1
110729	CJH	CJH	YJH	*	Shipyard comments(PAGE. 5)	1
110719	CJH	CJH	YJH	*	For approval	0

Licensor Ident.no.:	Type: 6S90ME-C8.2	 YUMYUNG ENGINEERING CO.,.
Info.no.:	Description: HYDRAULIC AUTO FILTER CONTROL PANEL GENERAL SPECIFICATION	Ident.No. YM11-JY0196
Page.no.: 01 OF 09		

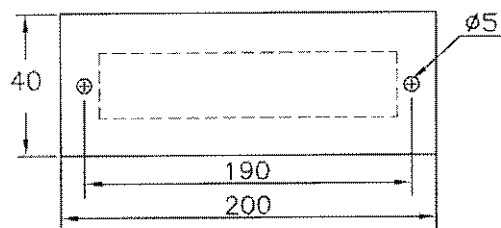
GRAPHICAL SYMBOLS

SYMBOL	NAME	SYMBOL	NAME
	RESISTOR		MAKE CONTACT(NO)
	RESISTOR WITH TAPPING		BREAK CONTACT(NO)
	WINDING, INDUCTOR		CHANGE-OVER CONTACT
	WINDING, INDUCTOR TAPPING		CHANGE-OVER CONTACT MAKE -- BEFORE -- BREAK
	CAPACITOR		MAKE CONTACT, (ON DELAY TIMER)
	POLARIZED CAPACITOR		BREAK CONTACT, (ON DELAY TIMER)
	BATTERY		MAKE CONTACT (OFF DELAY TIMER)
	EARTH(GROUND) CONNECTION		BREAK CONTACT (OFF DELAY TIMER)
	FRAME OR CHASIS CONNECTION		TRIPLE-POLE CIRCUIT BREAKER
	CONVERTER, TRANSMITTER		CIRCUIT BREAKER
	AMPLIFIER		SINGLE THROW SWITCH MANUALLY OPERATED
	SINGLE-PHASE BRIDGE- CONNECTED RECTIFIER		MOMENTARY SWITCH,MAKE CONTACT MANUALLY OPERATED
	THERMOCOUPLE		MOMENTARY SWITCH,BREAK CONTACT MANULLY OPERATED
	FUSE		MAINTAINED SWITCH,MAKE CONTACT MANUALLY OPERATED
	PLUG & SOCKET DEVICE		MAINTAINED SWITCH,BREAK CONTACT MANUALLY OPERATED
	VALVE		KEY OPERATED SWITCH,MAKE CONTACT
	CONTACTORS, RELAYS		KEY OPERATED SWITCH,BREAK CONTACT
	TIME RELAY (OFF DELAY) (SIG.ON : INSTANTANEOUS OPERATED) (SIG.OFF : DELAY OPERATED)		SEMICONDUCTOR DIODE
	TIME RELAY (ON DELAY) (POWER ON : DELAY OPERATED) (POWER OFF : INSTANTANEOUS)		TRANSFORMER WITH TWO SEPARATE WINDING
	TIME RELAY (FLICKERING OPERATED SIG.)		HORN
	PILOT LIGHT INDICATING LIGHT		BELL
	SIREN		BUZZER

Date	Des	Chk	Appd.	A.C	Replace by Ident.no.	R
				*		5
				*		4
				*		3
111205	CJH	CJH	YJH	*	For working (PAGE: 4)	2
110729	CJH	CJH	YJH	*	Shipyard comment(PAGE: 5)	1
110719	CJH	CJH	YJH	*	For approval	0
Licensor Ident.No.:		Type: 6S90ME-C8.2				 YUMYUNG ENGINEERING CO.,.
Info.no.:		Description: HYDRAULIC AUTO FILTER CONTROL PANEL				
Page.no.: 02 OF 09		Symbol LIST				
Ident.No.: YM11-JY0196						

TYPE :

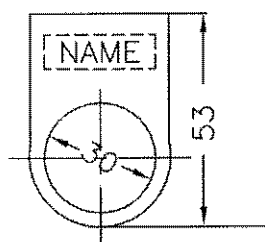
-MATERIAL : PHENOL
-GROUND : WHITE
-LETTER : BLACK



DESC.	Q'TY
HYDRAULIC AUTO FILTER CONTROL PANEL	1

Type :

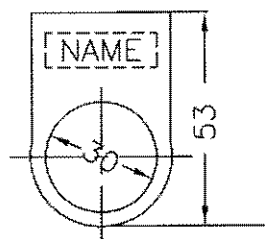
1. MATERIAL : PHENOL
2. LETTER : BLACK



DESC.	Q'TY
MAIN SOURCE	1
TO FLUSH	
MOTOR FAULT	
FLUSHING FREQUENCY MONITOR	

Type :

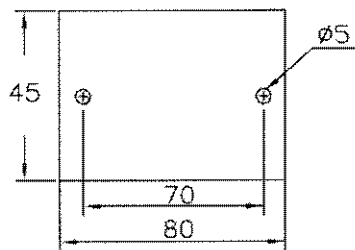
1. MATERIAL : PHENOL
2. LETTER : BLACK



DESC.	Q'TY
MANUAL ON	1
FLUSHING FREQUENCY MONITOR OFF - ON	

TYPE : LP-M1A

-MATERIAL : PHENOL
-GROUND : WHITE
-LETTER : BLACK



DESC.	Q'TY
YUMYUNG ENGINEERING CO., LTD.	1

Date	Des.	Onk.	Appd.	A/C	Replace by Ident.no.	R
				*		5
				*		4
				*		3
111205	CJH	CJH	YJH	*	For working (PAGE: 4)	2
110729	CJH	CJH	YJH	*	Shipyard comment(PAGE: 5)	1
110719	CJH	CJH	YJH	*	For approval	0
Licensor Ident.no.:		Type: 6S90ME-C8.2				 YUMYUNG ENGINEERING CO., LTD.
Info.no.:		Description: HYDRAULIC AUTO FILTER CONTROL PANEL NAME PLATE				
Page.no.: 03 OF 09		Ident.no.: YM11-JY0196				

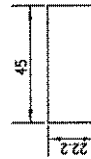
NO.	SYMBOL	NAME	TYPE	SPEC.	REMARK	Q'TY	MAKER
1	Q1	M.C.C.B	UAB 30C	33AF/10AT		1	HYUNDAI
2	Q2	M.C.C.B	UAB 30C	33AF/5AT		1	HYUNDAI
3	U1	POWER SUPPLY	SP-15024	AC230V/DC24V	150W	1	MEANWELL
4	F1~4	FUSE & HOLDER	SB-C1	3A 		4	SB FUSE
5	TR1	TRANSFORMER	HCW-96 200VA	AC440V/220V		1	H.K.T
6	K11	MAGNETIC CONTACTOR	UMC9	DC24V		1	HYUNDAI
7	F11	THR	UTH12H	0.35		1	HYUNDAI
8	T2	RELAY W/BASE	SZR-MY4-N1	DC24V,4c		5	HONEYWELL
9	K1, K2 K3, K4, K5	TIMER W/BASE	H3Y-4	DC24V,4c	6 min	1	OMRON
10	T3	TIMER W/BASE	H3Y-4	DC24V,4c	30 sec	1	OMRON
11	T4, T5	TIMER W/BASE	H3Y-4	DC24V,4c	30 min	2	OMRON
12	T1	TIMER W/BASE	H3Y-4	DC24V,4c	30 sec	3	OMRON
13	T6, T7, T8	TIMER W/BASE	H3BA-N	DC24V,2c	5 hour	1	OMRON
14	Q4	MAIN S.W	VCF-02			1	TELEMECANIQUE
15	L1	PILOT LAMP	YSPL3-AL24W	ø30,DC24V,WHITE		1	YONGSUNG
16	L2	PILOT LAMP	YSPL3-AL24G	ø30,DC24V,GREEN		1	YONGSUNG
17	L3, L4	PILOT LAMP	YSPL3-AL24R	ø30,DC24V,RED		2	YONGSUNG
18	CS1	SELECTOR S.W	YSAR3-211KB	ø30, 1ø1b		1	YONGSUNG
19	S1	PUSH BUTTON	YSAP13-11B	ø30, 1ø1b		1	YONGSUNG
20		TERMINAL BLOCK	STS 2.5 TWIN	15A, 2sq		23	PHOENIX CONTACT
21		TERMINAL BLOCK	STS 4 TWIN	30A, 2sq		9	PHOENIX CONTACT
22	HC	COUNTER	H7EC-NFV			1	OMRON
23	F5~6	FUSE & HOLDER	SB-C1	5A		2	SB FUSE
24							

Date	Des.	Chk.	Appd.	A.C	Replace by Ident.No.:	R	
				*		5	
				*		4	
				*		3	
111205	CJH	CJH	YJH	*	For working(PAGE: 4)	2	
110729	CJH	CJH	YJH	*	Shipyard common(PAGE: 5)	1	
110719	CJH	CJH	YJH	*	For approval	0	
Licensor Ident.No.:		Type:			6S90ME-C8.2	 YUMYUNG ENGINEERING CO.,.	
Info.no.:		Description:			HYDRAULIC AUTO FILTER CONTROL PANEL		Ident.No.: YM11-JY0196
Page.no.: 04 OF 09					MATERIAL PART LIST		

NO.	SYMBOL	DESCRIPTION	NAME PLATE		QTY	REMARK
			MARK	TYPE		
1	L1	LAMP (WHITE)	MAIN SOURCE	2A	1	
2	L2	LAMP (GREEN)	TO FLUSH	2A	1	
3	L3	LAMP (RED)	MOTOR FAULT	2A	1	
4	L4	LAMP (RED)	FLUSHING FREQUENCY MONITOR	2A	1	
5	S1	P.B. S.W.(GREEN)	MANUAL ON	2A	1	
6	CS1	SELECTOR S.W	FLUSHING FREQUENCY MONITOR OFF - ON	2A	1	
7	Q4	M.C.B S.W	MAIN SWITCH	4B	1	
8	HC	HOUR METER	FLUSHING COUNTER	2A	1	
9		NAME PLATE	HYDRAULIC AUTO FILTER CONTROL PANEL	9A	1	
10		NAME PLATE	YUMYUNG ENGINEERING CO., LTD.		1	

<CUT SIZE>

DETAIL "A"

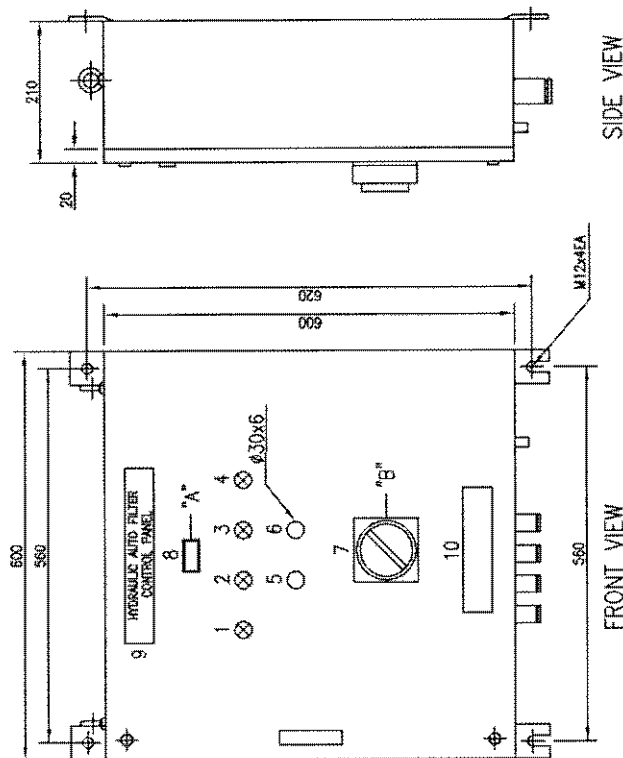


DETAIL "B"

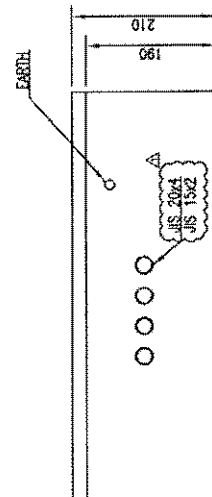


NOTE:

1. PLATE : 2.31 SS400
2. PAINTING COLOR : RAL 7032
3. MOUNTING METHOD : WALL MOUNTING TYPE
4. PROTECTION : IP44



SIDE VIEW



BOTTOM VIEW

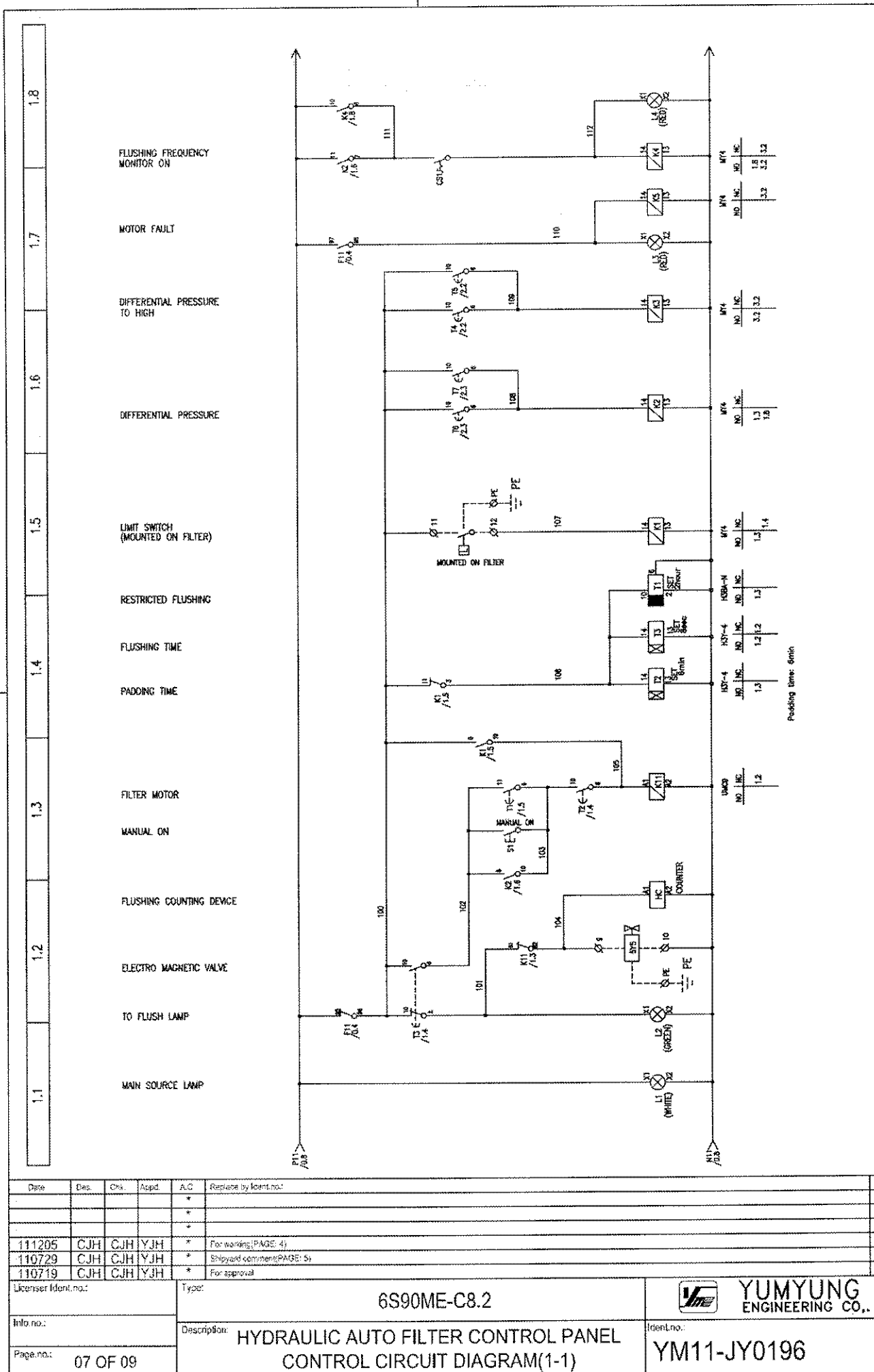
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				*		5
				*		4
				*		3
111205	CJH	CJH	YJH	*	For working(PAGE: 4)	2
110729	CJH	CJH	YJH	*	Shipyard comment(PAGE: 3)	1
110719	CJH	CJH	YJH	*	For approval	0
Licensor Ident.no.:		Type:				
Info.no.:		6S90ME-C8.2				
Page.no.:		05 OF 09				
		Description: HYDRAULIC AUTO FILTER CONTROL PANEL OUTLINE VIEW				
		YUMYUNG ENGINEERING CO.,				
		Ident.No.:				
		YM11-JY0196				



YUMYUNG
ENGINEERING CO.,

Ident.no.:

YM11-JY0196

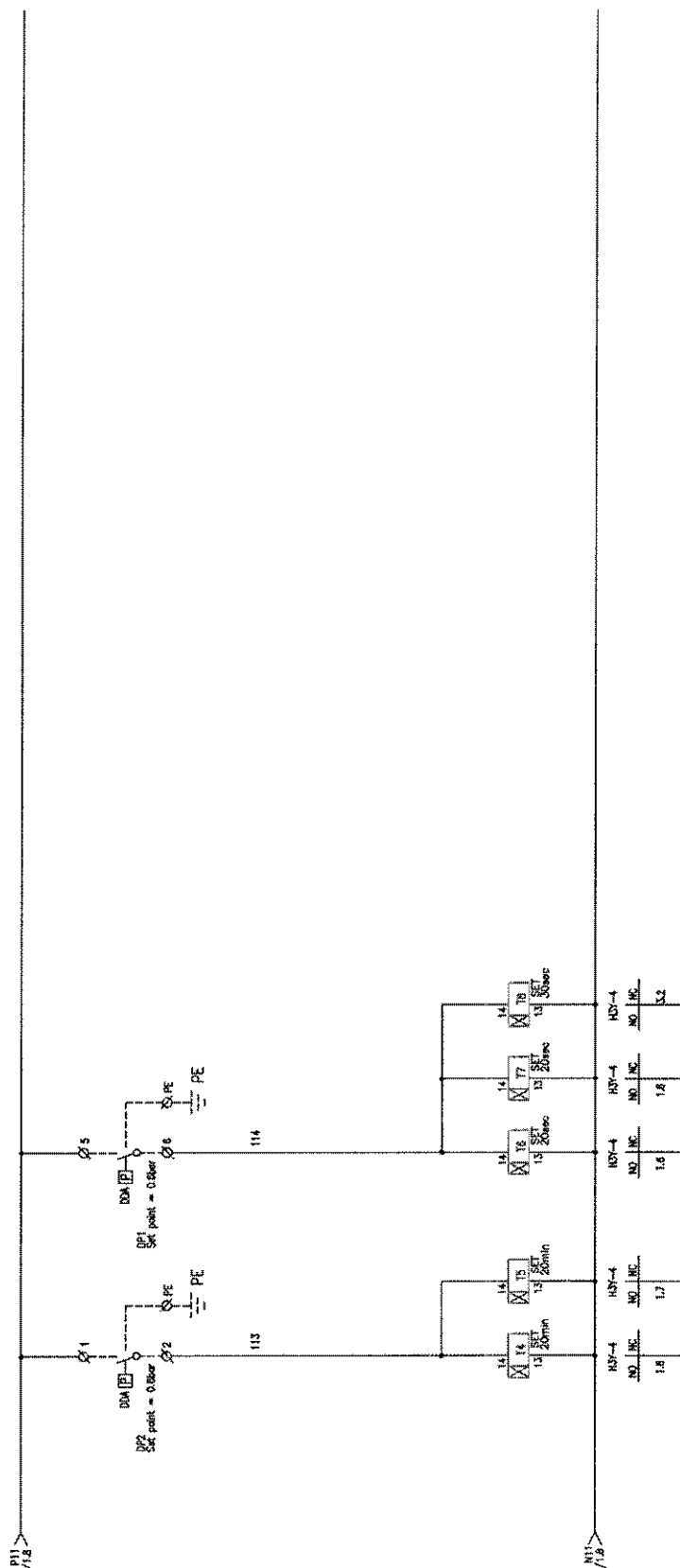


Date	Des.	Chk.	Appd.	A.C.	Replaced by Ident.No.	R
				*		5
				*		4
				*		3
111205	CJH	CJH	YJH	*	For warning (PAGE: 4)	2
110729	CJH	CJH	YJH	*	Shipyard comments (PAGE: 5)	1
110719	CJH	CJH	YJH	*	For approval	0
Licensor Ident.no.:						
Type:						
Info no.:						
Page no.:						
07 OF 09						
6S90ME-C8.2						
Description: HYDRAULIC AUTO FILTER CONTROL PANEL						
CONTROL CIRCUIT DIAGRAM(1-1)						
Ident.No.:						
YM11-JY0196						

2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8

TO FLUSH TIMER

DIFFERENTIAL PRESSURE
TO HIGH TIMER



Date	Des.	Chk.	Appd.	A.C.	Replace by Ident.no.:	R.	
				*		5	
				*		4	
				*		3	
111205	CJH	CJH	YJH	*	For working(PAGE: 4)	2	
110729	CJH	CJH	YJH	*	Shipyard comment(PAGE: 5)	1	
110719	CJH	CJH	YJH	*	For approval	0	
Licensor Ident.no.:				Type:	6S90ME-C8.2	 YUMYUNG ENGINEERING CO.,.	
Info.no.:				Description:	HYDRAULIC AUTO FILTER CONTROL PANEL		Ident.no.:
Page.no.: 08 OF 09				CONTROL CIRCUIT DIAGRAM(1-2)			YM11-JY0196

3.8

3.7

3.6

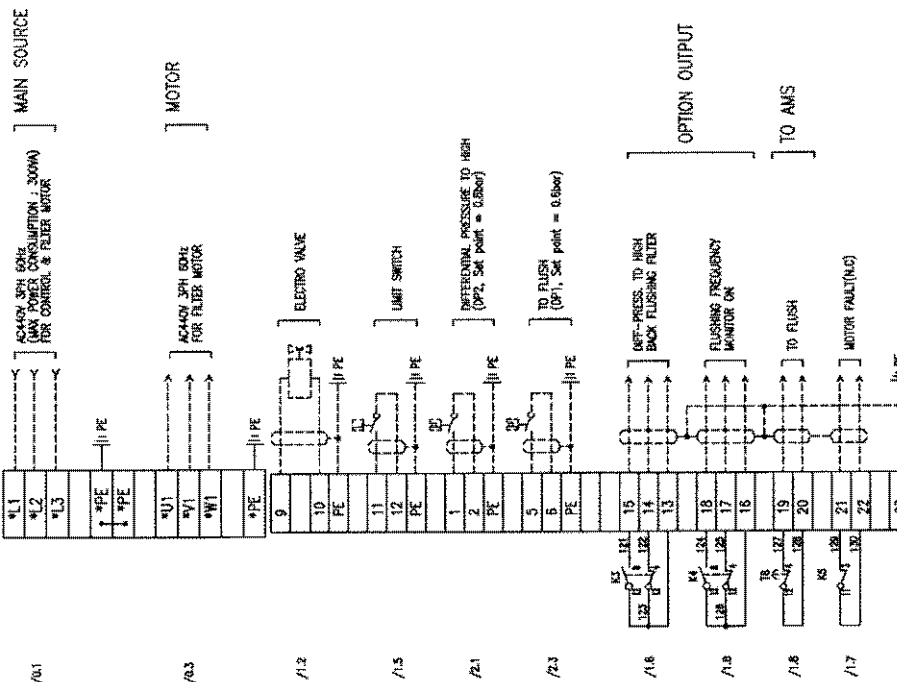
3.5

3.4

3.3

3.2

3.1



NOTE

* MARK T.B : 3.5A 5.5sq
OTHERS : 1.5A 2.0sq

Date	Des.	Chk.	Appd.	A.C.	Replaces by Ident.no.	R.
				*		5
				*		4
				*		3
111205	CJH	CJH	YJH	*	For working(PAGE: 4)	2
110729	CJH	CJH	YJH	*	Shigyard comment(PAGE: 5)	1
110719	CJH	CJH	YJH	*	For approval	0
Licensor Ident.no.:				Type:		
Info.no.:				Description:		
Page.no.: 09 OF 09				6S90ME-C8.2 HYDRAULIC AUTO FILTER CONTROL PANEL TERMINAL BLOCK		
				 YUMYUNG ENGINEERING CO.,.		
				Ident.no.: YM11-JY0196		

					S. PAGE	T. PAGE
PLAN HISTORY				ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2	
				MESSRS.	H.H.I.	
				RULE	LR + UMS	
				SHIP NO.	2585/86/87/88/89	
				ENG. NO.	AA4624/25/26/27/28	
TITLE : ELECTRIC PRESSURE GAUGE						
Date	Des.	Drk.	Appd.	A.C.	Replaced by Ident.no.:	Replacement for Ident.no.:
20110718	BSH	BSH	JCM		FOR WORKING.	
20110217	BSH	BSH	JCM			
Licensor Ident.no.:				Type:		
Info.no.:				Description:		
Page.no.:				Ident.no.:		
(01) 02				C		6S90ME-C ELECTRIC PRESSURE GAUGE A14-413500-4

INDEX

NO.	DESCRIPTION	DWG. NO.
1	PRESSURE GAUGE LIST	A14-285490-1
2	PRESSURE INDICATOR	A13-213980-2
3	DIAL PLATE FOR PRESS. INDICATOR	A12-314505-5

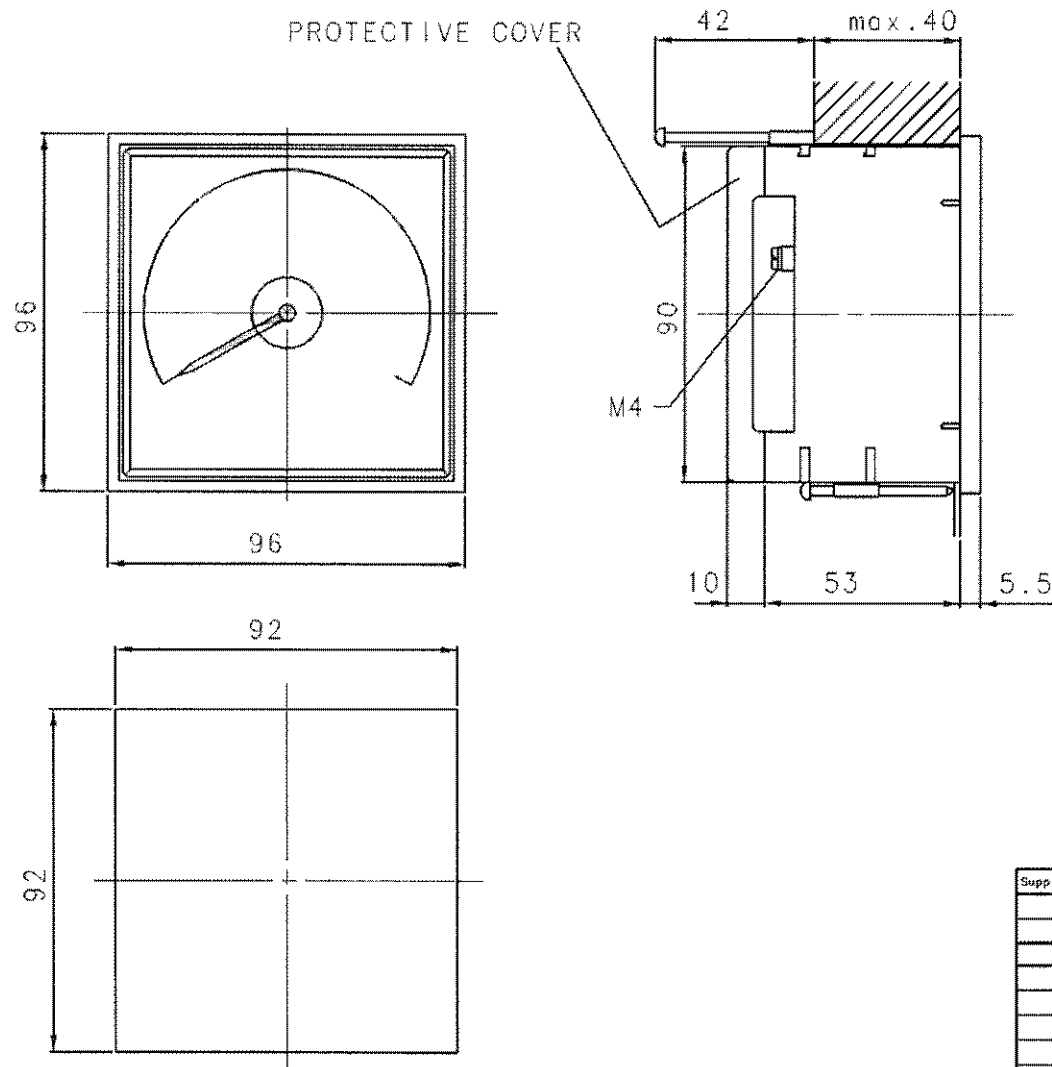
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	Replacement for Ident.no.:	R
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20110217	BSH	BSH	JCM				0
Licensor Ident.no.:		Type:				6S90ME-C	
Info.no.:		Description:				Ident.no.:	
Page.no.:		Security:				Ident.no.:	
(02) 02		C				A14-413500-4	



OUTPUT 4-20mA

Date	Des.	Chk.	Appd.	A.C	Replace by Ident.no.:	R
				*		5
				*		4
				*		3
				*		2
				*		1
060810HLSKLSKJG					* Replace for Ident.no.:	0
Licensor Ident.no.:		Type:			L/S-MC	
Info.no.:		Description:			Ident.no.:	
781100		PRESSURE GAUGE LIST			A14-285490-1	
Page.no.:						
01 OF 01						

24



SPECIFICATION

Maker : DEIF A/S

Main function: Measurement of DC currents
and DC voltages.

Size (mm): 096

Pointer deflection : 240°

Scale: Customised and exchangeable
scale available for 90°

Protection : IP 52

Accuracy class :1.5

Measuring range : 4...20mA

Housings : Plastic

Weight : 0.21kg

PANEL CUT

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Standard for surface roughness

Tolerances for dimensions without tolerances indication (ISO 2768-1989)

This standard states the permissible deviations for dimensions without direct interference indications or without dimensional manifestations by methods

Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	Non-descriptive Par- misable deviations	0.5 over 6	over 6 up to 30	over 30 up to 120	over 120 up to 315	over 315 up to 1000	over 1000 up to 2500
R _{max} , value, mm	0.025	0.05	0.1	0.2	0.4	0.6	1.6	3.2	6.3	12.5	25	50	Medium series	±0.1	±0.2	±0.3	±0.3	±0.8	±1.2

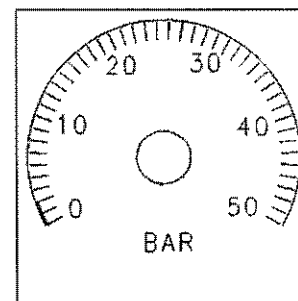
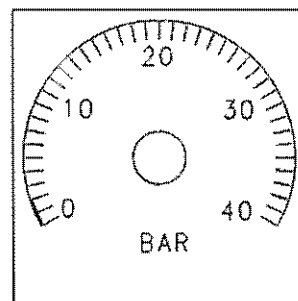
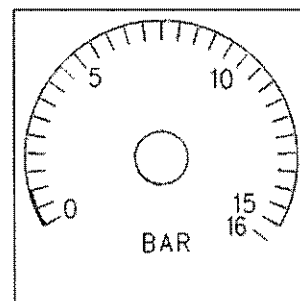
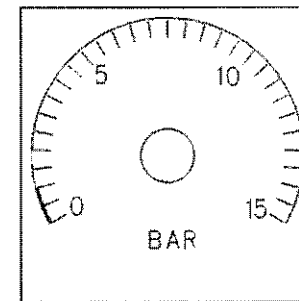
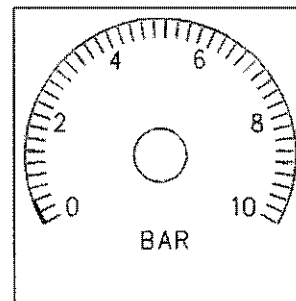
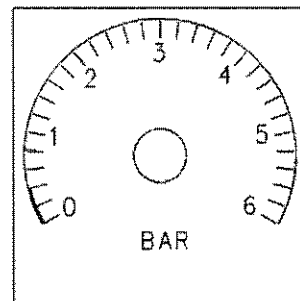
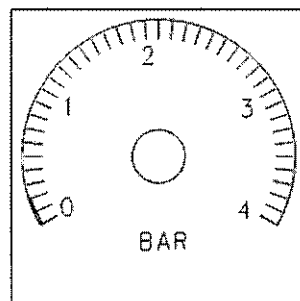
Supplement Drawing no.:					Projection: 		Mass (kg):		Material / Blank:		
					Licensor's Ident. no.:		Dist.:		Licensor's Material / Blank:		
Date	Des.	Chk.	Appd.	A.C.	Change / Replacement					C.No.	
				*	Replaced by Ident. No.:					9	
				*						8	
				*						7	
				*						6	
				*						5	
				*						4	
				*						3	
				*						2	
				*						1	
010629				ISHIKUG	*						0
Similar Drawing No.:							Replacement of Ident. No.:				
Scale: 1:1		Size: A3		Type:		Page No.:					
Info. No.:		Description:					Ident. No.:				
781100		PRESSURE INDICATOR					A13-213980-2				

HSEF-k210-012(R1)

한미농공업(주) 연세사업부

A.3 (1.2 Dimeca 297mm) 無選器利

[illegible]



Supplement Drawing No.:				Particulars:				Draw. No.:				Material / Ref.:			
				Licensor's Idem. No.:				Dist.:				Licensor's Material / Stock:			
Date	Des.	Qty.	Appr.	A.C.	C	Change / Rectification							C. No.		
						Replaced by Idem. No.:							1		
													2		
													3		
													4		
													5		
													6		
													7		
													8		
													9		
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													13		
													14		
													15		
													16		
													17		
													18		
													19		
													20		
071008 SR SKK IG						Licensor's Drawing No.:						Replacement of Idem. No.:			
Scale:	Size:	Type:	Page No.:				AHMUNDIAL								
1:1	A2		01 (01)				SEMI-CONDUCTOR CO. LTD.								
Idem. No.:		Order price:		Idem. No.:											
781100		DIAL PLATE FOR PRESS. INDICATOR		A12-314505-5											

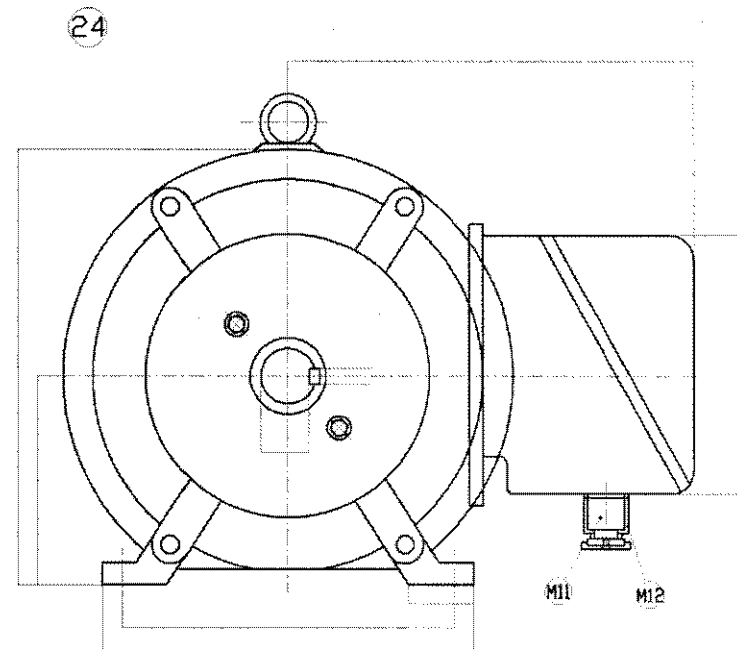
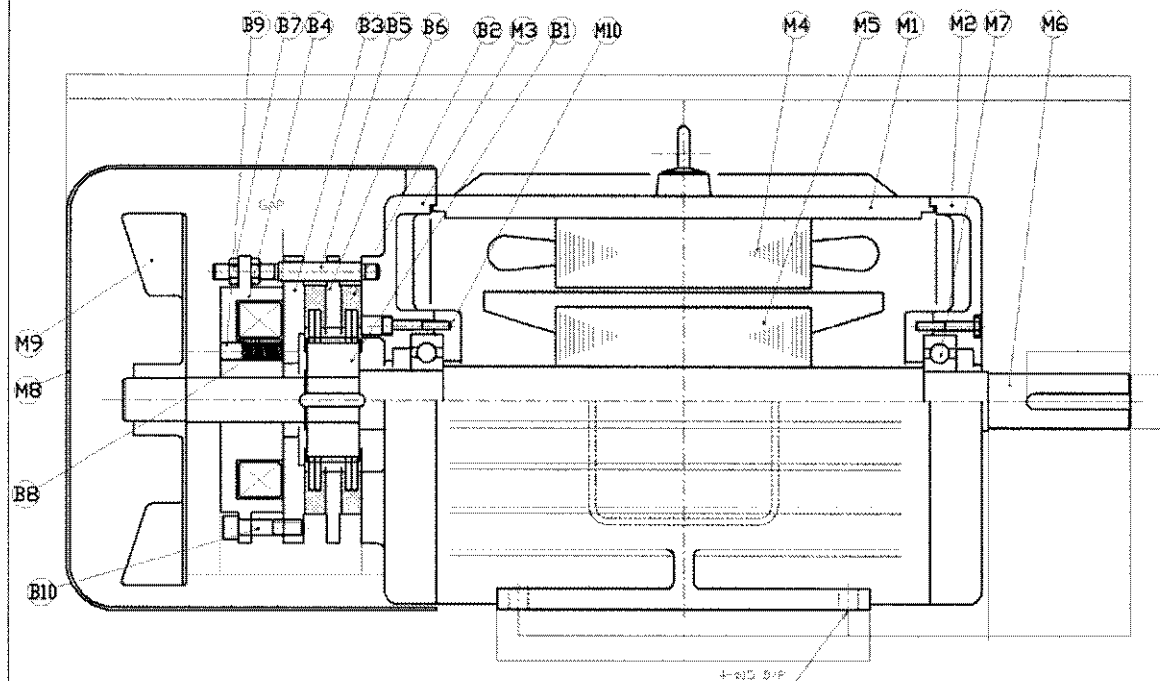
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					S. PAGE	T. PAGE
PLAN HISTORY				ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2	
				MESSRS.	H.H.I.	
				RULE	LR + UMS	
				SHIP NO.	2585/86/87/88/89	
				ENG. NO.	AA4624/25/26/27/28	
TITLE : TURNING GEAR MOTOR						
Date	Des.	Grk.	Appd.	A.C	Replaced by Ident.no.:	Replacement for Ident.no.:
20110718	BSH	BSH	JCM		FOR WORKING.	
20110217	BSH	BSH	JCM			
Licensor Ident.no.:				Type:		
Info.no.:				Description:		
Page.no.:				Security:		Ident.no.:
(01) 01				C		6S90ME-C TURNING GEAR MOTOR A14-413501-6

FOR APPROVAL		DATA SHEET FOR MOTOR	
CUSTOMER	HHI-EMD	MAKER	HHI-EES
MODEL NO		DWG. NO	6S-90ME-24
SERVICE	FOR TURNING GEAR	REL. NO	
SHIP NO	2585~2589	QUANTITY	1SET / 1SHIP

GENERAL		PERFORMANCE		
TYPE	HL-SD	PERCENT LOAD	100 %	
POWER	11Kw(15HP)	EFFICIENCY	89.5 %	
POLES	6 POLES	POWER FACTOR	74 %	
ENCLOSURE	TOTALLY ENCLOSURE	SPEED	1150 R.P.M	
FRAME	160 L	NO LOAD CURRENT	22.4 A	
PROTECTION DEGREE	IP 54	STARTING CURRENT	145.7 A	
COOLING METHOD	IC0141(FC)	GREASE NIPPLE	N/A	
FREQUENCY	60 Hz	RATED TORQUE	9.34 Kg/M	
VOLTAGE	A.C 440 V	STARTING TORQUE	23.35 Kg/M(250%)	
INSULATION CLASS	F	BREAKE DOWN TORQUE	26.15 Kg/M(280%)	
SERVICE FACTOR	1.15	MOTOR NET WEIGHT	145 Kg	
RATING	CONTINUOUS	BODY PAINTING	Munsell No. 7.5 BG 7/2	
STARTING METHOD	DIRECT-ON-LINE	DATE	2011.07.18	
AMBIENT TEMP	50 °C	DESIGNED	CHECKED	APPROVED
ALTITUDE	LESS THAN 1000 M			
HUMIDITY	LESS THAN 95 %			
COUPLING METHOD	CHAIN	REMARKS		
LOCATION	IN DOOR			
NEMA DESIGN	B			
FRONT BEARING	6309 ZZ C3			
REAR BEARING	6309 ZZ C3			
SHAFT EXTENSION	SINGLE			



SPACE	HEATING TYPE	VOLTS	AMPS	Hz
HEATER	WINDING HEATER	A.C 35V	3.9A	60Hz

MOTOR	MAKER	TYPE	FR.NO	OUTPUT	POLES	WEIGHT	r.p.m	VOLTS	AMPS	RATING
	Hyundai Heavy Industry	HKS-XSD	160L	11 kW	6 P	160Kg	1150	440 V	22.4A	CONTINUOUS

BRAKE	DYNAMIC TORQUE	STATIC TORQUE	VOLTS	W	MAKER	TYPE
	15 Kg.M	20 Kg.M	D.C 90 V	77.5W	Hyundai Heavy Industry	DB-30

M12	CABLE GLAND	1	CG-25B			
M11	CABLE GLAND	1	CG-20C			
M10	BEARING COVER	2				
M9	COOLING FAN	1				
M8	COVER	1				
M7	BALL BEARING	2				
M6	MOTOR SHAFT	1				
M5	ROATOR	1				
M4	STATOR COIL	1				
M3	REAR HOUSING	1				
M2	FRONT HOUSING	1				
M1	MOTOR FRAME	1				
NO.	NAME	MATERIAL	Q'TY	W'HT	SIZE	REMARKS

B10	MANUAL BOLT	PUR	2			
B9	SPRING PUSH PIN	SS41	8			
B8	SPRING	SUP	8			
B7	GAP ADJUST NUT	PUR	8			
B6	BREAKE DISC	SS41	1			
B5	STUD BOLT	SUS304	4			
B4	MAGNET HOUSING	SS41	1			
B3	PUSHING DISC	SS41	1			
B2	FRICTION DISC		2			
B1	AMATURE	SS41	1			
NO.	NAME	MATERIAL	Q'TY	W'HT	SIZE	REMARKS

24	INDUCTION MOTOR	HYUNDAI 1	160	11kW, 6P, 440V		
NO.	NAME	MATERIAL	Q'TY	W'HT	SIZE	REMARKS
PROJECT					APPROVED BY	
TITLE	TURNING GEAR WITH MOTOR		SCALE	CHECKED BY		
	YRTG 96-140		1/4	DESIGNED BY		
CUSTOMER	HHI.EMD			DRAWN BY		
DATE	05.02.19		LIST NO			
	YU RIM INDUSTRIAL CO.,LTD.			DWG.NO	6S-90ME-24	

					S. PAGE	T. PAGE
PLAN HISTORY				ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2	
				MESSRS.	H.H.I.	
				RULE	LR + UMS	
				SHIP NO.	2585/86/87/88/89	
				ENG. NO.	AA4624/25/26/27/28	
TITLE : AUX. BLOWER STARTER TURNING GEAR STARTER						
Date	Des.	Dk.	Appd.	A.C	Replaced by Ident.no.:	Replacement for Ident.no.:
20110718	BSH	BSH	JCM		FOR WORKING.	
20110217	BSH	BSH	JCM			
Licencee Ident.no.:				Type:		
Info.no.:				Description:		
Page.no.:				Security:		
(01) 01				C		6S90ME-C AUX. BLOWER & T/GEAR STARTER A14-413502-8

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1. GENERAL SPECIFICATION

A. NAME : STARTER FOR AUX. BLOWER & TURNING GEAR

B. ENGINE TYPE : 6S90ME-C8.2

C. PANEL TYPE

- TYPE : WALL MOUNT
- MATERIAL & THICKNESS : SS400 2.3t
- PAINTING COLOR : RAL 7032
- PROTECTION : IP44

D. NAME PLATE

- MATERIAL : PHENOL or SUS
- LANGUAGE : ENGLISH
- METHOD : BLACK LETTER AND WHITE GROUND

E. TERMINAL COLOR (IEC STANDARD)

a. AC POWER

- R(U) : RED
- S(V) : WHITE
- T(W) : BLACK

b. DC POWER

- P : RED
- N : BLUE

E. AMBIENT TEMPERATURE

- 45℃

2. AUX. BLOWER STARTER SPECIFICATION

A. SCOPE OF SUPPLY

- STARTER CUBICLE : GROUP STARTER 1set/engine

B. MOTOR CAPACITY : 125KW, (195.9)A x 2 sets

C. STARTING METHOD : DIRECT ON LINE TYPE

D. POWER SOURCE : AC440V, 3PHASE, 60Hz

E. CONTROL SOURCE : AC440V, 1PHASE 60Hz/ DC24V

F. SIGNAL LAMP

- SOURCE LAMP (WHITE)
- RUNNING LAMP (GREEN)
- STOP LAMP (DARK)
- OVERLOAD LAMP (RED)
- HEATER ON LAMP (ORANGE)

3. TURNING GEAR STARTER SPECIFICATION

A. SCOPE OF SUPPLY

- STARTER CUBICLE : 1set/engine
- RECEPTACLE : 2set/engine
- REMOTE PUSH BUTTON SWITCH BOX ; 1set/engine

B. MOTOR CAPACITY : 11 KW, (22.4)A

C. STARTING METHOD : DIRECT ON LINE TYPE

D. POWER SOURCE : AC440V, 3PHASE, 60Hz

E. CONTROL SOURCE : AC440V, 1PHASE 60Hz/ DC24V

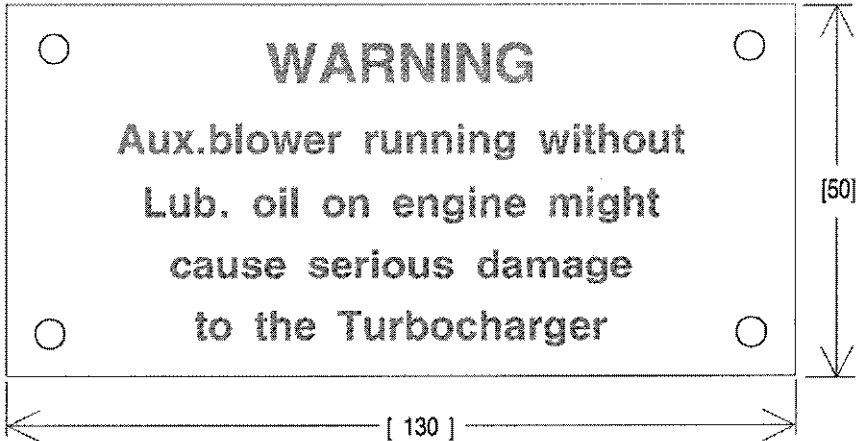
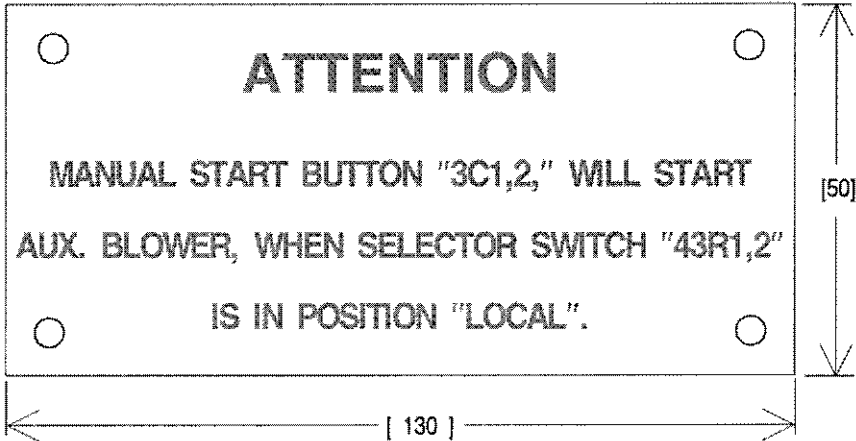
F. SIGNAL LAMP

- SOURCE LAMP (WHITE)
- FORWARD RUNNING LAMP (GREEN)
- REVERSE RUNNING LAMP (GREEN)
- ABNORMAL LAMP (RED)
- HEATER ON LAMP (ORANGE)

4. NAME PLATE LIST

No	NAME	MATERIAL	QTY	REMARK	SIZE
1	SOURCE	PHENOL	3		
2	RUNNING	PHENOL	2		
3	START	PHENOL	2		
4	STOP	PHENOL	5		
5	LOCAL-REMOTE	PHENOL	2		
6	OVERLOAD	PHENOL	2		
7	ABNORMAL	PHENOL	1		
8	FORWARD	PHENOL	2		
9	REVERSE	PHENOL	2		
10	LAMP TEST	PHENOL	3		
11	HEATER ON	PHENOL	3		
12	HEATER OFF-ON	PHENOL	3		
13					
14					
15					
16					
17					
18					
19					
20	NO.1 AUX.BLOWER	PHENOL	1		
21	NO.2 AUX.BLOWER	PHENOL	1		
22	TURNING GEAR STARTER	PHENOL	1		
23					
24					
25	MAIN POWER	PHENOL	3		
26	AM METER	PHENOL	3		
27	RECEPTACLE FOR TURNING GEAR STARTER	PHENOL	1		
28					
29					
30	MAKER NAME PLATE	SUS	2		

6. SAFETY LABEL

No	NAME	MATERIAL	QTY	REMARK
3	WARNING LABEL (AUX. BLOWER)	P.C	1	
	SIZE			
				
4	ATTENTION LABEL (AUX. BLOWER)	P.C	1	
	SIZE			
				
	-- NOTE -- WARNING : RED LETTER AND WHITE GROUND ATTENTION : RED LETTER AND WHITE GROUND			

7. SAFETY LABEL

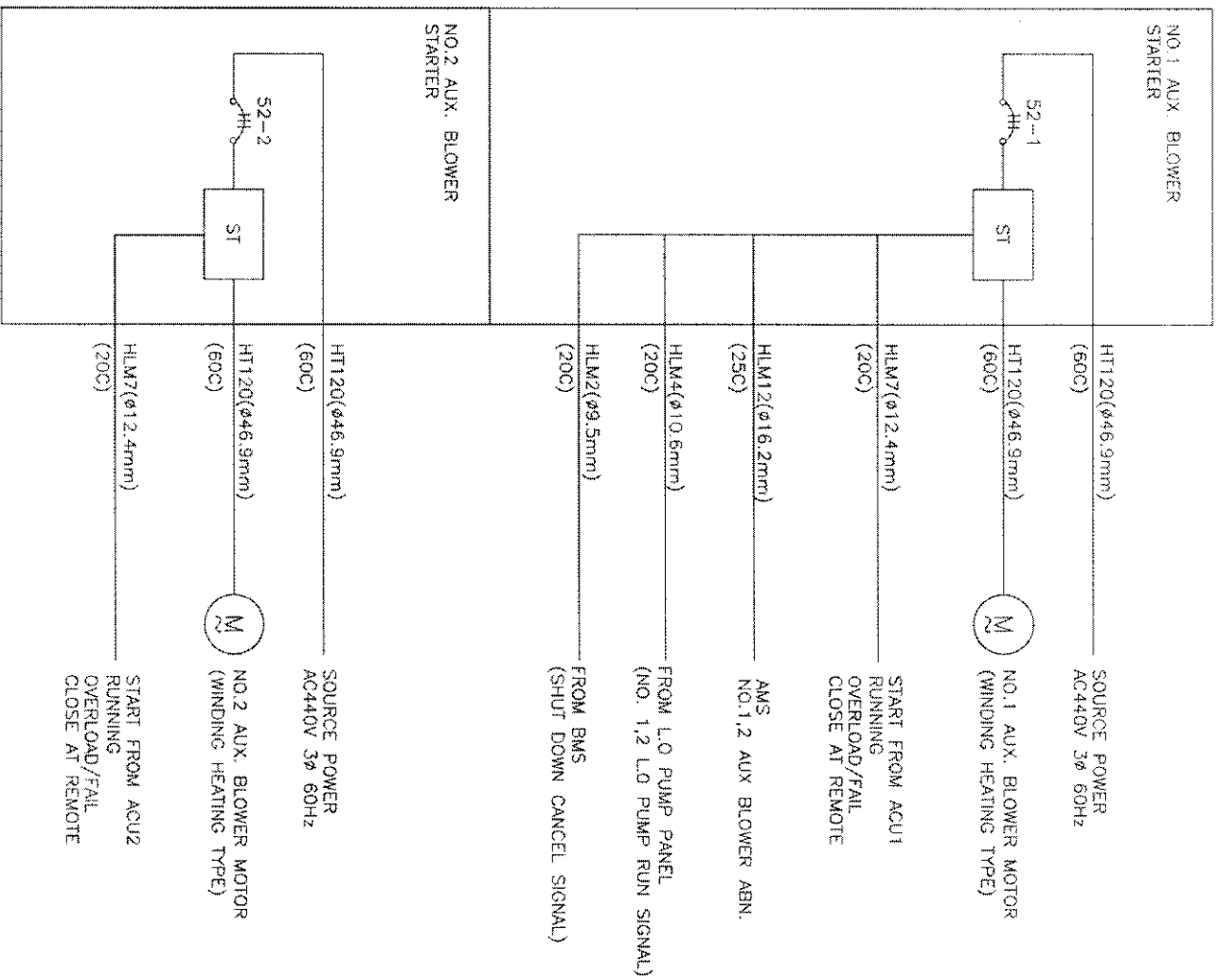
No	NAME	MATERIAL	Q'TY	REMARK
	CAUTION LABEL (TURNING GEAR)	SCREEN	1	
	SIZE			
	주의 터닝기어 작동 시, Main bearing / Cross hearing / Crank pin bearing 등 각종 bearing 의 보호를 위하여 엔진이 Dry turning 이 되지 않도록 주의 할 것. 1. 터닝기어 작동 전, Dry turning 방지 지침서 A14-319102-0 에 따라서 Shell valvata 1000 또는 이에 상응하는 Oil을 충분히 주입한 후 터닝기어를 작동 시킬 것. 2. 본 Caution sticker 는 선박 인도 전 제거 할 것. CAUTION When turn the engine by turning gear, do not operate turning gear at dry condition for protecting main bearing / cross head bearing / crank pin bearing and other bearings. 1. Before operating turning gear, infusing sufficient Shellvalvata 1000 oil or equivalent oil according to the guidance for pre-lubrication to prevent dry turning, A14-319102-0. 2. This cautions stickers should be removed before the ship delivery. 注意 在啓動Turning Gear時，爲了保護各種Bearing包括Main Bearing, Cross head Bearing 和 Crank pin Bearing, 請貴方不要在干燥的狀態上啓動Turning Gear。還有，請貴方遵守下面的指南。 1. 在啓動Turning Gear之前，按照防止Dry-Turning的指南A14-319102-0, 先把 Shell Valvata1000或者相應的油充分地注入一下。 2. 在交船之前，請清除這主意張貼物。			140
	150			
	-- NOTE --			
	*바탕 색 : Yellow, 글자 색 : Red,			
	*글자 크기 : 제목 - 15, 본문 - 9			
	*본 Sticker를 Turning gear 의 Disengage device 및 Turning gear starter panel 에 부착 후 입고 할 것.			
	*본 Sticker를 작업자에게 육안 노출이 쉬운 곳에 부착 하여 입고 할 것.			

8. AUX. BLOWER STARTER PART LIST

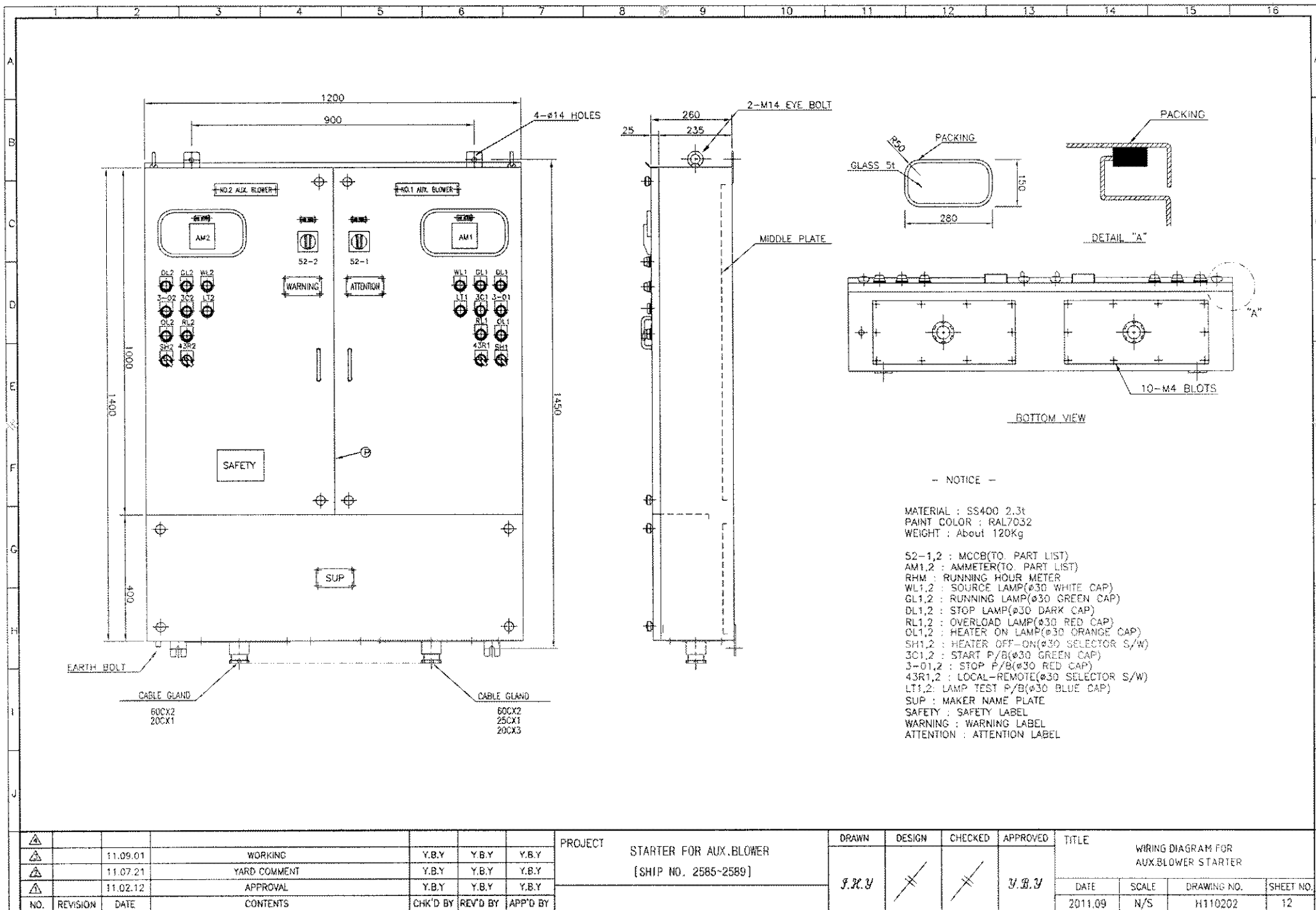
No	SYMBOL	NAME	SPEC. & MODEL TYPE	Q'TY	REMARK
1	52-1,2	MOLDED CASE CIRCUIT BREAKER	HiBS403/300A	2	HYUNDAI
2	88-1,2	MAGNETIC CONTACTOR	HiMC300W,22,AC440V	2	HYUNDAI
3	EOCR1,2	ELECTRONIC OVERCURRENT RELAY	EOCRDS-05RB (CT-300:5)	2	SAMWHA
4	AM1,2	AC AMMETER	0~300A 300:5 O.S 300%	2	DAEBOONG
5	CT1,2	CURRENT TRANSFORMER	300:5 5VA	2	DAEBOONG
6	4-1,2	CONTROL RELAY	HMT31/DC24V	2	HYUNDAI
7	88-1A,2A	CONTROL RELAY	HMX31/AC440V	2	HYUNDAI
8	51X1,2	CONTROL RELAY	DRM570024LD	2	WEIDMILLER
9	84-1,2	CONTROL RELAY	DRM570024LD	2	WEIDMILLER
10	R1	CONTROL RELAY	DRM570024LD	1	WEIDMILLER
11	HX-1,2	MAGNETIC CONTACTOR	HiMC40W22,AC440V	2	HYUNDAI
12	HT1,2	TIMER	DC24V ON DELAY	2	OMRON
13	F11,12,15,16	FUSE	5A	4	SAMBU
14	F21,22,25,26	FUSE	5A	4	SAMBU
15	F13,14,23,24	FUSE	3A	4	SAMBU
16	F17,27	FUSE	40A	2	SAMBU
17	TR11,21	TRANSFORMER	AC440V/DC24V250VA	2	SHINSEUNG
18	TR12,22	TRANSFORMER	AC440V/26V,1100VA	2	SHINSEUNG
19	WL1,2	PILOT LAMP	ø30 DC24V WHITE CAP	2	YONGSUNG
20	GL1,2	PILOT LAMP	ø30 DC24V GREEN CAP	2	YONGSUNG
21	RL1,2	PILOT LAMP	ø30 DC24V RED CAP	2	YONGSUNG
22	DL1,2	PILOT LAMP	ø30 DC24V DARK CAP	2	YONGSUNG
23	OL1,2	PILOT LAMP	ø30 DC24V ORANGE CAP	2	YONGSUNG
24	3C1,2	PUSH BUTTON	ø30 1a1b BLUE CAP	2	YONGSUNG
25	3-01,2	PUSH BUTTON	ø30 1a1b RED CAP	2	YONGSUNG
26	LT11,21	PUSH BUTTON	ø30 4a BLUE CAP	2	YONGSUNG
27	43R1,2	SELECTOR SWITCH	ø30 2a1b	2	YONGSUNG
28	SH1,2	SELECTOR SWITCH	ø30 1a1b	2	YONGSUNG
29	REC1,2	RECTIFIER	AC24V/DC24V	2	KI
30		TERMINAL BLOCK	600V 300A 3P	2	SUNGHO
31		TERMINAL BLOCK	600V 2단15A	28	SUNGHO
32					
33					
34					
35					
36					
37					
38					

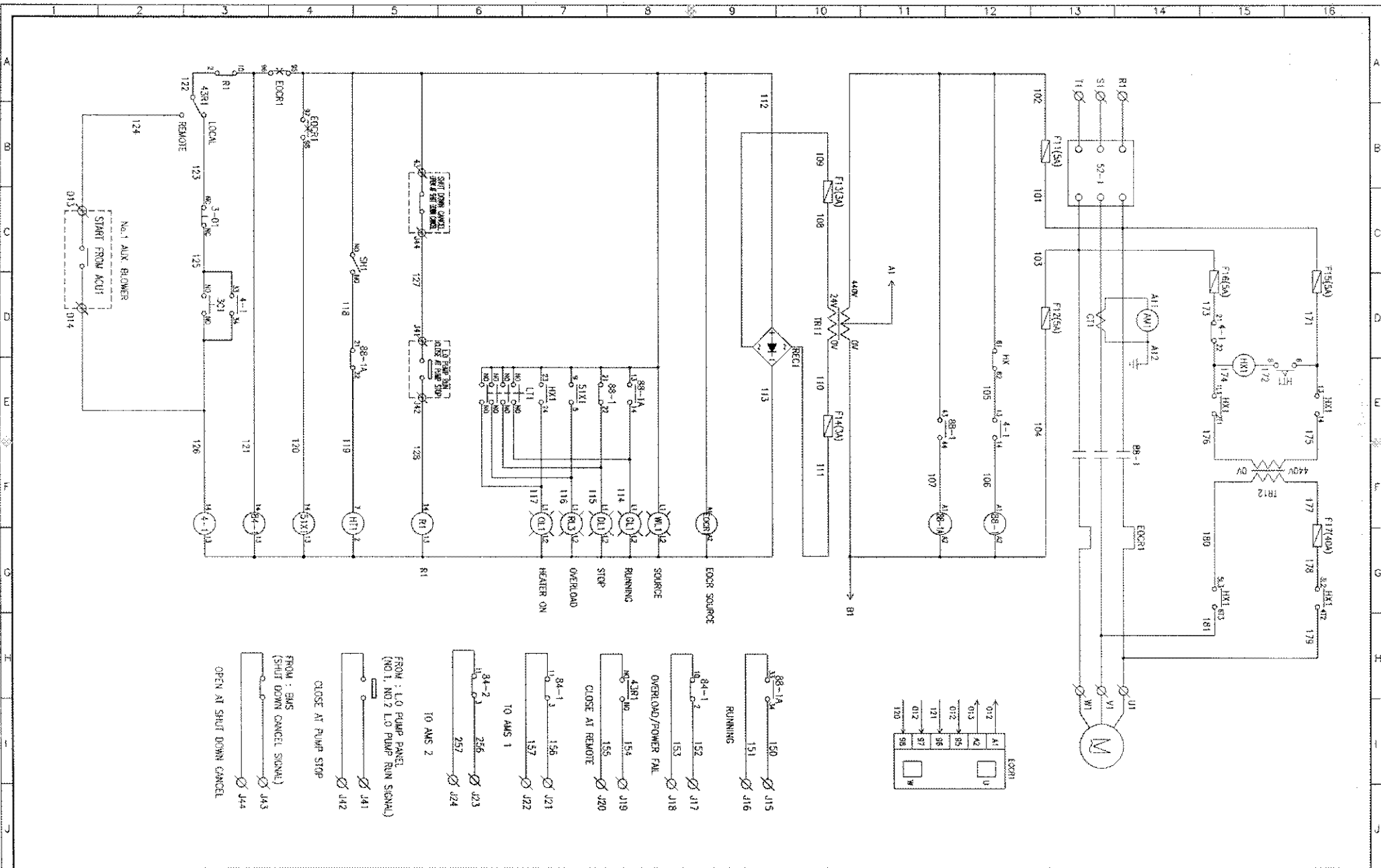
9. TURNING GEAR STARTER PART LIST

No	SYMBOL	NAME	SPEC. & MODEL TYPE	QTY	REMARK
1	52	MOLDED CASE CIRCUIT BREAKER	HIBS63/40A	1	HYUNDAI
2	88F,88R	MAGNETIC CONTACTOR	HiMC40W22/AC440V	2	HYUNDAI
3	75	MAGNETIC CONTACTOR	HiMC40W22/AC440V	1	HYUNDAI
4	EOCR	ELECTRONIC OVERCURRENT RELAY	EOCRDS-60RB, DC24V	1	SAMWHA
5	AM	AC AMMETER	60:5, 0~60A O.S 300%	1	DAEBOONG
6	CT	CURRENT TRANSFORMER	60:5 5VA	1	DAEBOONG
7	4R,4F	CONTROL RELAY	DRM570024LD	2	WEIDMILLER
8	51X	CONTROL RELAY	DRM570024LD	1	WEIDMILLER
9	F1,2,7,8	FUSE	5A	4	SAMBU
10	F3,4,5,6	FUSE	3A	4	SAMBU
11	F9	FUSE	5A	1	SAMBU
12	TR1	TRANSFORMER	AC440V/DC24V 250VA	1	SHINSEUNG
13	TR2	TRANSFORMER	AC440V/DC90V 200VA	1	SHINSEUNG
14	TR3	TRANSFORMER	AC440V/35V,180VA	1	SHINSEUNG
15	HT	TIMER	DC24V ON DELAY	1	OMRON
16	WL	PILOT LAMP	ø30 DC24V WHITE CAP	1	YONGSUNG
17	GF,GR	PILOT LAMP	ø30 DC24V GREEN CAP	2	YONGSUNG
18	RL	PILOT LAMP	ø30 DC24V RED CAP	1	YONGSUNG
19	OL1,2	PILOT LAMP	ø30 DC24V ORANGE CAP	1	YONGSUNG
20	HX	CONTROL RELAY	HiMC40W22/AC440V	1	HYUNDAI
21	3CF,3CR	PUSH BUTTON	ø30 1a1b BLUE CAP	2	YONGSUNG
22	3-0	PUSH BUTTON	ø30 1a1b RED CAP	1	LOCKING TYPE
23	43	SELECTOR SWITCH	ø30 1a1b	1	YONGSUNG
24	SH	SELECTOR SWITCH	ø30 1a1b	1	YONGSUNG
25	TNR	SURGE ABSORB	TNR23G 471K	1	YONGSUNG
26	REC1	RECTIFIER	AC24V/DC24V	1	KI
27	REC2	RECTIFIER	AC110V/DC90V	1	KI
28	LT	PUSH BUTTON	ø30 4a BLUE CAP	1	YONGSUNG
29		TERMINAL BLOCK	600V 60A 3P	2	SUNGHO
30		TERMINAL BLOCK	600V 20A,12P	1	SUNGHO
31		TERMINAL BLOCK	600V 20A,6P	1	SUNGHO
32					
33					
34					
35					
36					

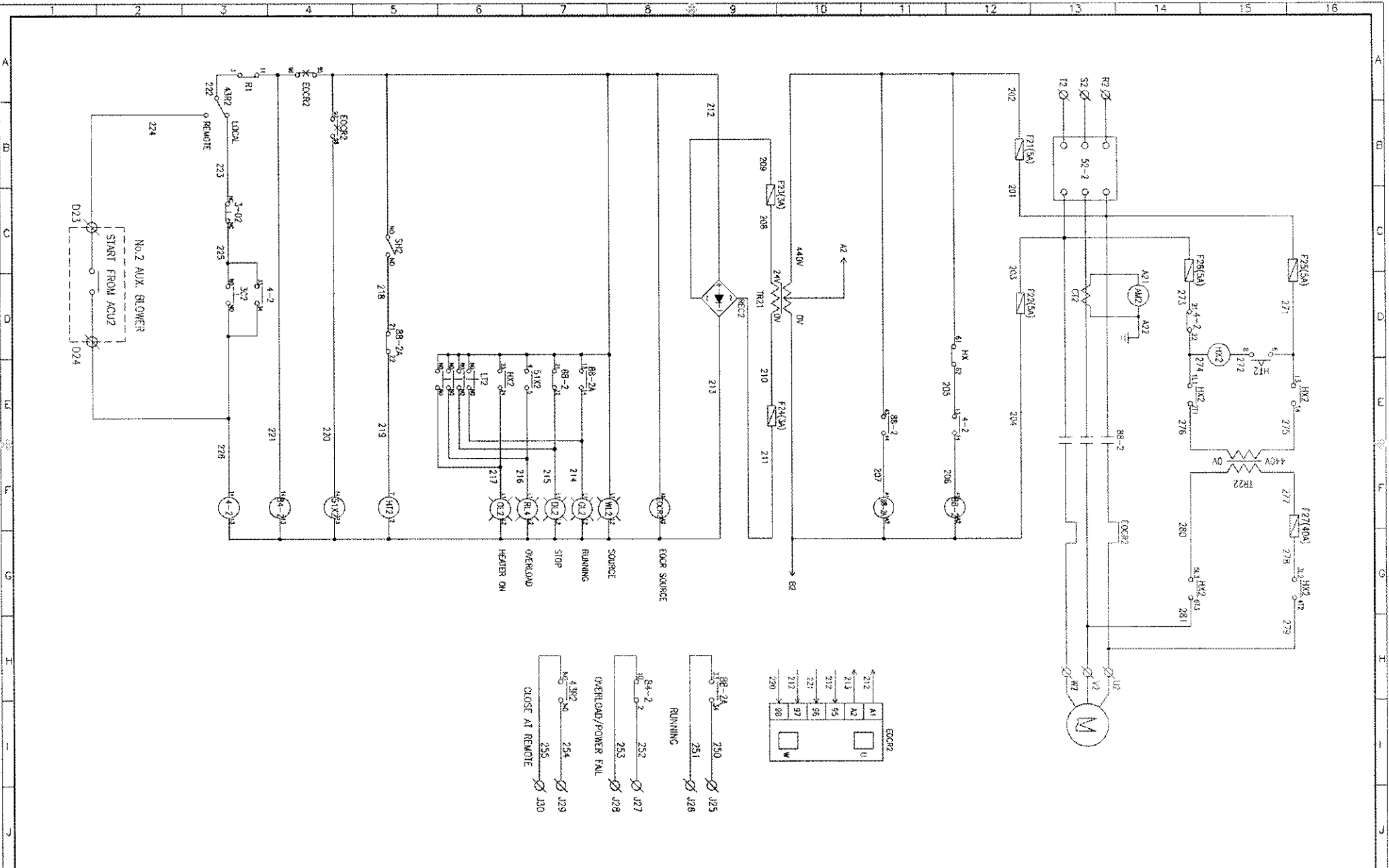


NO.	REVISION	DATE	CONTENTS	CHK'D BY	REV'D BY	APP'D BY	PROJECT	DRAWN	DESIGN	CHECKED	APPROVED	TITLE			
												DATE	SCALE	DRAWING NO.	SHEET NO.
		11.09.01	WORKING	Y.B.Y	Y.B.Y	Y.B.Y	STARTER FOR AUX.BLOWER [SHIP NO. 2585-2589]	J.H.Y			Y.B.Y	WIRING DIAGRAM FOR AUX BLOWER STARTER			
		11.07.21	YARD COMMENT	Y.B.Y	Y.B.Y	Y.B.Y						2011.09	N/5	H110202	11
		11.02.12	APPROVAL	Y.B.Y	Y.B.Y	Y.B.Y									





PROJECT				DRAWN				DESIGN				CHECKED				APPROVED				TITLE			
STARTER FOR AUX.BLOWER				J.K.V												Y.B.Y				NO.1 AUX. BLOWER CIRCUIT			
[SHIP NO. 2585-2589]																							
NO.1, NO.2 L.O PUMP RUN SIGNAL																				DATE			
CLOSE AT PUMP STOP																				SCALE			
FROM : SHS																				DRAWING NO.			
(SHUT DOWN CANCEL SIGNAL)																				SHEET NO.			
OPEN AT SHUT DOWN CANCEL																				2011.09			
																				N/S			
																				H110202			
																				13			



NO.	REVISION	DATE	CONTENTS	CHK'D BY	REV'D BY	APP'D BY	PROJECT	DRAWN	DESIGN	CHECKED	APPROVED	TITLE			
												NO.2 AUX. BLOWER CIRCUIT			
		11.09.01	WORKING	Y.B.Y	Y.B.Y	Y.B.Y	STARTER FOR AUX.BLOWER [SHIP NO. 2585-2589]	J.H.V			Y.B.V	DATE	SCALE	DRAWING NO.	SHEET NO.
		11.07.21	YARD COMMENT	Y.B.Y	Y.B.Y	Y.B.Y						2011.09	N/S	H110202	14
		11.02.12	APPROVAL	Y.B.Y	Y.B.Y	Y.B.Y									

[illegible]

NO.	R1	S1	T1	U1	V1	W1	D13	D14	J15	J16	J17	J18	J19	J20	J21	J22	J23	J24	J41	J42	J43	J44
CAPACITY	300A			300A			15A															
USE REMARK	SOURCE			MOTOR			START FROM ACU	RUNNING	OVERLOAD/ POWER FAIL	CLOSE AT REMOTE			AMS1	AMS2	LO PUMP RUN		SHUT DOWN OIL TEL					
DESCRIPTION	POWER			POWER			ACU1										LO PUMP PANEL		BMS			
CABLE ENTRY	HT120			HT120			HLM7								HLM12		HLM4		HLM2			

NO.1 AUX. BLOWER STARTER

TERMINAL BLOCKS

NO.1 AUX. BLOWER STARTER

NO.	R1	S1	T1	U1	V1	W1	D13	D14	J15	J16	J17	J18	J19	J20	J21	J22	J23	J24	J41	J42	J43	J44
CAPACITY	300A			300A			15A															
USE REMARK	SOURCE			MOTOR			START FROM ACU	RUNNING	OVERLOAD/ POWER FAIL	CLOSE AT REMOTE	AMS1		AMS2		LO PUMP RUN		SHUT DOWN OIL TEL					
DESCRIPTION	POWER			POWER			ACU1								LO PUMP PANEL		BMS					
CABLE ENTRY	HT120			HT120			HLM7						HLM12		HLM4		HLM2					

NO.2 AUX. BLOWER STARTER

NO.	R2	S2	T2	U2	V2	W2	D23	D24	J25	J26	J27	J28	J29	J30	J31	J32		
CAPACITY	300A			300A			15A											
USE REMARK	SOURCE			MOTOR			START FROM ACU	RUNNING	OVERLOAD/ POWER FAIL	CLOSE AT REMOTE	AMS2							
DESCRIPTION	POWER			POWER			ACU2											
CABLE ENTRY	HT120			HT120			HLM7						HLM12					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A																
B																
C																
D																
E																
F																
G																
H																
I																
J																

TERMINAL BLOCKS

NO.1 AUX. BLOWER STARTER

NO.	R1	S1	T1	U1	V1	W1	D13	D14	J15	J16	J17	J18	J19	J20	J21	J22	J23	J24	J41	J42	J43	J44
CAPACITY	300A			300A			15A															
USE REMARK	SOURCE			MOTOR			START FROM ACU	RUNNING	OVERLOAD/ POWER FAIL	CLOSE AT REMOTE	AMS1		AMS2		LO PUMP RUN		SHUT DOWN OIL TEL					
DESCRIPTION	POWER			POWER			ACU1								LO PUMP PANEL		BMS					
CABLE ENTRY	HT120			HT120			HLM7						HLM12		HLM4		HLM2					

NO.2 AUX. BLOWER STARTER

NO.	R2	S2	T2	U2	V2	W2	D23	D24	J25	J26	J27	J28	J29	J30	J31	J32		
CAPACITY	300A			300A			15A											
USE REMARK	SOURCE			MOTOR			START FROM ACU	RUNNING	OVERLOAD/ POWER FAIL	CLOSE AT REMOTE	AMS2							
DESCRIPTION	POWER			POWER			ACU2											
CABLE ENTRY	HT120			HT120			HLM7						HLM12					

TERMINAL BLOCKS

NO.1 AUX. BLOWER STARTER

NO.	R1	S1	T1	U1	V1	W1	D13	D14	J15	J16	J17	J18	J19	J20	J21	J22	J23	J24	J41	J42	J43	J44
CAPACITY	300A			300A			15A															
USE REMARK	SOURCE			MOTOR			START FROM ACU	RUNNING	OVERLOAD/ POWER FAIL	CLOSE AT REMOTE	AMS1		AMS2		LO PUMP RUN		SHUT DOWN OIL TEL					
DESCRIPTION	POWER			POWER			ACU1								LO PUMP PANEL		BMS					
CABLE ENTRY	HT120			HT120			HLM7						HLM12		HLM4		HLM2					

NO.2 AUX. BLOWER STARTER

NO.	R2	S2	T2	U2	V2	W2	D23	D24	J25	J26	J27	J28	J29	J30	J31	J32		
CAPACITY	300A			300A			15A											
USE REMARK	SOURCE			MOTOR			START FROM ACU	RUNNING	OVERLOAD/ POWER FAIL	CLOSE AT REMOTE	AMS2							
DESCRIPTION	POWER			POWER			ACU2											
CABLE ENTRY	HT120			HT120			HLM7						HLM12					

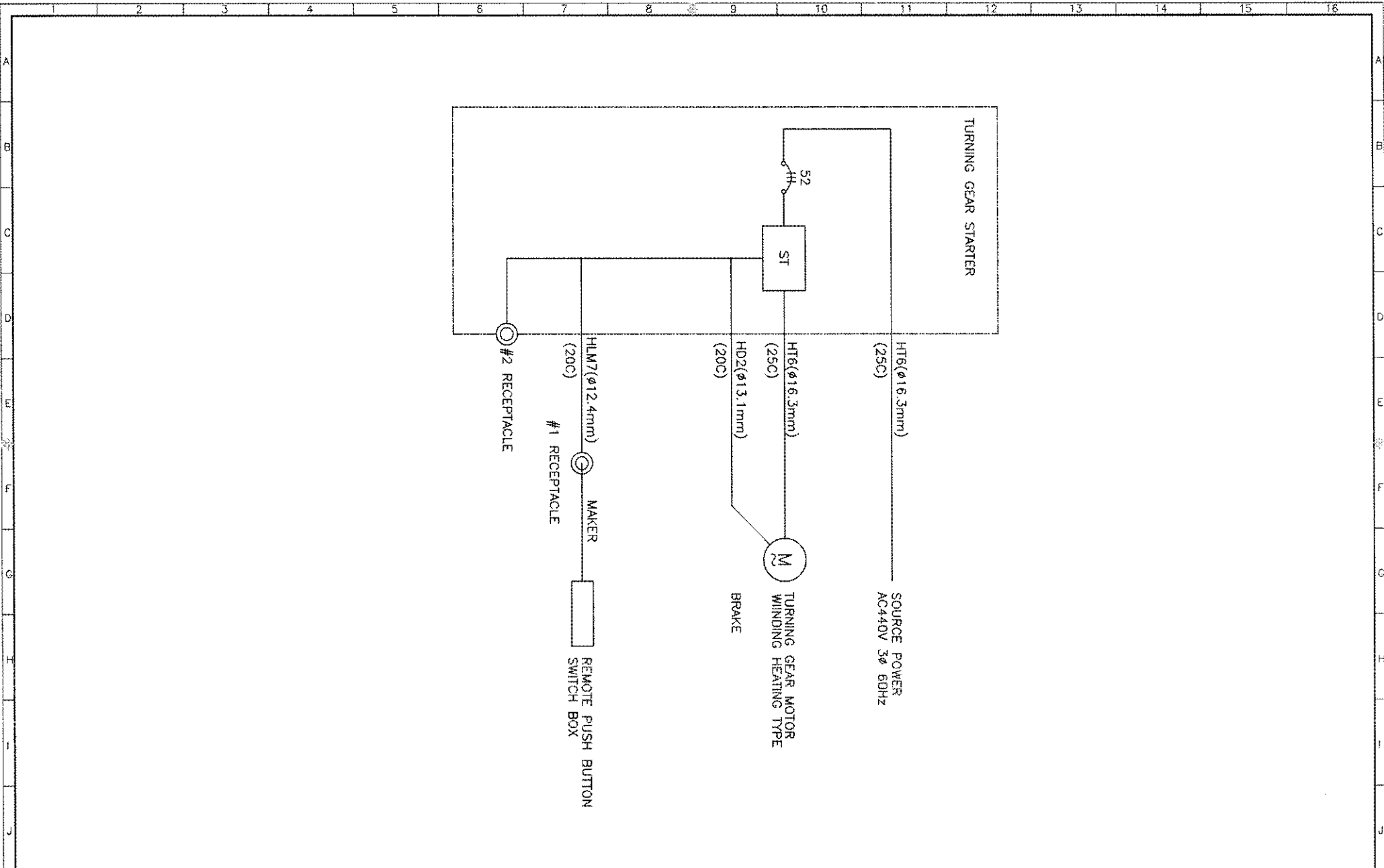
TERMINAL BLOCKS

NO.1 AUX. BLOWER STARTER

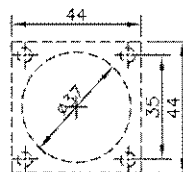
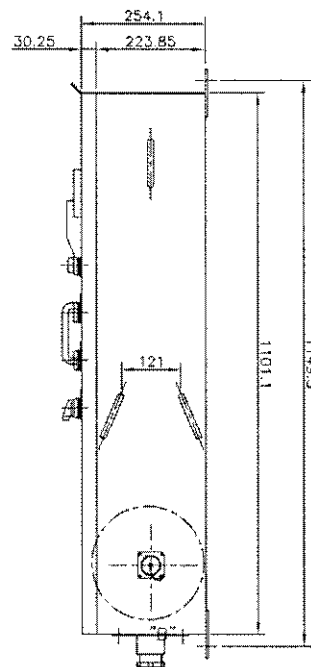
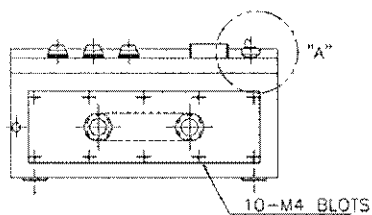
NO.	R1	S1	T1	U1	V1	W1	D13	D14	J15	J16	J17	J18	J19	J20	J21	J22	J23	J24	J41	J42	J43	J44
CAPACITY	300A			300A			15A															
USE REMARK	SOURCE			MOTOR			START FROM ACU	RUNNING	OVERLOAD/ POWER FAIL	CLOSE AT REMOTE	AMS1		AMS2		LO PUMP RUN		SHUT DOWN OIL TEL					
DESCRIPTION	POWER			POWER			ACU1								LO PUMP PANEL		BMS					
CABLE ENTRY	HT120			HT120			HLM7						HLM12		HLM4		HLM2					

NO.2 AUX. BLOWER STARTER

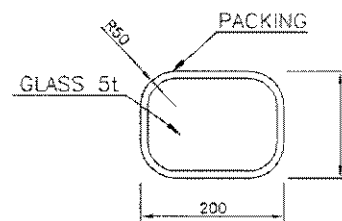
NO.	R2	S2	T2	U2	V2	W2	D23	D24	J25	J26	J27	J28	J29	J30	J31	J32		
CAPACITY	300A			300A			15A											
USE REMARK	SOURCE			MOTOR			START FROM ACU	RUNNING	OVERLOAD/ POWER FAIL	CLOSE AT REMOTE	AMS2							
DESCRIPTION	POWER			POWER			ACU2											
CABLE ENTRY	HT120			HT120			HLM7						HLM12					



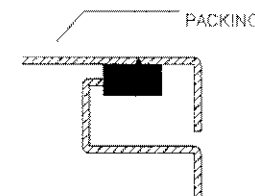
							PROJECT STARTER FOR TURNING GEAR [SHIP NO. 2585-2589]	DRAWN <i>J.H.Y</i>			APPROVED <i>Y.B.Y</i>	TITLE WIRING DIAGRAM FOR TURNING GEAR STARTER			
		11.09.01	WORKING	Y.B.Y	Y.B.Y	Y.B.Y									
		11.07.21	YARD COMMENT	Y.B.Y	Y.B.Y	Y.B.Y									
		11.02.12	APPROVAL	Y.B.Y	Y.B.Y	Y.B.Y									
NO.	REVISION	DATE	CONTENTS	CHK'D BY	REV'D BY	APP'D BY									
												2011.09	N/S	H110202	16



DETAIL "B"



DETAIL "C"



DETAIL 81 92

— NOTICE —

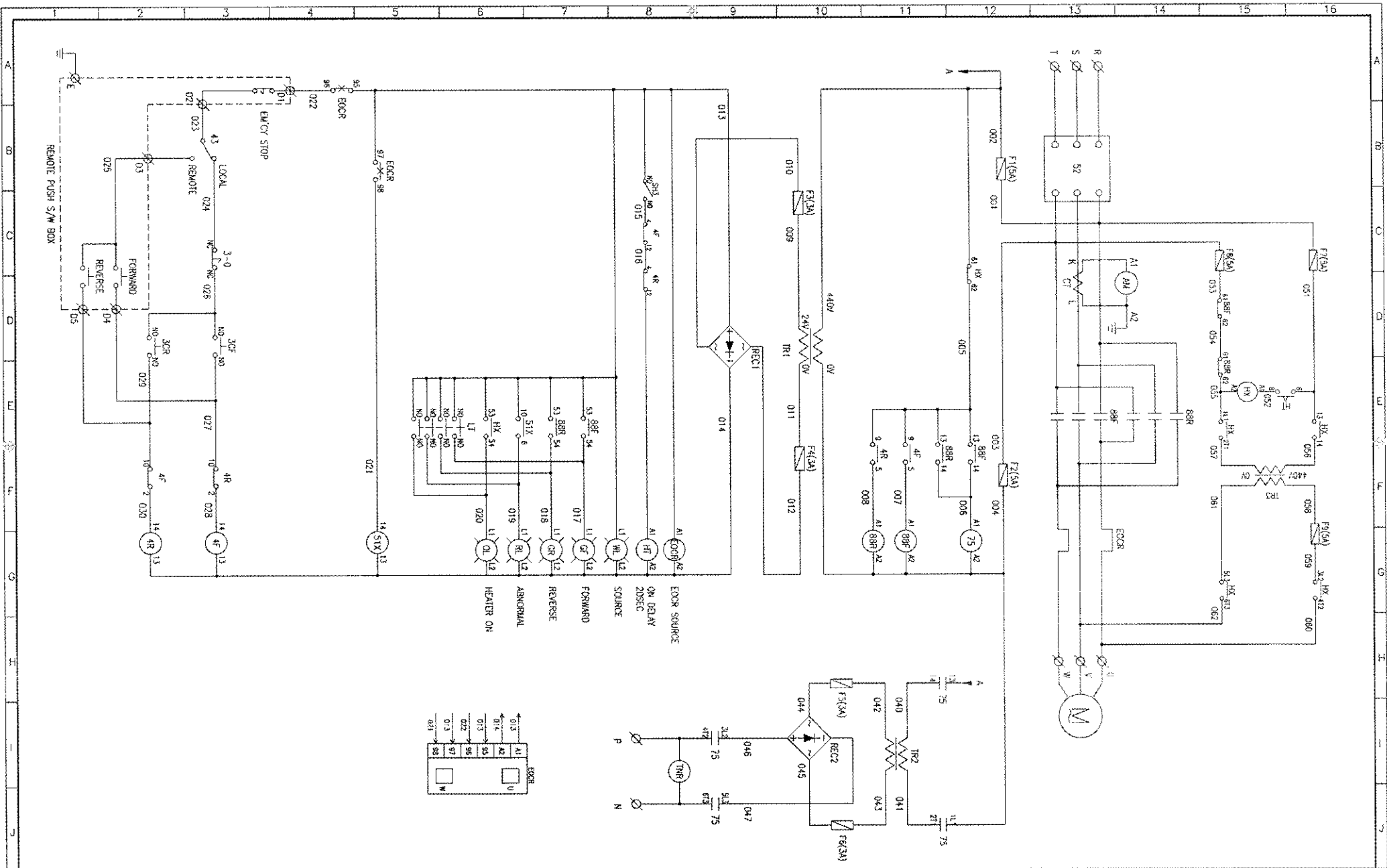
MATERIAL : SS400 2.3t
PAINT COLOR : RAL7032
WEIGHT : About 40Kg

```

52 : MCCB(TO. PART LIST)
AM : AMMETER(TO. PART LIST)
WL : SOURCE LAMP(#30 WHITE CAP)
GLF : FORWARD LAMP(#30 GREEN CAP)
GLR : REVERSE LAMP(#30 GREEN CAP)
RL : ABNORMAL LAMP(#30 RED CAP)
3CF : FORWARD P/B(#30 GREEN CAP)
OL : HEATER ON LAMP(#30 ORANGE CAP)
3CR : REVERSE P/B(#30 GREEN CAP)
3-O : STOP P/B(#30 RED CAP)LOCKING TYPE
LT : LAMP TEST P/B (#30 BLUE CAP)
43 : LOCAL-REMOTE(#30 SELECTOR S/W)
SH : HEATER OFF-ON(#30 SELECTOR S/W)
SUP : MAKER NAME PLATE
SAFETY : SAFETY LABEL

```

							PROJECT STARTER FOR TURNING GEAR [SHIP NO. 2585-2589]	DRAWN <i>J.H.Y</i>			APPROVED <i>Y.B.Y</i>	TITLE			
	11.09.01	WORKING	Y.B.Y	Y.B.Y	Y.B.Y	OUTLINE DRAWING FOR TURNING GEAR STARTER									
	11.07.21	YARD COMMENT	Y.B.Y	Y.B.Y	Y.B.Y										
	11.02.12	APPROVAL	Y.B.Y	Y.B.Y	Y.B.Y										
															
NO.	REVISION	DATE	CONTENTS	CHK'D BY	REV'D BY	APP'D BY									
							2011.09 N/S DRAWING NO. SHEET NO. H110202 17								



PROJECT				DRAWN				DESIGN				CHECKED				APPROVED				TITLE			
STARTER FOR TURNING GEAR				J.H.V												Y.B.V				CONTROL CIRCUIT FOR TURNING GEAR			
[SHIP NO. 2585-2589]																				DATE			
																				SCALE			
																				DRAWING NO.			
																				SHEET NO.			
																				2011.09			
																				N/S			
																				H110202			
																				18			

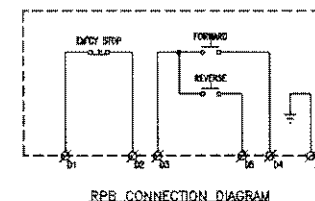
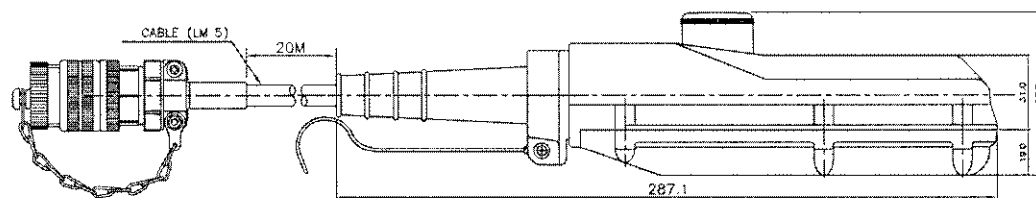
TERMINAL BLOCKS

NO.	R	S	T	U	V	W	P	N	D1	D2	D3	D4	D5	E	D1	D2	D3	D4	D5	E
CAPACITY	60A			60A			20A													
USE REMARK	SOURCE			MOTOR			MOTOR		RECEPTACLE #1					RECEPTACLE #2						
DESCRIPTION	POWER						BRAKE		REMOTE					REMOTE						
CABLE ENTRY	HT6			HT6			HD2		HLM7					INTER, CONNECTION						

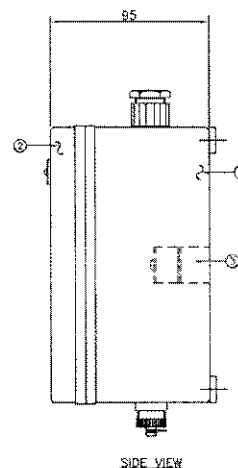
NO.	REVISION	DATE	CONTENTS	CHK'D BY	REV'D BY	APP'D BY	PROJECT STARTER FOR TURNING GEAR [SHIP NO. 2585~2589]	DRAWN	DESIGN	CHECKED	APPROVED	TITLE TERMINAL BLOCK FOR TURNING GEAR STARTER			
1		11.09.01	WORKING	Y.B.Y	Y.B.Y	Y.B.Y		J.M.Y			Y.B.Y	DATE	SCALE	DRAWING NO.	SHEET NO.
2		11.07.21	YARD COMMENT	Y.B.Y	Y.B.Y	Y.B.Y						2011.09	N/S	H110202	19
3		11.02.12	APPROVAL	Y.B.Y	Y.B.Y	Y.B.Y									

[illegible]

MATERIAL : ABS
PAINT COLOR : MAKER STANDARD
IP GRADE : IP54
PLUG : 7P
WEIGHT :
REMOTE S/W BOX : About 0.3Kg
PLUG : About 0.8kg



Front view of a rectangular plate. The overall dimensions are 170 units wide and 172 units high. The inner dimensions are 160 units wide and 122 units high. The plate has four corner fasteners, each labeled '4'. A central rectangular area is labeled 'N P'. A dimension of 132 units is shown for the height of the central area. A dimension of 4-96 is shown for the width of the central area. The plate is labeled 'FRONT VIEW'.



PAINT COLOR : MAKER STANDARD
IP GRADE : IP44
NAME PLATE : RECEPTACLE FOR TURNING GEAR
RECEPTACLE : 7P

NO.	N A M E	MATERIAL	Q'TY	REMARK
1	BODY	ABS	1	
2	COVER	ABS	1	
3	TERMINAL BLOCK	15A 6P	1	
4	NAME PLATE	PHENOL	1	50x15
5	CABLE GLAND		1	

							PROJECT STARTER FOR TURNING GEAR [SHIP NO. 2585-2589]	DRAWN	DESIGN	CHECKED	APPROVED	TITLE REMOTE S/W BOX & PLUG & RECEPTACLE FOR 1/G STARTER			
		11.09.01	WORKING	Y.B.Y	Y.B.Y	Y.B.Y		<i>J.H.V</i>			<i>Y.B.Y</i>				
		11.07.21	YARD COMMENT	Y.B.Y	Y.B.Y	Y.B.Y									
		11.02.12	APPROVAL	Y.B.Y	Y.B.Y	Y.B.Y									
NO.	REVISION	DATE	CONTENTS	CHK'D BY	REV'D BY	APP'D BY									
												DATE	SCALE	DRAWING NO.	SHEET NO.
												2011.09	N/S	H110202	20

					S. PAGE	T. PAGE
PLAN HISTORY					ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2
					MESSRS.	H.H.I.
					RULE	LR + UMS
					SHIP NO.	2585/86/87/88/89
					ENG. NO.	AA4624/25/26/27/28
TITLE : AUXILIARY BLOWER WITH MOTOR						
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	Replacement for Ident.no.:
20110718	BSH	BSH	JCM		FOR WORKING.	
20110217	BSH	BSH	JCM			
Licensor Ident.no.:				Type:		
Info.no.:				Description:		
Page.no.:				Security:		
(01) 01				C		
				6S90ME-C		
				AUXILIARY BLOWER WITH MOTOR		
						
				Ident.no.:		
				A14-413503-0		

MESSRS. : HYUNDAI HEAVY INDUSTRIES CO.,LTD.

ARTICLE : AUX. BLOWER WITH MOTOR

SHIP NO. :  2585~89

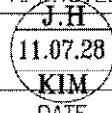
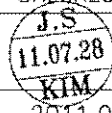
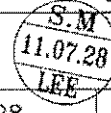
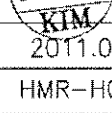
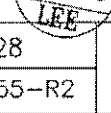
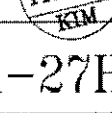
PROJECT NO. : AA4624~28

ENGINE TYPE : 6S90ME-C8.2 CLASS : LR

SHIP OWNER :

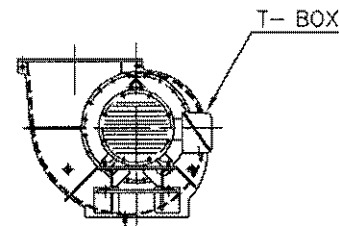
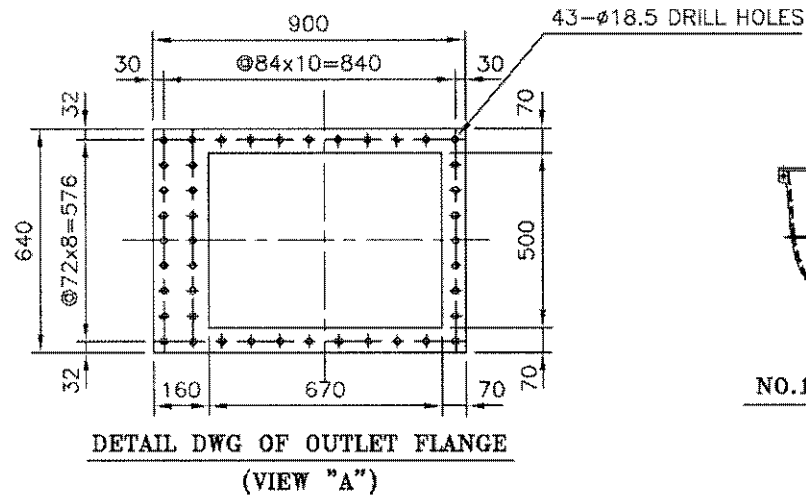
PAINT COLOR IN SIDE : MUNSELL NO. N-9.0

OUT SIDE : MUNSELL NO. 7.5BG 7/2

FAN SPECIFICATION				MOTOR SPECIFICATION			
MODEL	HAA-414/185N			FRAME NO.	280M		
DRAWING NO.	H-0127L-H	REV. NO.	0	MAKER	HHI / MDB		
AIR CAPACITY	6.2 / 10.6	M ³ /SEC	r=1.225	OUT PUT & NO. OF POLES	125 Kw 2 POLES		
AIR PRESS.	571 / 327	mmAq	Kg/M ³	VOLTAGE & CYCLES	440 V 60 Hz		
AIR DENSITY	1.225 ~ 2.1 Kg/M ³			RATING CURRENT	195.9 A		
REVOLUTION	3,565	R P M		REVOLUTION	3,565 R P M		
AIR TEMP.	15	°C		AMB. TEMP. & INSULATION PROTECTION GRADE	45°C, F CLASS, IP44		
NO. OF PER SHIP	2 SET/ENGINE						
TOTAL WEIGHT	ab. 1250 Kg/SET						
HISTORY OF DRAWING				 HMMCO Hyundai Marine Machinery Co.,Ltd.			
NO.	REV.	DATE	HISTORY	APPROVED	CHECKED	DRAWN	
1		FEB. 22. 2011	FOR APPROVAL DWG.				
2		JUL. 18. 2011	FOR REAPPROVAL DWG.				
3		JUL. 28. 2011	FOR WORKING DWG.	DATE	2011.07.28	A-27H	
4				FILE NO.	HMR-H0755-R2		

DRAWING LIST

[illegible]



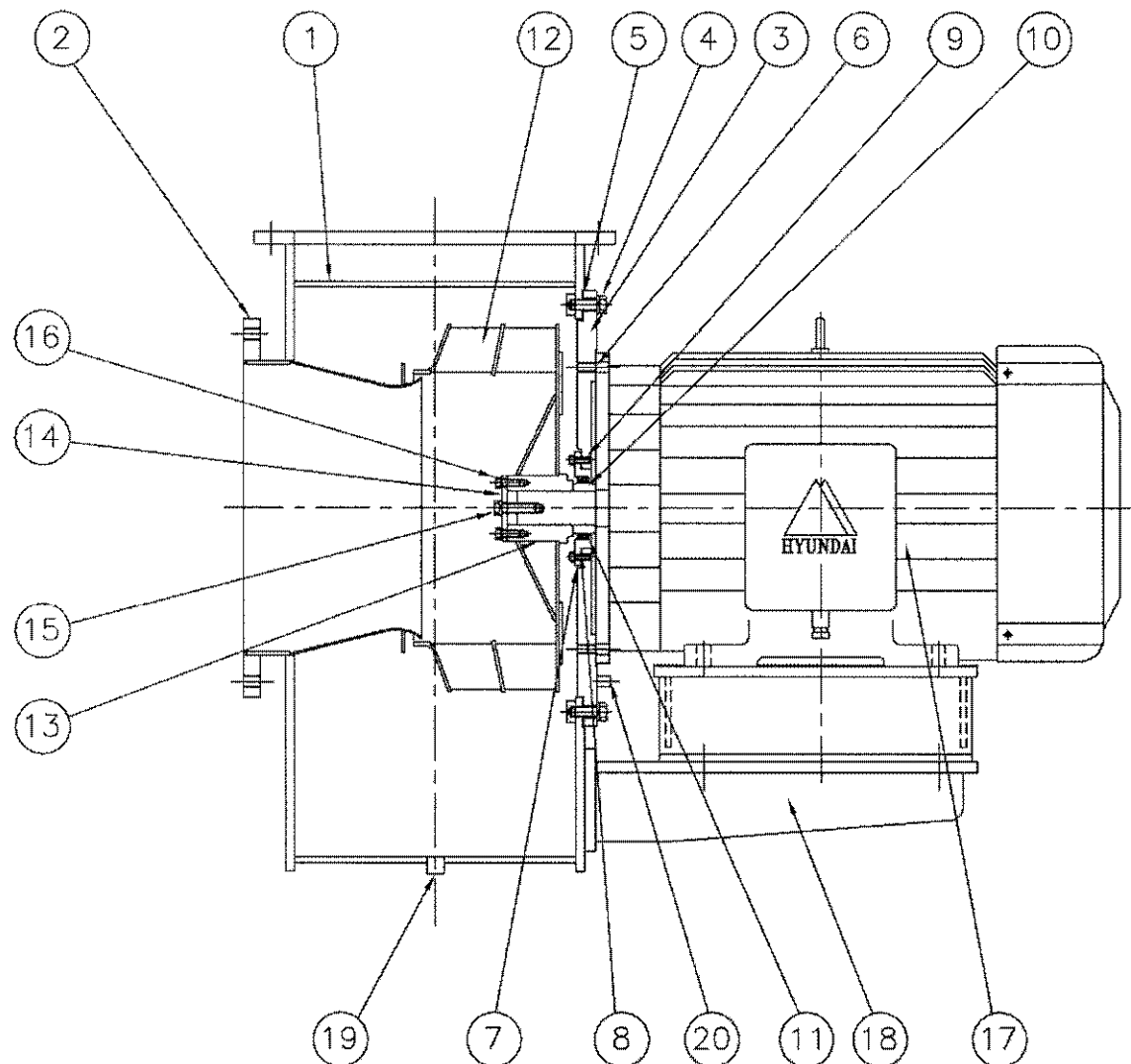
NO.1~2 AUX. BLOWER
(VIEW "B")

SPECIFICATION				
TYPE	HAA-414/185N		ENGINE TYPE	6S90ME-C8.2
AIR VOLUME	6.2/10.6	m ³ /sec	TEMPERATURE	15 °C
PRESSURE	571/327	mmAq	AIR GRAVITY	1.225 Kg/m ³
REVOLUTION	3565	RPM	SUCTION AIR DENSITY	1.225~2.1 Kg/m ³
MOTOR	125kW 2P 440 V 195.9 A 3 # 45°C IP44			
Q'ty	SCALE	TITLE	LAYOUT DWG OF AUX. BLOWER WITH MOTOR	
2 Sets	1=20			
DWG. NO.		SHIP NO.		3RD ANGLE
H-0127L-H 		2585~2589		

A-27H

061011-JSK

 HMMCO



MAKER SUPPLY

1. BOLT,NUT,S/W (M16x110L) : 43eaX2Sets=86ea
 2. DISTANCE PIPE (φ28xφ18x30L) : 43eaX2Sets=86ea
 3. GASKET (900x640x1.5t) : 1eaX2Sets=2ea+1SPARE

20	DRAIN WITH PLUG	SS400	1		
19	DRAIN	SS400	1		
18	MOTOR BED	SS400	1	AMB03	
17	MOTOR		1	280M	
16	BOLT,S/W,DL/W	8.8T	2		
15	BOLT,S/W,DL/W	8.8T	1		
14	SHAFT CAP	SS400	1		
13	BOSS		1		
12	IMPELLER	A5083	1		
11	GASLOCK SEAL	THERMO-ELASTIC	2		
10	SEALING RING	SM45C	1		
9	BOLT,S/W	8.8T	6		
8	GASKET		1		
7	STUFFING BOX	SS400	1		
6	MOTOR FIXING BOLT,S/W	8.8T	8		
5	GASKET		1		
4	BOLT,S/W	8.8T	20		
3	MOTOR SEAT	SS400	1	MP06-P50	
2	SUCTION CONE	SS400	1	ASC17	
1	FAN CASING	SS400	1	AFC6	

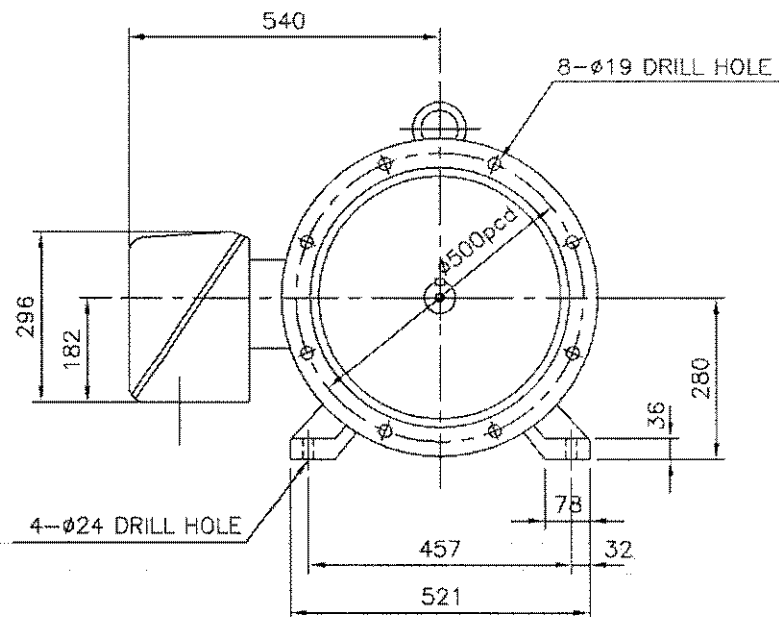
NO.	DESCRIPTION	MAT.L	Q'TY	PART NO.	REMARKS
Q'ty	SCALE	TITLE			
2 Sets	1=12				
DWG. NO.		SHIP NO.		3RD ANGLE	
H- 0127S-H		2585~2589			

DATE	CODE	MEMO	SIGN
	△		
	△		

A-27H

061011-JSK

HMMCO



MOTOR TYPE : MDB

Technical drawing of a circular component with the following dimensions and features:

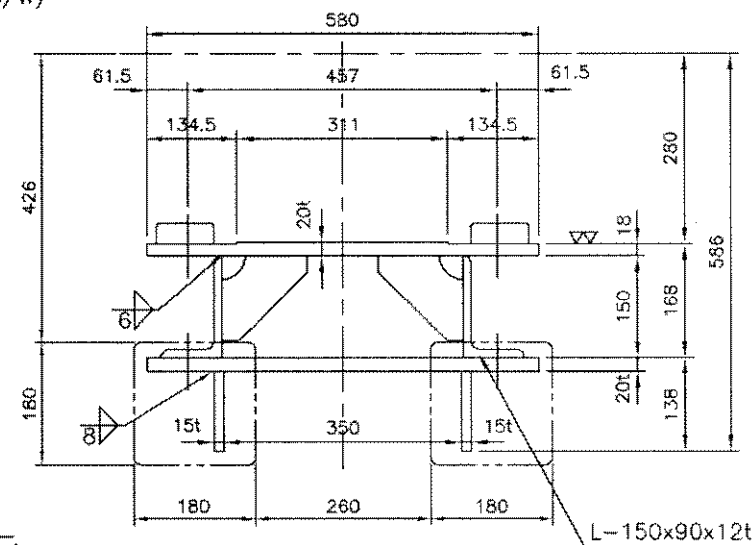
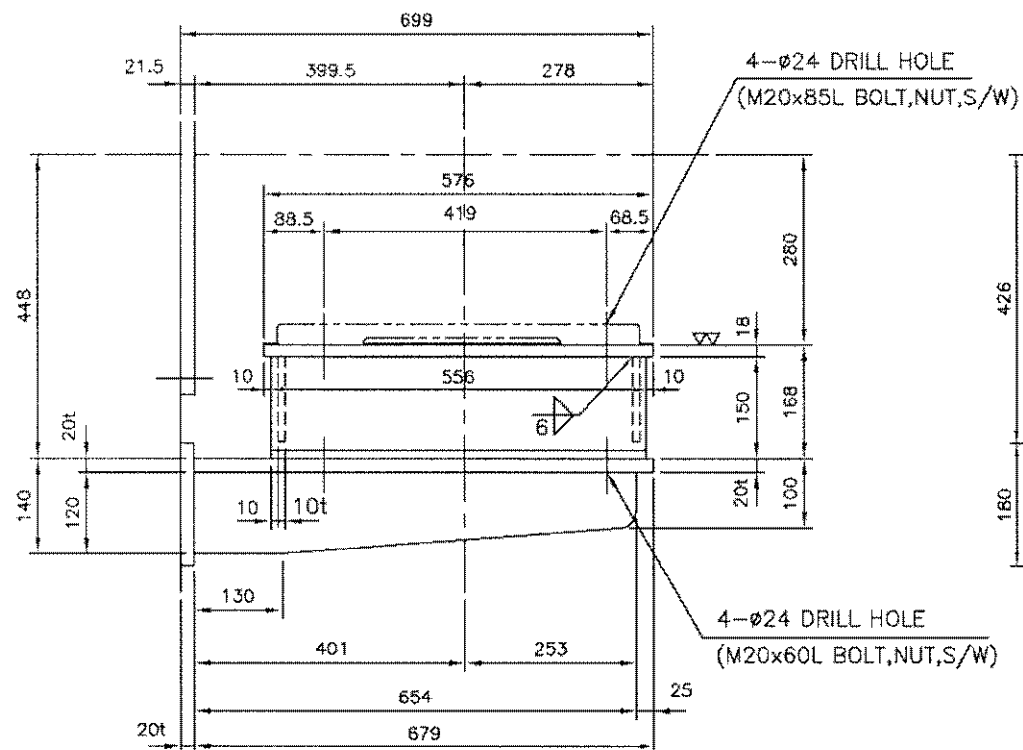
- Top flange width: 15Wx10H
- Overall height: 55
- Outer diameter: Ø60m6
- Threaded hole: M 6 TAP (DP:40mm)

$$\phi 60m6 = \phi 60 \begin{matrix} +0.030 \\ +0.011 \end{matrix}$$

WEIGHT : 825Kg

1. GREASE NIPPLE TO BE JIS B1575 A-PT 1/8" BALL TYPE
2. WINDING SPACE HEATER CAPACITY : 26 V, 40A
3. TERMINAL COLORS : R(U): Red, S(V): White, T(W): Black

NO.	DESCRIPTION	MAT'L	Q'TY	SPECIFICATION	REMARKS
Q'ty	SCALE	TITLE	LAYOUT DWG OF HYUNDAI MOTOR (125KW-2P Fr.280M-B35)		
	1/12				
DWG. NO.		SHP NO.			3RD ANGLE
H-0514MT		2585~2589			



MAKER	FRAME	POWER
HHI	280M	110, 125 132, 150
ABB	280M	105

DATE	CODE	MEMO	SIGN
	△		
	△		

NO.	DESCRIPTION	MAT.L	Q'TY	SPECIFICATION	REMARKS
Q'ty	SCALE	TITLE	DETAIL DWG OF MOTOR BASE		
	1=10	SYMBOL	AMB03	3RD ANGLE	
DWG. NO.	H-0013MB				

061002-JSK

HMMCO

ESTIMATED PERFORMANCE CURVED

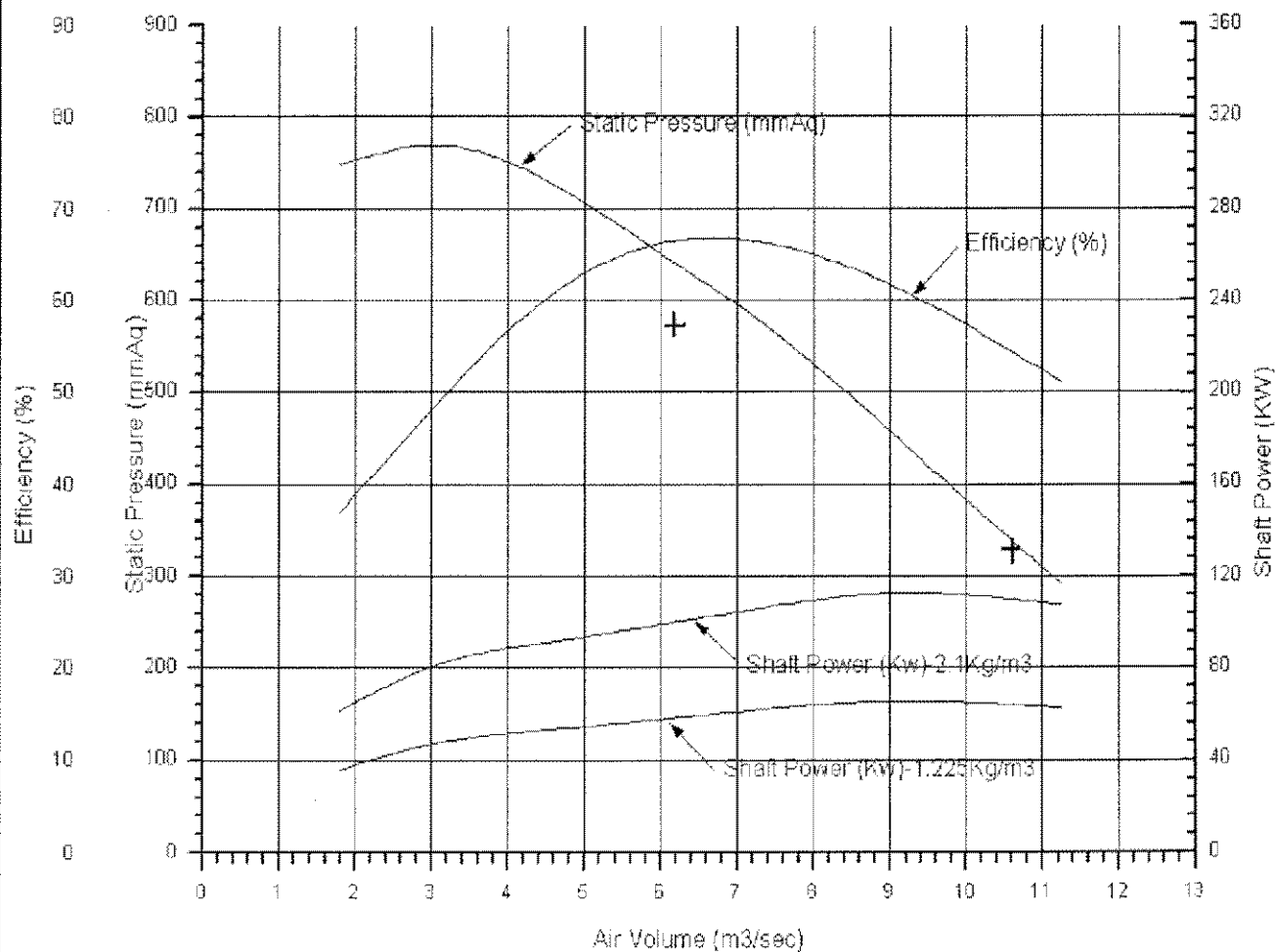
CLIENT	HYUNDAI HEAVY INDUSTRIES CO.,LTD.		
SHIP YARD			
SERVICE	AUX. BLOWER WITH MOTOR		
NUMBER OF UNIT	2 Sets/Ship	ENGINE TYPE	6S90ME-C8.2
SHIP NO.	2585~89	TYPE	N10

OPERATING CONDITIONS

FAN & BLOWER MODEL	HAA-414/185N	FRAME NO.	280M
CAPACITY	6.2/10.6 m ³ /sec	MOTOR CAPACITY	125 Kw
FAN STATIC PRESSURE	571/327 mmAq	POLE / CYCLE	2 P / 60 Hz
AIR DENSITY	1.225 kg/m ³	VOLTAGE	440 V
ACTUAL SPEED	3565 RPM	Power Consumption	115 Kw

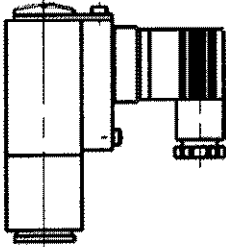
ESTIMATED PERFORMANCE CURVED

SPECIFICATION (6.2/10.6m³/sec x 571/327mmAq x 125KW-2P)



					S. PAGE	T. PAGE	
PLAN HISTORY				ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2		
				MESSRS.	H.H.I.		
				RULE	LR + UMS		
				SHIP NO.	2585/86/87/88/89		
				ENG. NO.	AA4624/25/26/27/28		
TITLE : SPARE PART & TOOL LIST FOR ELECTRIC EQUIPMENTS							
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	Replacement for Ident.no.:	
20110718	BSH	BSH	JCM		FOR WORKING.		
20110217	BSH	BSH	JCM				
Licencee Ident.no.:				Type:			
Info.no.:				Description:			
Page.no.:				Ident.no.:			
(01) 01				Security: C	ELECTRIC SPARE PART & TOOL LIST		A14-413505-3

3D CAD Drawing - do not contact by hand

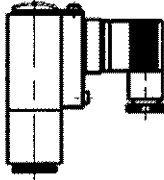
ITEM NO	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP				PLATE		REMARKS	BOX NO.
				WORKING	STAND- ARD	ADDI- TION	TOTAL	NO.	PART NO.		
1	MBC5100 -1211- 3DB04 (061B0006)						1			-	S008 (MS06)
	MBC5100 -1411- 3DB04 (061B0052)						-			-	

Similar no.: SIMILAR NO. Ship no.: Scale: 1:2.5 Mass. (kg): 1.000

Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	R
				*		5
				*		4
				*		3
				*		2
				*		1
				*		0

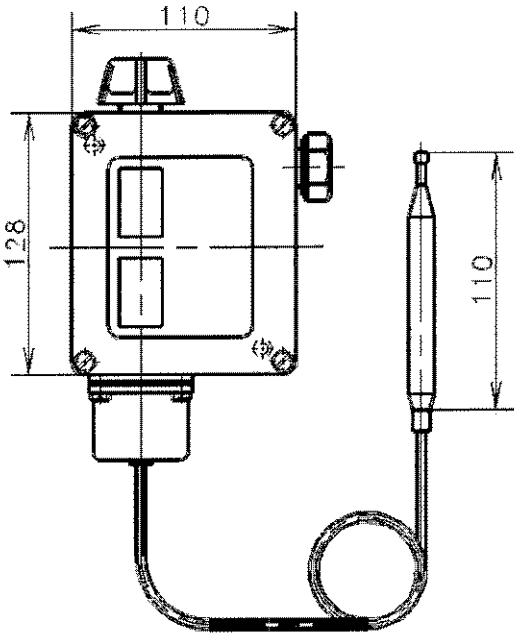
090203 BSH BSH JCM * Replacement for Ident.no.:

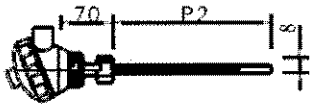
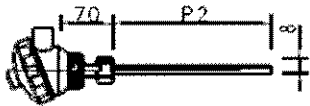
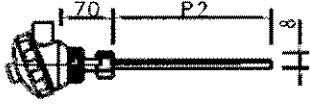
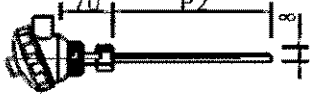
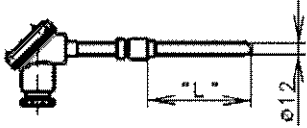
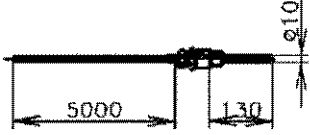
SPARE	Type: L/S-ME-C	
Info. no.	Description: PRESSURE SWITCH	Ident. no.: A14-354907-8

ITEM NO	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP				PLATE		REMARKS	BOX NO.
				WORKING	STAND- -ARD	SPARE	ADDITION	TOTAL	NO.		
	MBS5150 -1611 -XDB04 (060N1264)						1			-	S008 (MS06)
	MBS5150 -1811 -XDB04 (060N1265)						1			-	
	MBS5150 -2011 -XDB04 (060N1072)						1			-	
	MBS5150 -2211 -XDB04 (060N1271)						1			-	
	MBS5150 -2611 -XDB04 (060N1266)						1			-	

Similar no.:SIMILAR NO.				Ship no.:				Scale: 1:2.5		Mass.(kg): 1.000	
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:						
				*							
				*							
				*							
				*							
091215	BSH	BSH	JCM	*	CODE NO. MODIFIED.						
090130	BSH	BSH	JCM	*	Replacement for Ident.no.:						
SPARES				Type:				L/S-ME-C			
Info. no.				Description:				Ident.no.:			
000-000000				PRESSURE TRANSMITTER				A14-338215-7			



ITEM NO.	TYPE	SKETCH (WEIGHT) KG	MAT'L	SUPPLY PER SHIP				PLATE/ DRAWING		REMARKS	BOX NO.																																																
				WORKING	STAND- -ARD	ADDI- -TION	TOTAL	NO.	PART NO.																																																		
	RT 101						1			PART NO. A13-139091-4 (A19-003855-4) CODE NO: 17-5022 MAKER: DANFOSS	S008 (MS06)																																																
Similar no.: DANFOSS Ship no.: Scale: Mass. (kg): <table border="1"> <thead> <tr> <th>Date</th> <th>Des.</th> <th>Chk.</th> <th>Appd.</th> <th>A.C</th> <th>Replaced by Ident.no.:</th> </tr> </thead> <tbody> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td>*</td><td></td></tr> <tr> <td>111027</td> <td>JEJ</td> <td>JEJ</td> <td>JCM</td> <td>*</td> <td>DRAWING NO. IS ADDED.</td> </tr> <tr> <td>980527</td> <td>PKY</td> <td>BJS</td> <td>BHS</td> <td>*</td> <td>Replacement for Ident.no.:</td> </tr> </tbody> </table> SPARES Type: L/S-MC Info. no. 796104 Description: TEMPERATURE SWITCH  Ident.no.: A14-164173-1												Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:					*						*						*						*						*		111027	JEJ	JEJ	JCM	*	DRAWING NO. IS ADDED.	980527	PKY	BJS	BHS	*	Replacement for Ident.no.:
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:																																																						
				*																																																							
				*																																																							
				*																																																							
				*																																																							
				*																																																							
111027	JEJ	JEJ	JCM	*	DRAWING NO. IS ADDED.																																																						
980527	PKY	BJS	BHS	*	Replacement for Ident.no.:																																																						

ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP				PLATE/ DRAWING PART NO.	REMARKS	BOX NO.
				WORKING	STAND- ARD	SPARE	ADDITION	TOTAL		
1	TEMP. ELEMENT MPT100							1	Max. temp. 200°C Pocket L=60	
2	TEMP. ELEMENT MPT100							1	Max. temp. 200°C Pocket L=80	
3	TEMP. ELEMENT MPT100							1	Max. temp. 200°C Pocket L=100	
4	TEMP. ELEMENT MPT100							1	Max. temp. 200°C Pocket L=120	
5	TEMP. ELEMENT MPT100							1	Max. temp. 200°C Pocket L=200	
6	THERMO COUPLE							1	Pocket L=200 Max. temp. 600°C	
7	TEMP. SENSOR (PTR-M)							1	For Thrust pad	
8	SPARE PARTS BOX		STEEL					1 LOT		

Similar no.:

Ship no.:

Scale:

Mass. (kg):

Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	
				*		R
				*		5
				*		4
				*		3
				*		2
				*		1
I10222 BSH BSH JCM					* Replacement for Ident.no.:	0

SPARES

Type:

ME/ME-C



Info. no.

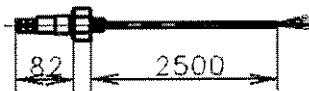
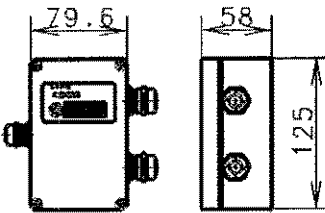
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Description:

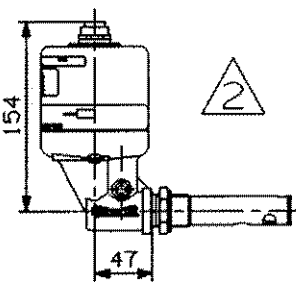
SPARE FOR TEMPERATURE SENSOR

Ident. no.:

A14-413521-7

ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP			PLATE		REMARKS (DRAWING NO.)	BOX NO.
				WORKING	STAND- ARD	SPARE TOTAL	NO.	PART NO.		
1	COMBINED FLOW & TEMP. SENSOR					1			ELS-3000 (A12-318907-1)	
2	ALARM MONITORING & INTERFACE BOX		ALUMINUM DIE-CASTING			1			ELS-3000AM (A12-318907-1)	

Similar no.:					Ship no.:					Scale: N/S					Mass. (kg):				
Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:										R				
				*											5				
				*											4				
				*											3				
				*											2				
110616	KYY	KYY	JCM	*	SPARE DRAWING NO. MODIFIED.										1				
080107	HHJ	HHJ	JCM	*	Replacement for Ident.no.:										0				
SPARES				Type: ALL															
Info. no. 691405				Description: P.C.O. SENSOR										Ident.no.: A14-316433-0					

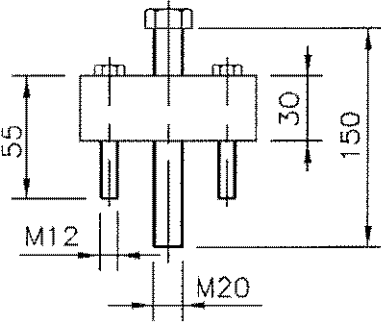
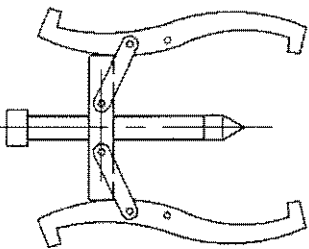
ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.																																
				CYL NO	WORKING	STAND- -ARD	ADDITION	TOTAL	NO.	PART NO.																																		
1	SENSOR MK6							1			E3561-301	S008 (MS06)																																
Similar no.: Ship no.: Scale: Mass. (kg): <table border="1" style="width: 100%;"> <thead> <tr> <th>Date</th> <th>Des.</th> <th>CHK.</th> <th>Appd.</th> <th>A.C</th> <th>Replace by Ident.no.:</th> <th>Replace by Ident.no.:</th> <th>R</th> </tr> </thead> <tbody> <tr> <td>20101203</td> <td>PKY</td> <td>PKY</td> <td>JCM</td> <td></td> <td>UP TO DATE.</td> <td></td> <td>2</td> </tr> <tr> <td>20050325</td> <td>HAY</td> <td>KWS</td> <td>KJG</td> <td>*</td> <td>UP TO DATE</td> <td></td> <td>1</td> </tr> <tr> <td>20020205</td> <td>KWS</td> <td>KWS</td> <td>KJG</td> <td>*</td> <td></td> <td></td> <td>0</td> </tr> </tbody> </table> SPARES Info. no. 235307 Type: MK-6 Description: OIL MIST DETECTOR  Ident.no.: A14-219242-4													Date	Des.	CHK.	Appd.	A.C	Replace by Ident.no.:	Replace by Ident.no.:	R	20101203	PKY	PKY	JCM		UP TO DATE.		2	20050325	HAY	KWS	KJG	*	UP TO DATE		1	20020205	KWS	KWS	KJG	*			0
Date	Des.	CHK.	Appd.	A.C	Replace by Ident.no.:	Replace by Ident.no.:	R																																					
20101203	PKY	PKY	JCM		UP TO DATE.		2																																					
20050325	HAY	KWS	KJG	*	UP TO DATE		1																																					
20020205	KWS	KWS	KJG	*			0																																					

NO.	NAME	OUTLINE	QUANTITY		SPEC. MODEL NO.
			AUX.BLOWER	TURN.GEAR	
1	MAGNETIC CONTACTOR		1	—	HiMC300W22,AC440V
			—	1	HiMC40W22,AC440V
2	ELECTRONIC OVER CURRENT RELAY		1	—	EOCRDS-05RB,DC24V
			—	1	EOCRDS-30RB,DC24V
3	FUSE HOLDER		2	1	
4	FUSE		2	2	5A
			4	2	3A
5	TIMER		1	—	DC24V ON DELAY
6	PUSH BUTTON SWITCH		1	—	ø30 1a1b (BLUE)
7	SELECTOR SWITCH		1	—	ø30 2a1b
8	PILOT LAMP		2	—	ø30 DC24V (RED, GREEN)
9	BULB FOR PILOT LAMP		10	4	24V
10	GLOBE FOR PILOT LAMP		1 1 1 1 1 1	—	ø30 WHITE CAP ø30 GREEN CAP ø30 RED CAP ø30 BLUE CAP ø30 ORANGE CAP ø30 DARK CAP
11	RECTIFIER		1	—	AC24V/DC24
12	RELAY		2	1	DRM570024LD
13	SPARE BOX		1		
14					

[illegible]

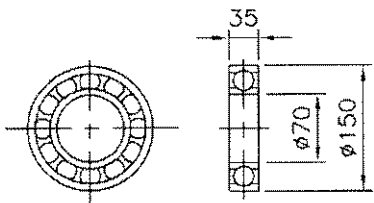
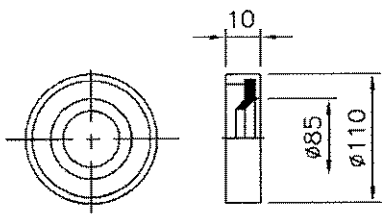
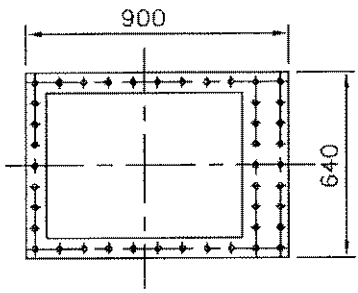
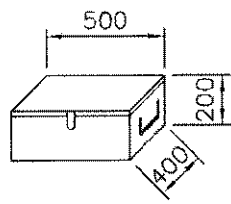
TOOL LIST

(NO.1 ~ 2 AUX. BLOWER)

SHIP NO.	2585~2589	A M E N D	REV.	DATE	N O T E
			①		
DRAW NO.	H-0005T		②		
ITEM NO.	NAME OF PARTS	OUT LINE		Q'TY	REMARK
1	IMPELLER TOOL			1	
2	BEARING TOOL			1	12"

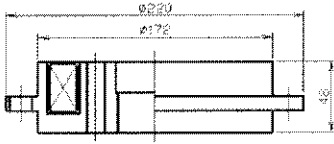
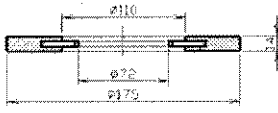
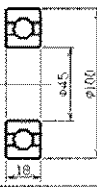
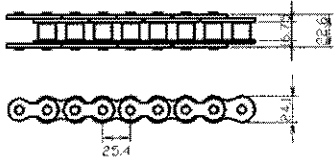
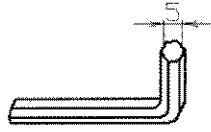
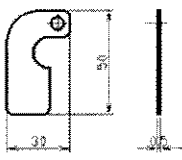
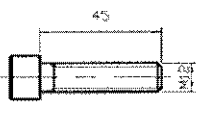
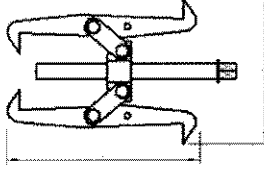
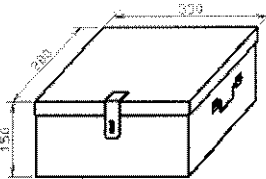
SPARE PART LIST

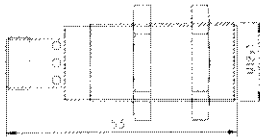
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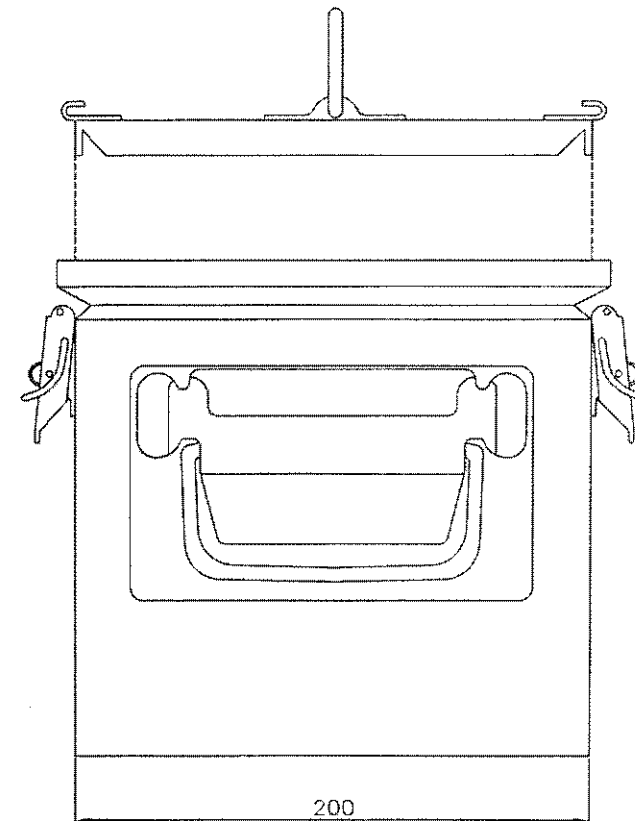
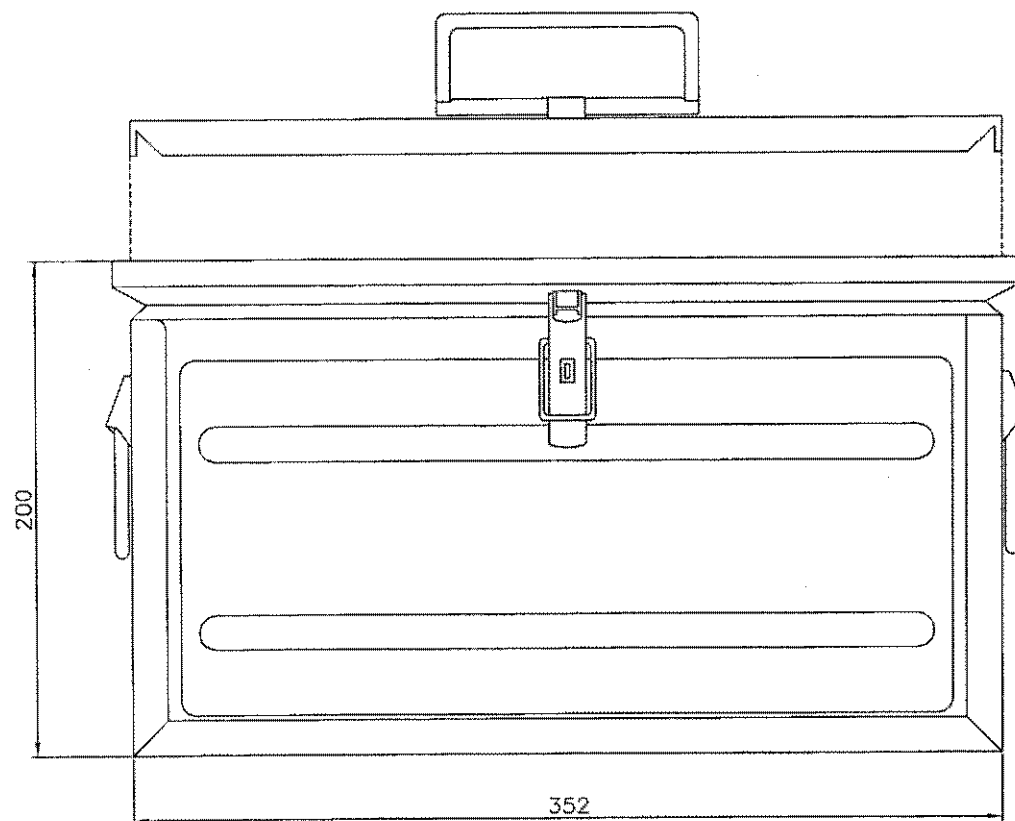
SHIP NO.		2585~2589	A M E N D	REV.	DATE	N O T E	
DRAW NO.		H-0127P-H		①			
				②			
NO.	NAME OF PARTS	OUT LINE	QUANTITY			REMARK	
			WORKING		SPARE		
			PER BL.SET	PER ENG.			
1	BALL BEARING		2	4	1	NO. 6314 C3 125Kw x 2P MOTOR	
2	GASLOCK SEAL		2	4	2	THERMOELASTIC SEAL	
3	PACKING		1	2	1	NON-ASBESTOS (1.5t)	
	SPARE PART BOX				1	WITH KEY AND LOCK	

MAIN ENGINE TURNING GEAR WITH MOTOR

SPARE PARTS LIST FOR MOTOR

NO.	NAME	SKETCH	METERIAL	SET SPARE		PART NO	SIZE	REMARKS
				QUANTITY				
1	MAGNET HOUSING			1	1	6S-90ME-24A (B4)	DB-30 (PART)	DAE KWANG ELECTRIC CO.
2	FRICTION DISC		NON-ASBESTOS /SUS304	2	2	6S-90ME-24A (B2)	DB-30 (PART)	DAE KWANG ELECTRIC CO.
3	BALL BEARING		BEARING STEEL	2	2	6S-90ME-24 (M7)	#6309	PURCHASE
4	ROLLER CHAIN		SK-5	3 M	0.5 M	(391)	RS #80	PURCHASE
5	WRENCH				1	6S-90ME-24A (B12)		PURCHASE
6	THICKNESS GAUGE		SUS304		4	6S-90ME-24A (B13)		YU RIM INDUSTRIAL
7	MANUAL BOLT				2	6S-90ME-24A (B10)		PURCHASE
8	PULLER				1			PURCHASE
9	TOOL BOX				1			
NOTE			YRTG 96-140	 YU RIM INDUSTRIAL CO.,LTD.		6S-90ME-SPLST2		

AutoChief C20, REMOTE CONTROL SYSTEM STANDARD SPARE PARTS						
Item No.:	PART DESCRIPTION	OUTLINE	QUANTITY			PARTS NUMBER
				Each vessel		
1	Inductive Pick-up XS618B1NBM12			1		310153
2	If OPU is Required Paper Termic OPU AC C20 Rolls of 16m			5		1200065



B	eco A0-002875	15/4/97HJK
A	1. PROD. ISSUE	26.09.88EN
ISSUE	CHANGE	DATE SIGN

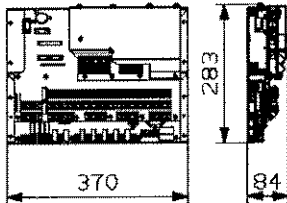
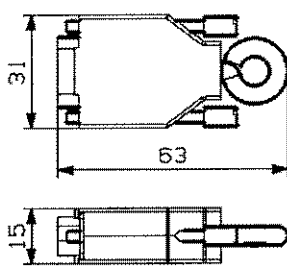
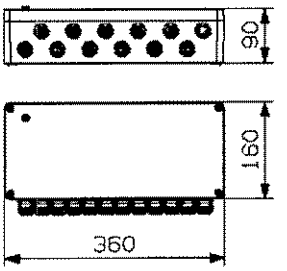
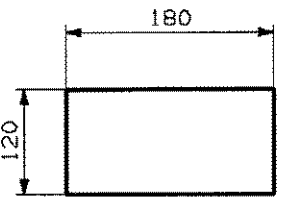
AUTOCHIEF
SPARE PART CASE MODEL 23-20
LAYOUT
STANDARD PROJECT DRAWING



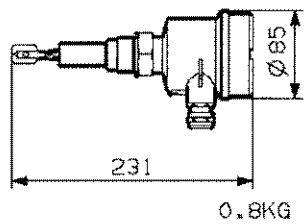
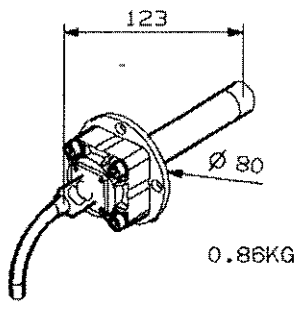
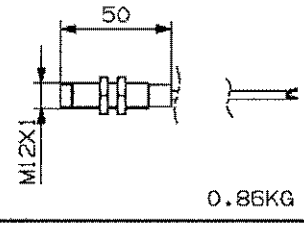
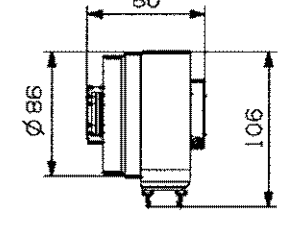
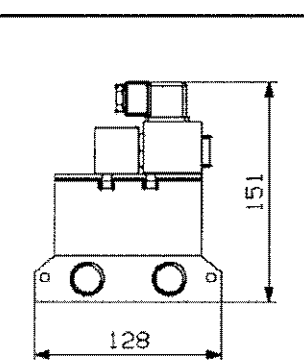
KONGSBERG

Kongsberg Maritime AS
Marine Automation Division - Horten

SCALE 1:2	DESIGNED 26.09.88 EN	CHECKED 15.04.97 SM
	TRACED	APPROVED1
PROJ.METH.		APPROVED2 15.04.97 DAM
FILENAME	REPLACEMENT FOR	REPLACED BY
DWG.NO. HA331226	REV. B	
REF.	PAGE	

ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.	
				CYL NO	WORKING	STAND- ARD	ADDITION	TOTAL	NO.	PART NO.			
H-1-1	MULTI PURPOSE CONTROLLER	 4.25KG		6	13								
				7	14								
				8	15								
				9	16	1		1	90645-0011	016	A11-269039-6		
				10	17								
				11	18								
				12	19								
H-1-2	I.D.KEY (PRINTED CIRCUIT BOARD ASSY)	 0.05KG		6	7								
				7	8								
				8	9								
				9	10	1		1		100	A14-269042-9		
				10	11								
				11	12								
				12	13								
H-1-3	TACHO SIGNAL AMPLIFIER	 4.84KG											
				2	1			1		112	A11-269051-2 (1142866-1)		
H-1-4	FUSE KIT	 0.15KG											
						1		1			A13-435109-5		

Similar no.:					Ship no.:					Scale:					Mass, (kg):				
Date	Des.	Chk.	Appd.	A.C	Replace by Ident.no.:					Replace by Ident.no.:					R				
20110928	BSH	BSH	JCM		H-1-4 IS ADDED.														
20101109	BSH	BSH	JCM																
SPARES		Security:	Type:	ME/ME-C															
Info. no.				Description:										Ident.no.:					
				ENGINE CONTROL SYSTEM (1/2)										A14-387087-0					

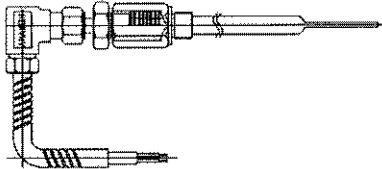
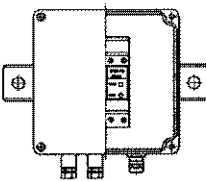
ITEM NO.	NAME	SKETCH (WEIGHT)KG	MAT'L	SUPPLY PER SHIP					PLATE/ DRAWING		REMARKS	BOX NO.
				CYL NO	WORKING	STAND- ARD	ADDITION	TOTAL	NO.	PART NO.		
H-1-4	LEVEL SWITCH				4	1		1	90641-0017	553	A13-306016-4 (1747177-0)	
H-1-5	POSITION (INDUCTIVE) SENSOR FOR EXH. VALVE			6	6							
				7	7							
				8	8							
				9	9	1		1	90803-0052	051	A19-240743-4 (1881670-5)	
				10	10							
				11	11							
				12	12							
H-1-6	MAKER SENSOR FOR TACHO SYSTEM				1	1		1			A14-323142-2	
H-1-7	ANGLE ENCODER				2	1		1			A12-269046-6 (3270554-3)	
H-1-8	SOLENOID VALVE			6	6							
				7	7							
				8	8							
				9	9	1		1			A13-163304-0	
				10	10							
				11	11							
				12	12							
Similar no.:				Ship no.:				Scale:		Mass. (kg):		
Date	Des.	CHK.	Appd.	A.C	Replace by Ident.no.:				Replace by Ident.no.:			
20110928	BSH	BSH	JCM		H-1-7, H-1-8 ADDED.							
20101109	BSH	BSH	JCM		UP TO DATE.							
SPARES		Security:	Type:	ME/ME-C								
Info. no.		Description:						Ident.no.:				
		ENGINE CONTROL SYSTEM (2/2)						A14-387086-8				

[illegible]

SPARE PART LIST

Cyl. Liner Temperature sensor

ENG.TYPE : S90ME-C8.2

NO.	DESCRIPTION	SKETCH	Q'TY	REMARKS
1	TEMPERATURE SENSOR FOR CYLINDER LINER TYPE: HT201KS174		1	
2	AMPLIFIER BOX WITH 2 AMPLIFIERS		1	
3				
4				
5				
6				
7				

					S. PAGE	T. PAGE
PLAN HISTORY			ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2		
			MESSRS.	H.H.I.		
			RULE	LR + UMS		
			SHIP NO.	2585/86/87/88/89		
			ENG. NO.	AA4624/25/26/27/28		
TITLE : AXIAL VIBRATION MONITOR						
Date	Des.	Ork.	Appd.	A.C	Replaced by Ident.no.:	Replacement for Ident.no.:
20110718	BSH	BSH	JCM		FOR WORKING.	
20110217	BSH	BSH	JCM			
Licensor Ident.no.:			Type:		6S90ME-C	
Info.no.:			Description:			
Page.no.:		Security:		Ident.no.:		
(01) 02		C		AXIAL VIBRATION MONITOR		A14-413506-5

INDEX

(NORMAL RANGE : 0 - 3.24mm)
 (ALARM VALUE : 4.33mm)
 (SLOW DOWN VALUE : 5.41mm)

NO. DESCRIPTION

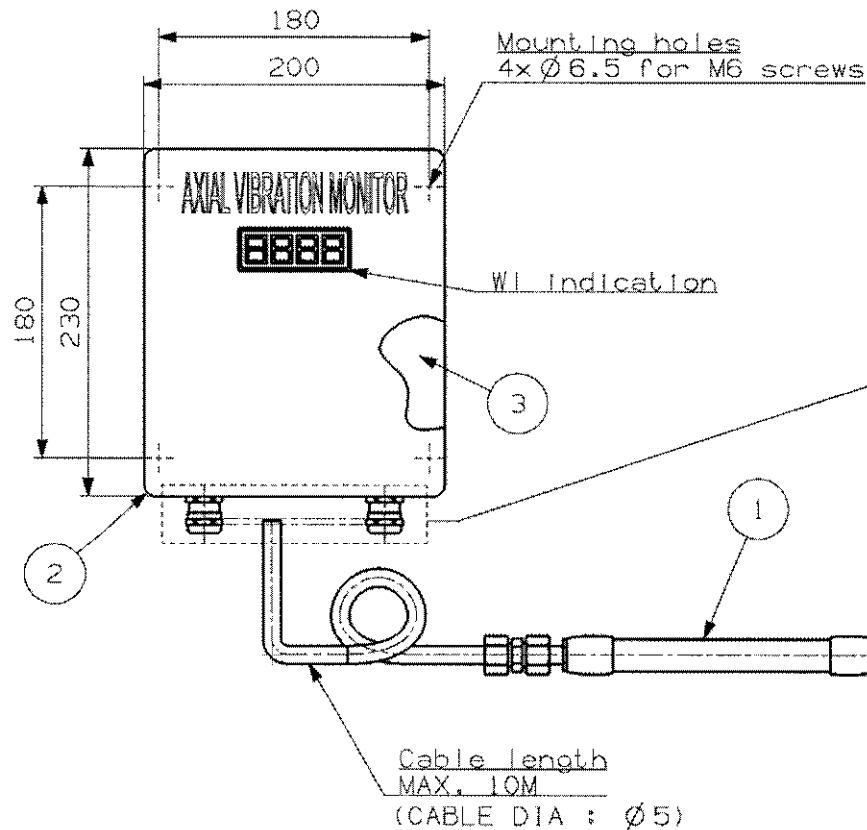
DWG. NO.

1	AXIAL VIBRATION MONITOR	A13-166014-3
2	AXI. VIBR. MONITOR CONTROL BOX	A13-166018-0
3	CONNECTION AND ADJUSTMENT	A14-166019-2
4	BLOCK DIAGRAM	A14-166017-9
5	ANALOG SENSOR (PROBE) BAW030-PF-1-K	A14-166015-5
6	SENSOR ASS'Y OF AX. VIBR. MONITOR	A14-166016-7

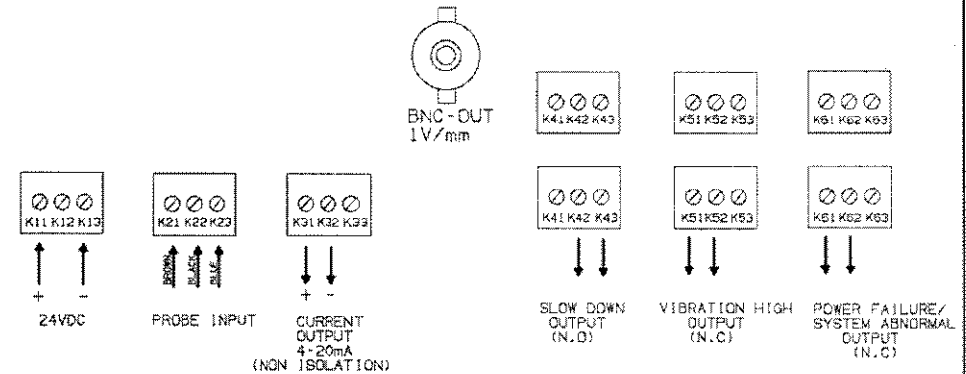
Date	Des.	Chk.	Appd.	A.C.	Replaced by Ident.no.:	Replacement for Ident.no.:	R
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20110217	BSH	BSH	JCM				O
Licensor Ident.no.:		Type:				6S90ME-C	
Info.no.:		Description:				Ident.no.:	
Page.no.:		Security:				A14-413506-5	
(02) 02		C				AXIAL VIBRATION MONITOR	

HYUNDAI
 HEAVY INDUSTRIES CO., LTD.

TERMINAL ON AVM-KM30-01



WARNING : BNC shield is connected to ground of power supply.(24V DC)
Connect only floating measuring equipment



No	Description	Material	Q'ty	Remarks
1	SENSOR ASS'Y		1	A14-166016-7
2	CASE	AL.	1	
3	PRINT CIRCUIT BOARD	EXPOXY	1	

Supplement Drawing no.1				Projection 		Scale (kg):		Material / Blank:		
				Licensee's Ident. no.1		Dist.1 A92		Licensee's Material / Blank:		
Date	Des.	Drk.	Appd.	A.C.	E	Change / Replacement				C.No
20101130	BSH	BSH	JCM			DWG. IS UPDATED,				5
20101124	BSH	BSH	JCM			DWG. IS UPDATED,				4
20081202	KYY	KYY	JCM			CADAM TO UG				3
20030526	LSK	KSY	KJG	*	*	DWG. CORRECTED,				2
20001215	KWS	KWS	KJG	*	*	DWG. CORRECTED,				1
19990510	BYJ	JCM	BHS	*	*					0

Standards for surface roughness													Tolerances for dimensions without tolerance indication (ISO 2768-1999)												
The basic symbols and class numbers are in accordance with ISO 1302-1978.													This standard shows the permissible deviations for dimension without direct tolerance indications on metallic components manufactured by machining.												
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	Permissible deviation	up to 3	over 3 up to 30	over 30 up to 120	over 120 up to 315	over 315 up to 1000	over 1000 up to 2500						
R _a max. value	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50	Medium series	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2						
This drawing is the property of MHI-ENG and is to be treated as confidential by the party to whom it has been supplied by MHI-ENG, and is not to be disclosed to third party, without the specific prior written permission of MHI-ENG.																									

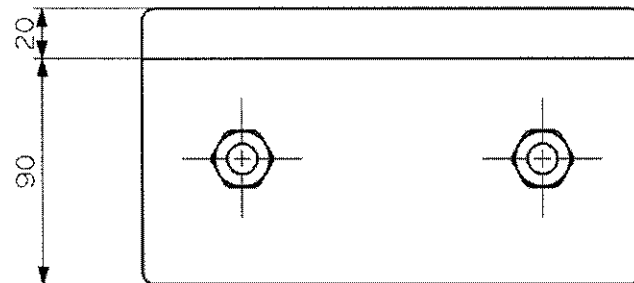
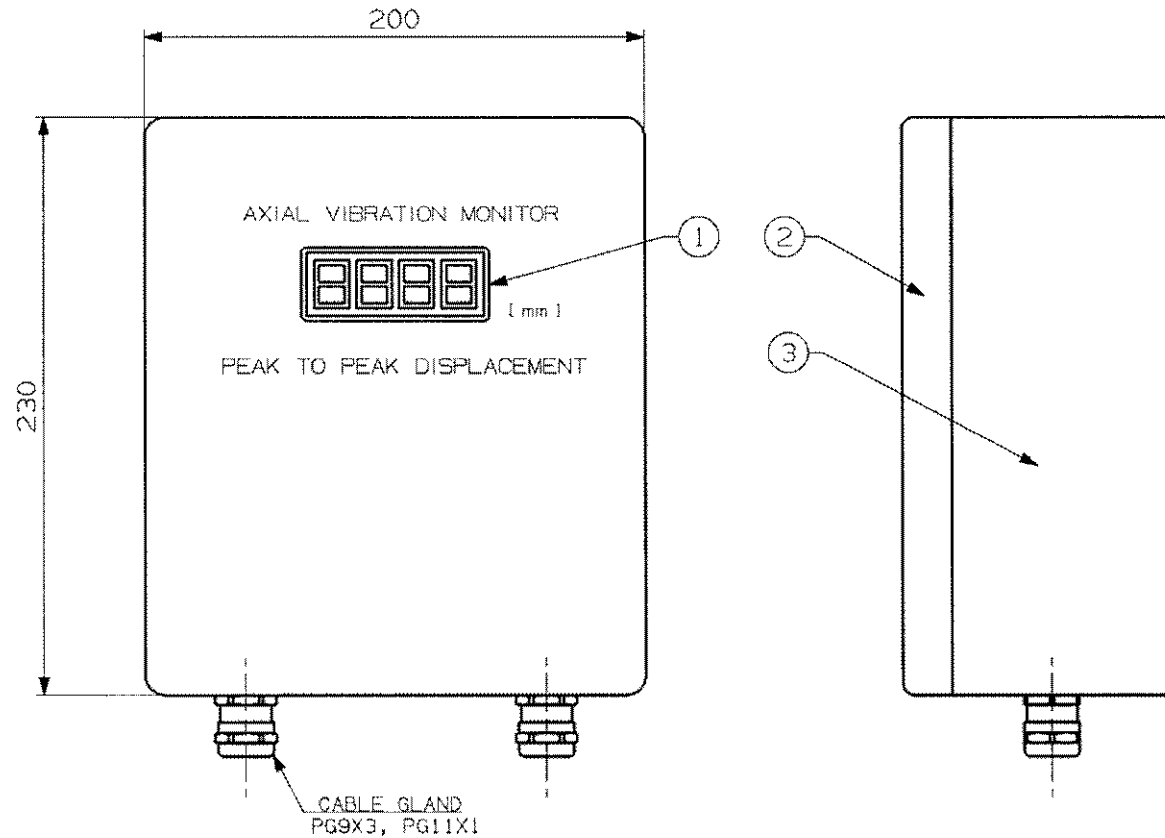
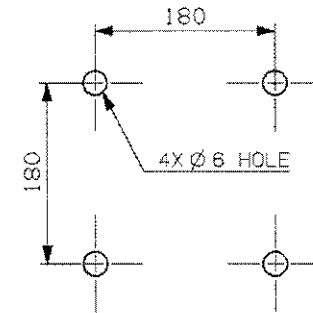
Scale: 1.5:1	Size: A3	Type: 50/60/70/80/90/98	Page No.: 01 (01)	HYUNDAI	
693300		AXIAL VIBRATION MONITOR		Ident. No.1	
				A13-166014-3	

No	Description	Material	Q'ty	Remarks
1	WINDOW	ACRYL	1	
2	COVER	AL-SI12	1	
3	BODY	AL-SI12	1	

Note

1. MAKER : KOMECO
2. TYPE : AVM-KM30-01
3. PROTECTION : IP65
4. PAINT COLOR : GREY

MOUNTING DIMENSION

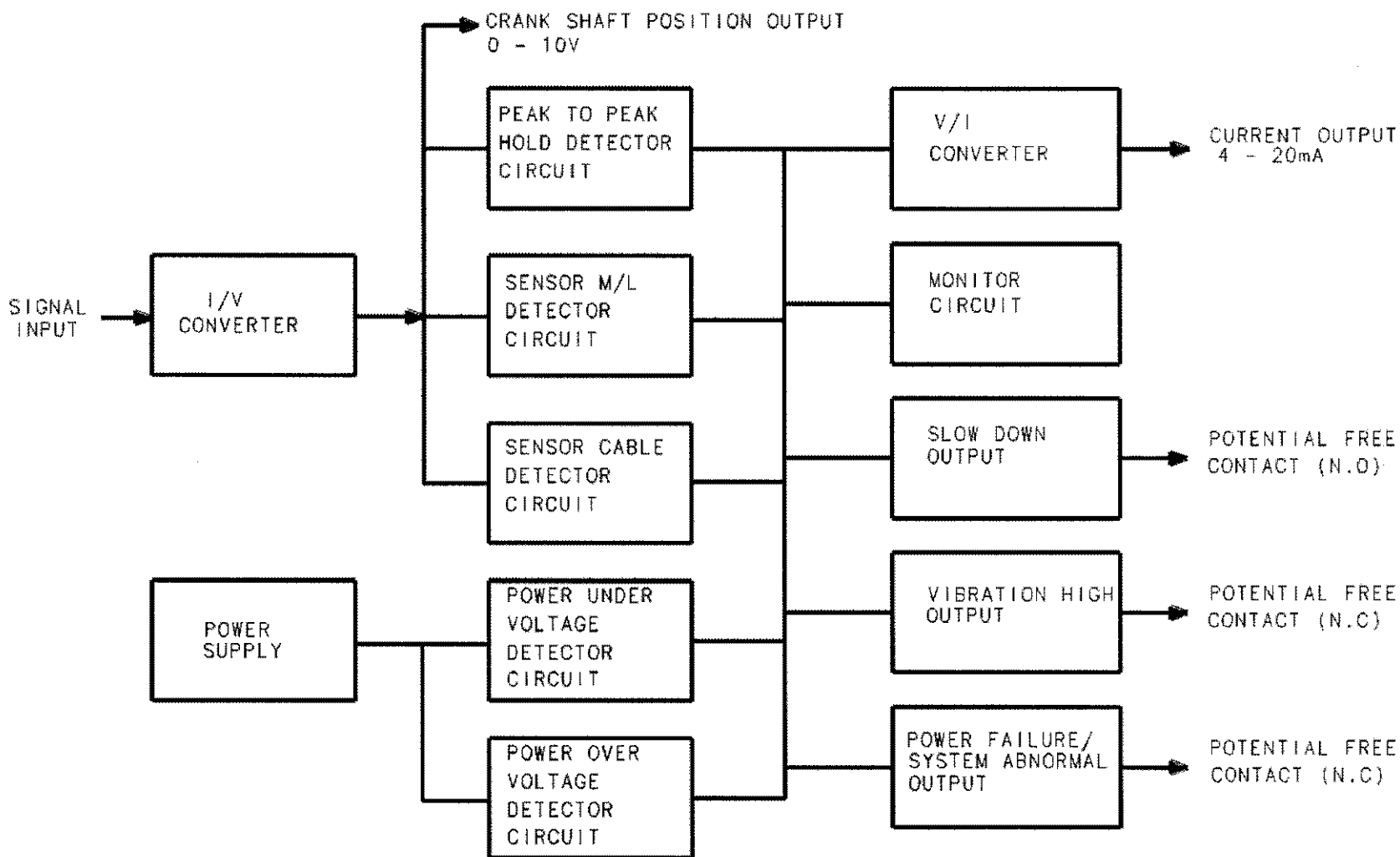


Standard for surface roughness													Tolerances for dimensions without tolerance indication (ISO 2768-1/2001)						
The basic symbols and class numbers are in accordance with ISO 1302-1978.													This standard states the permissible deviations for dimension without direct tolerance indication on metallic components manufactured by machining.						
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	Permissible deviation	0.5	over 0.5	over 30	over 120	over 315	over 1000
R _a max. value	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50	Medium series	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2
This drawing is the property of HHI-EMD and is to be treated as confidential by the party to whom it has been submitted by HHI-EMD, and is not to be disclosed to third party without the specific prior written permission of HHI-EMD																			

This drawing is the property of HUI-EMO and is to be treated as confidential by the party to whom it has been submitted by HUI-EMO, and is not to be disclosed to third party without the specific prior written permission of HUI-EMO.

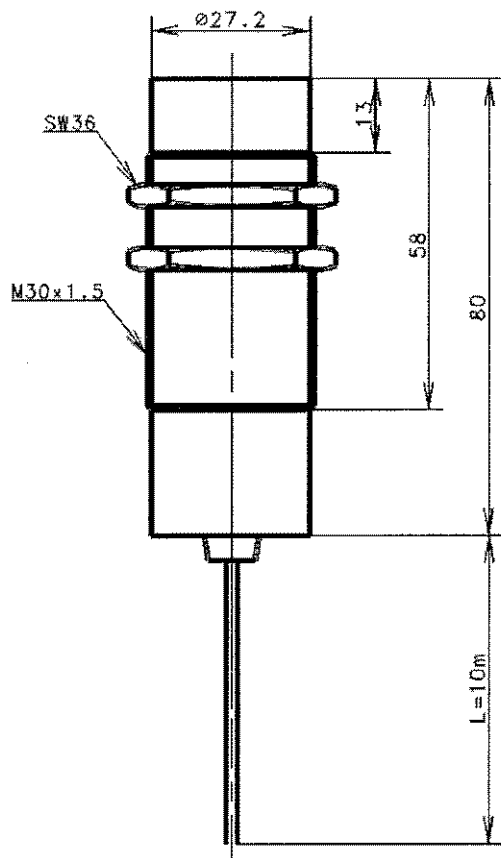
Supplement Drawing no.1				Projection		Mass (kg):		Material / Blank:		
										
				Licensee's Ident. no.1		Date:		Licensee's Material / Blank:		
						A92				
Date	Des.	Drk.	Appd.	A.E.	E	Change / Replacement				C.No
20101125	BSH	BHS	JCM			DWG. IS UPDATED.				5
20081202	KYY	KYY	JCM			CADAM TO UG				4
20030625	LSK	KSY	KJG	*	*	CABLE GLAND PG9(1EA) IS DELETED.				3
20030526	LSK	KSY	KJG	*	*	DWG. CORRECTED.				2
20001215	KWS	KWS	KJG	*	*	DWG. CORRECTED.				1
19990510	BYJ	JCM	BHS	*	*					0
Similar Dwg No.1				Replacement of 1				Replaced by:		
Scale:	5:1	Size:	A3	Type:	50/60/70/80/90/98		Page No.:	01 (01)		
Info. No.1				Description				Ident. No.1		
693300				AXIAL VIBRATION MONITOR CONTROL BOX				A13-166018-0		

Ident.no.:

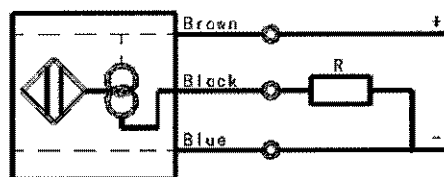


Date	Des.	Chg.	Appd.	A/C	Replaced by Ident. no.:
101129	BSH	BSH	JCM	*	DWG. IS UPDATED.
030526	LSK	KSY	KJG	*	DWG. CORRECTED.
001215	KWS	KWS	KJG	*	DWG. CORRECTED.
990510	BYI	NCM	BHS	*	Replacement for Ident. no.:
Licensor Ident. no.:					

Info. no.: 693300
 Type: 50/60/70/80/90 & K98MC/ME/-C
 Ident. no.: A14-166017-9

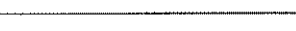


OUTPUT CIRCUIT



SPECIFICATION

1. MAKER : BALLUFF
2. TYPE : BAW 030-PF-1-K
3. MAX. SENSING DISTANCE : 3~15mm
4. LINEARITY : from 4.5~12mm
5. AMBIENT TEMPERATURE: -10°C to +60°C
6. OUTPUT SIGNAL : PNP analog
Current drops at approach
7. REPEAT ACCURACY : ≤0.02mm
8. SUPPLY VOLTAGE : 10~30VDC
9. RIPPLE : ≤10% Peak to Peak
10. HOUSING MATERIAL : Nickel Plated Brass
11. PROTECTION : IP67
12. CABLE : 3X0.34mm²(φ5)
POLY-URETHANE FLEX. CABLE

Date	Des.	Chk.	Appd.	A.C	Replaced by Ident.no.:	
				*		R
				*		5
				*		4
101129	BSH	BSH	JCM	*	ENGINE TYPE IS UPDATED.	3
030526	LSK	KSJ	KJG	*	UP TO DATE	2
001215	KWS	KWS	KJG	*	DWG. CORRECTED.	1
990510	BYJ	JCM	BHS	*	Replacement for Ident.no.:	0
Licensor Ident.no.:				Type:		
Info.no.:				50/60/70/80/90 & K98MC/ME/-C		
Page.no.:				Description:		
01 OF 01				ANALOG SENSOR (PROBE) (BAW030-PF-1-K)		
Ident.no.:						A14-166015-5

Technical drawing of a mechanical assembly, likely a valve or actuator, showing a side view and a detailed view of the top/bottom flange.

Dimensions:

- Overall length: 300
- Flange thickness: 50
- Flange outer diameter: 99
- Flange inner diameter: 53
- Flange hole diameter: 35
- Flange hole offset: 10
- Flange hole diameter (detail): 20
- Flange hole offset (detail): 8
- Flange hole diameter (detail): 40
- Flange hole offset (detail): 20

Callouts:

- 1: Top/bottom flange
- 2: Side view of the flange
- 3: Side view of the flange
- 4: Side view of the flange
- 5: Side view of the flange
- 6: Detail view of the flange
- 7: Detail view of the flange

Notes:

- To be secured by Locktite.
- PF 3/8
- Viewed from P

NO.	PART NAME	MATERIAL	DIMENSION	Q'TY	REMARK
1	SENSOR	NICKEL PLATED BRASS	M30x1.5	1	BAW030 -PF-1-K
2	HOUSING	SS40 (NI-Cr)	50x53x40	1	
3	CONNECTOR	SS41 (NI-Cr)	PF 3/8	1	
4	HOSE	SYNTHETIC RUBBER	Ø 15	0.2m	
5	CONNECTOR	SS41 (NI-Cr)	PF 3/8	1	
6	HEXAGON NUT	8	M8	2	
7	STD. SCREW	8.8	M8		REMARK

[illegible]

					S. PAGE	T. PAGE
PLAN HISTORY				ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2	
				MESSRS.	H.H.I.	
				RULE	LR + UMS	
				SHIP NO.	2585/86/87/88/89	
				ENG. NO.	AA4624/25/26/27/28	
TITLE : CYL. LINER TEMPERATURE SENSOR						
Date	Des.	CHK.	Appd.	A.C	Replaced by Ident.no.:	Replacement for Ident.no.:
20110718	BSH	BSH	JCM		FOR WORKING.	
20110217	BSH	BSH	JCM			
Licensor Ident.no.:				Type:		
Info.no.:				Description:		
Page.no.:		Security:		Ident.no.:		
(01) 01		C		CYL. LINER TEMPERATURE SENSOR		
				6S90ME-C		
						A14-415943-7

MESSRS : HYUNDAI HEAVY INDUSTRIES CO.,LTD.
 ENG.TYPE : 6S90ME-C8.2
 SHIP NO : 2484/85/86/87/88
 ITEM : THERMOCOUPLE FOR CYLINDER LINER

PLAN HISTORY

TOTAL 7 SHEET WITH COVER

△						
△						
△						
△						
△						
△						
△	2011.03.16	FOR APPROVAL	Y.H.CHO	Y.H.CHO		Y.H.CHO
REV.	DATE	DESCRIPTION	DWG.	CHECK	CHECK	APP.

 **HERIANA CO.,LTD.**

#583-23,HWAJEON-DONG, GANGSEO-GU,
 PUSAN, KOREA 618-280
 Tel. (051)313-6690-1 Fax. (051)313-6693

SHEET NO.	1/7
DWG.NO.	HA11-A60-CYT0593

CONTENS LIST

ENG'TYPE: 6S90ME-C8.2

NO	NAME	TYPE & SPEC.	Q'TY	DWG.NO.
1	NO.1 CYL.LINER TEMP. (FUEL PUMP,EXHAUST SIDE)	HT201KS1746.5	2	H-T040301
2	NO.2 CYL.LINER TEMP. (FUEL PUMP,EXHAUST SIDE)	HT201KS1746.5	2	H-T040301
3	NO.3 CYL.LINER TEMP. (FUEL PUMP,EXHAUST SIDE)	HT201KS1746.5	2	H-T040301
4	NO.4 CYL.LINER TEMP. (FUEL PUMP,EXHAUST SIDE)	HT201KS1746.5	2	H-T040301
5	NO.5 CYL.LINER TEMP. (FUEL PUMP,EXHAUST SIDE)	HT201KS1746.5	2	H-T040301
6	NO.6 CYL.LINER TEMP. (FUEL PUMP,EXHAUST SIDE)	HT201KS1746.5	2	H-T040301
7	CONNECTION BOX	120x120x90	6ST	H-T04034
8	AMPLIFIER	HT201-KA1(0-300°C)	12	H-T040303
9	NAME PLATE	75x25x1.0t(BRASS)	12	H-T040304
10	SPARE PART LIST	-	1LOT	-
11				
12				
13				
14				
15				
16				
17				

 **HERIANA CO.,LTD.**

SHEET NO.

2/7

SPECIFICATION TABLE FOR CYL.LINER TEMP.

ENG.TYPE : 6S90ME-C8.2

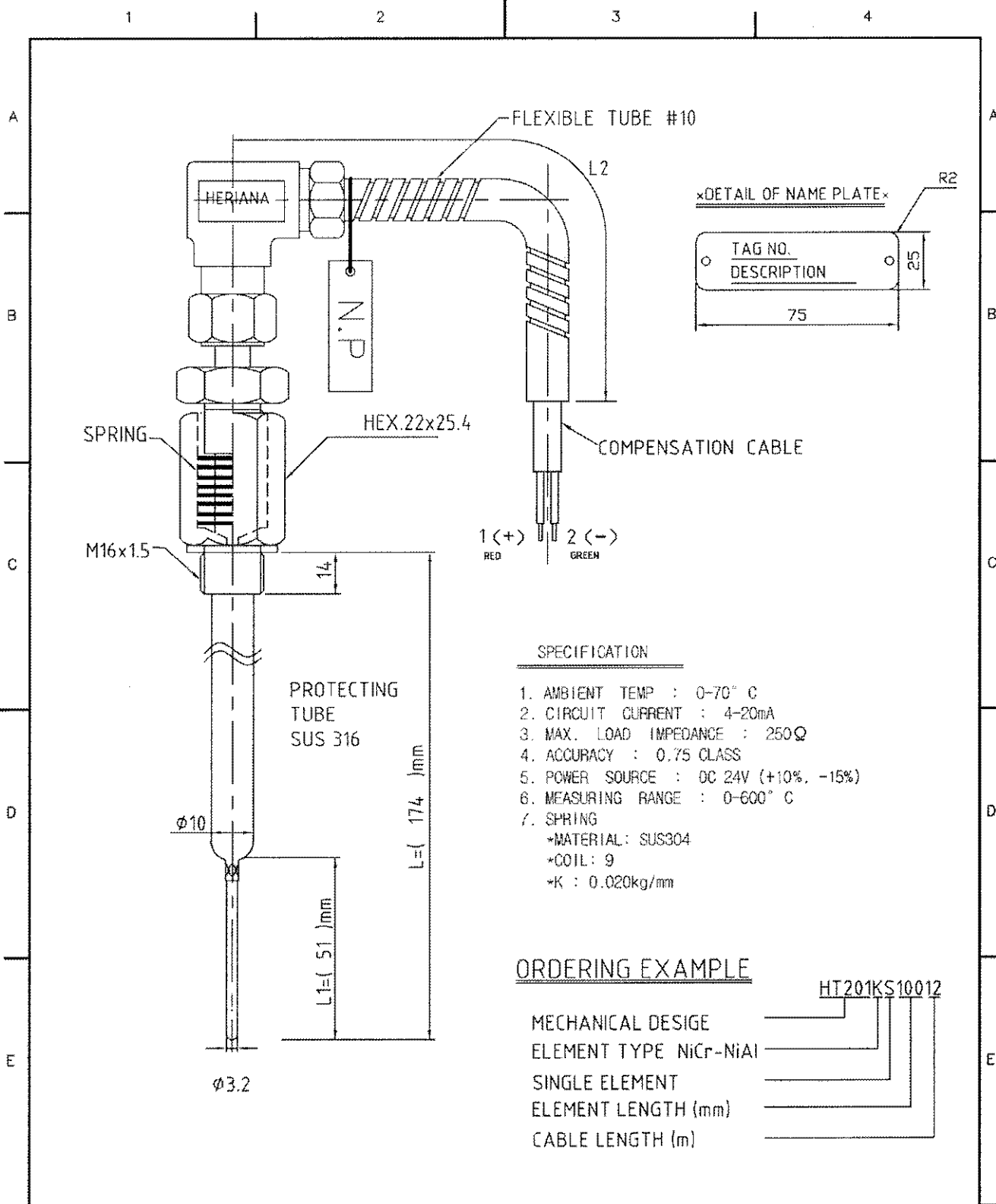
THERMOCOUPLE TYPE K (1/1)

NO	TAG NO.	AMS CH. NO.	DESCRIPTION	SPECIFICATION								
				CYLLINER SENSOR						AMPLIFIER		
				TYPE	MEASURING RANGE (°C)	L (mm)	L1 (mm)	L2(m) COMP. CABLE LENGTH	DWG. NO.	TYPE	MEASURING RANGE (°C)	DWG. NO.
1	TC8901F-01AH		NO.1 CYL.LINER TEMP(FUEL PUMP SIDE)	HT201KS174	0 ~600	174	51	6.5	H-T040301	HT201-KA1	0 ~300	H-T040303
2	TC8901E-01AH		NO.1 CYL.LINER TEMP(EXHAUST SIDE)	HT201KS174	0 ~600	174	51	6.5	H-T040301	HT201-KA1	0 ~300	H-T040303
3	TC8901F-02AH		NO.2 CYL.LINER TEMP(FUEL PUMP SIDE)	HT201KS174	0 ~600	174	51	6.5	H-T040301	HT201-KA1	0 ~300	H-T040303
4	TC8901E-02AH		NO.2 CYL.LINER TEMP(EXHAUST SIDE)	HT201KS174	0 ~600	174	51	6.5	H-T040301	HT201-KA1	0 ~300	H-T040303
5	TC8901F-03AH		NO.3 CYL.LINER TEMP(FUEL PUMP SIDE)	HT201KS174	0 ~600	174	51	6.5	H-T040301	HT201-KA1	0 ~300	H-T040303
6	TC8901E-03AH		NO.3 CYL.LINER TEMP(EXHAUST SIDE)	HT201KS174	0 ~600	174	51	6.5	H-T040301	HT201-KA1	0 ~300	H-T040303
7	TC8901F-04AH		NO.4 CYL.LINER TEMP(FUEL PUMP SIDE)	HT201KS174	0 ~600	174	51	6.5	H-T040301	HT201-KA1	0 ~300	H-T040303
8	TC8901E-04AH		NO.4 CYL.LINER TEMP(EXHAUST SIDE)	HT201KS174	0 ~600	174	51	6.5	H-T040301	HT201-KA1	0 ~300	H-T040303
9	TC8901F-05AH		NO.5 CYL.LINER TEMP(FUEL PUMP SIDE)	HT201KS174	0 ~600	174	51	6.5	H-T040301	HT201-KA1	0 ~300	H-T040303
10	TC8901E-05AH		NO.5 CYL.LINER TEMP(EXHAUST SIDE)	HT201KS174	0 ~600	174	51	6.5	H-T040301	HT201-KA1	0 ~300	H-T040303
11	TC8901F-06AH		NO.6 CYL.LINER TEMP(FUEL PUMP SIDE)	HT201KS174	0 ~600	174	51	6.5	H-T040301	HT201-KA1	0 ~300	H-T040303
12	TC8901E-06AH		NO.6 CYL.LINER TEMP(EXHAUST SIDE)	HT201KS174	0 ~600	174	51	6.5	H-T040301	HT201-KA1	0 ~300	H-T040303
13												
14												
15												
16												

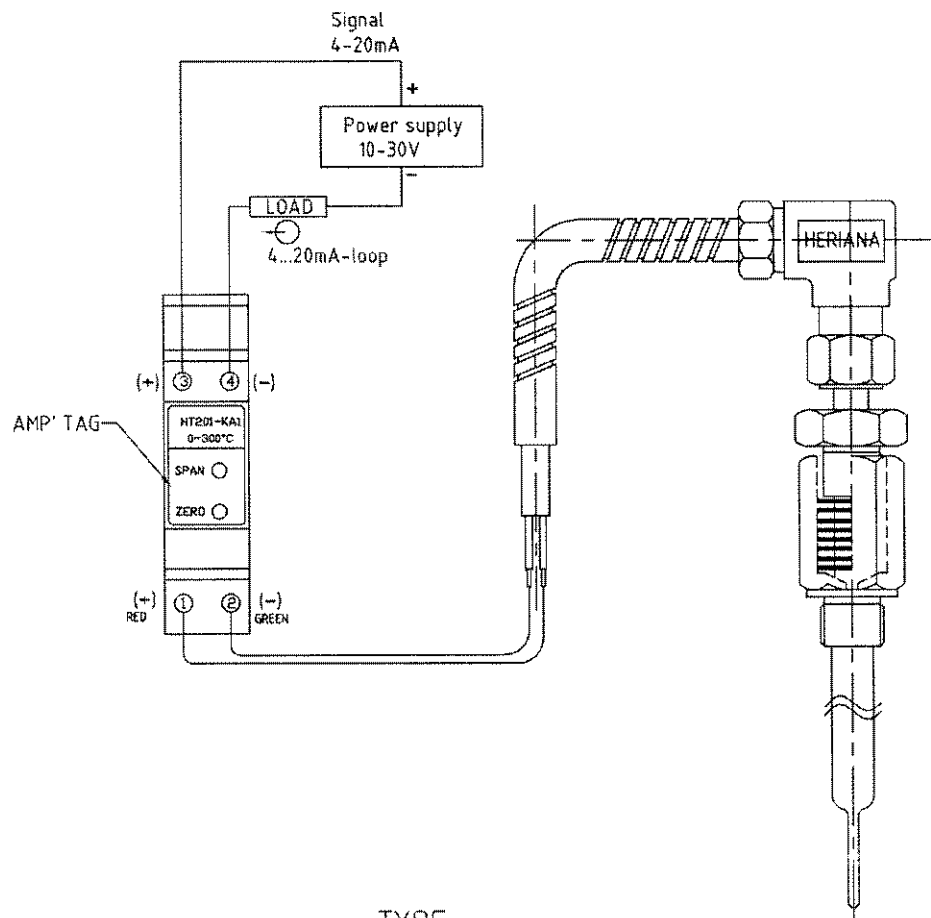
 HERIANA CO.,LTD.

SHEET NO.

3/7

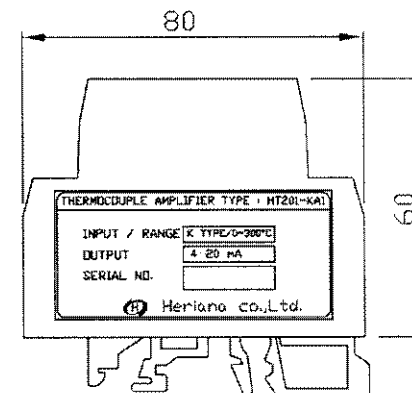


UNITS	mm	TITLE : TEMPERATURE SENSOR FOR CYLINDER LINER TYPE : HT201K	APPROVED	Y.H.CHO
SCALE	A4 N/S		CHECKED	Y.H.CHO
EDITION	0		DRAWN	K.J.KIM
MODEL	-		DATE	2011.03.16
DWG No.	H-T040301		SHEET No.	4/7



TYPE

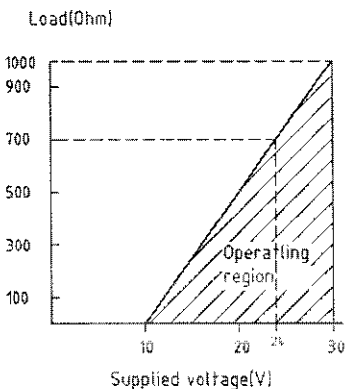
NO	Standard types	Element type	Range
1	HT201-KA1	K NiCr-NiAl	0-300°C
2	HT201-KA1	K NiCr-NiAl	0-600°C



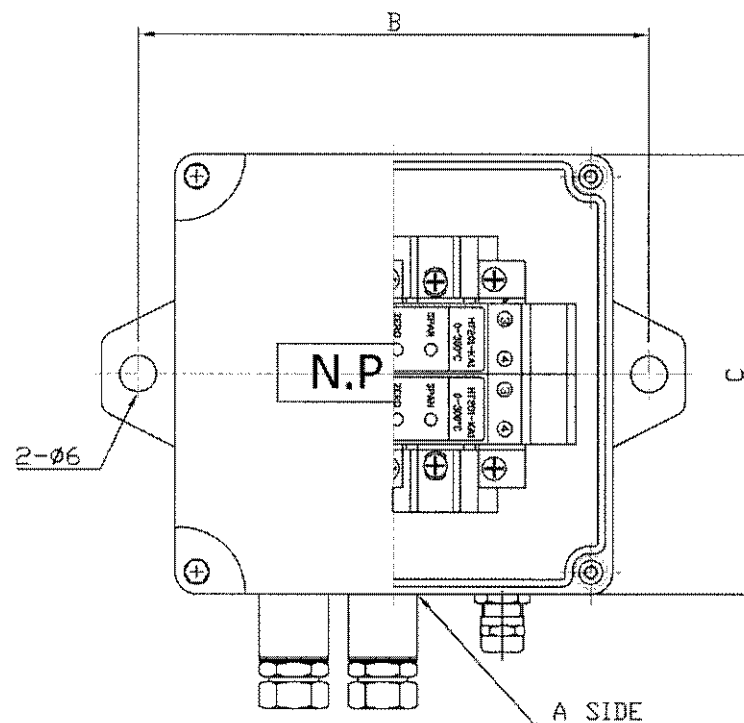
THERMOCOUPLE AMPLIFIER

AMP' SPECIFICATION

AMBIENT TEMP. : 0~70°C
 CONSUMP. CURRENT : 4~20mA
 CIRCUIT CURRENT : 4~20mA
 MAX. LOAD IMPEDANCE : 250Ω
 ACCURACY : ±1.0%
 SOURCE : DC24V (+10% , -15%)
 COLOR : RAL 6018
 MEASURING RANGE : 0~300°C

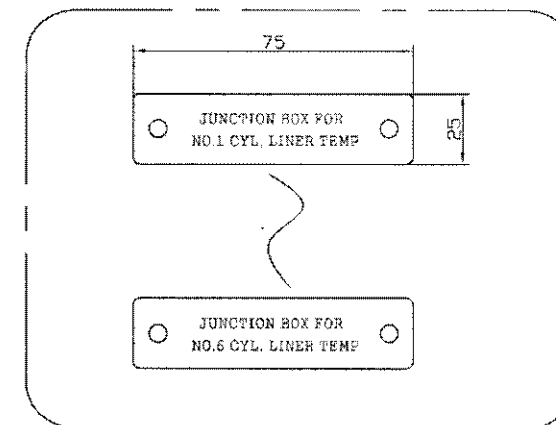


UNITS	mm	TITLE : THERMOCOUPLE AMPLIFIER HT201-KA1	APPROVED	Y.H.CHO
SCALE	A3 N/S		CHECKED	Y.H.CHO
EDITION	0		DRAWN	K.J.KIM
MODEL	HT201-KA1		DATE	2011.03.16
DWG No.	H-T040303		SHEET No.	5/7

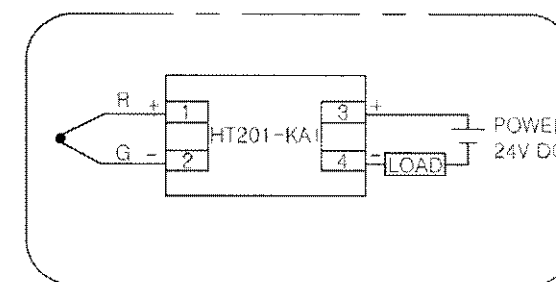


BOX NAME	AMP.Q'TY	DIMENSION			A SIDE (CABLE GLAND)	
		B	C	D	PG9	FLEX #10
CONNECTION BOX	2	143	120	95	1	2

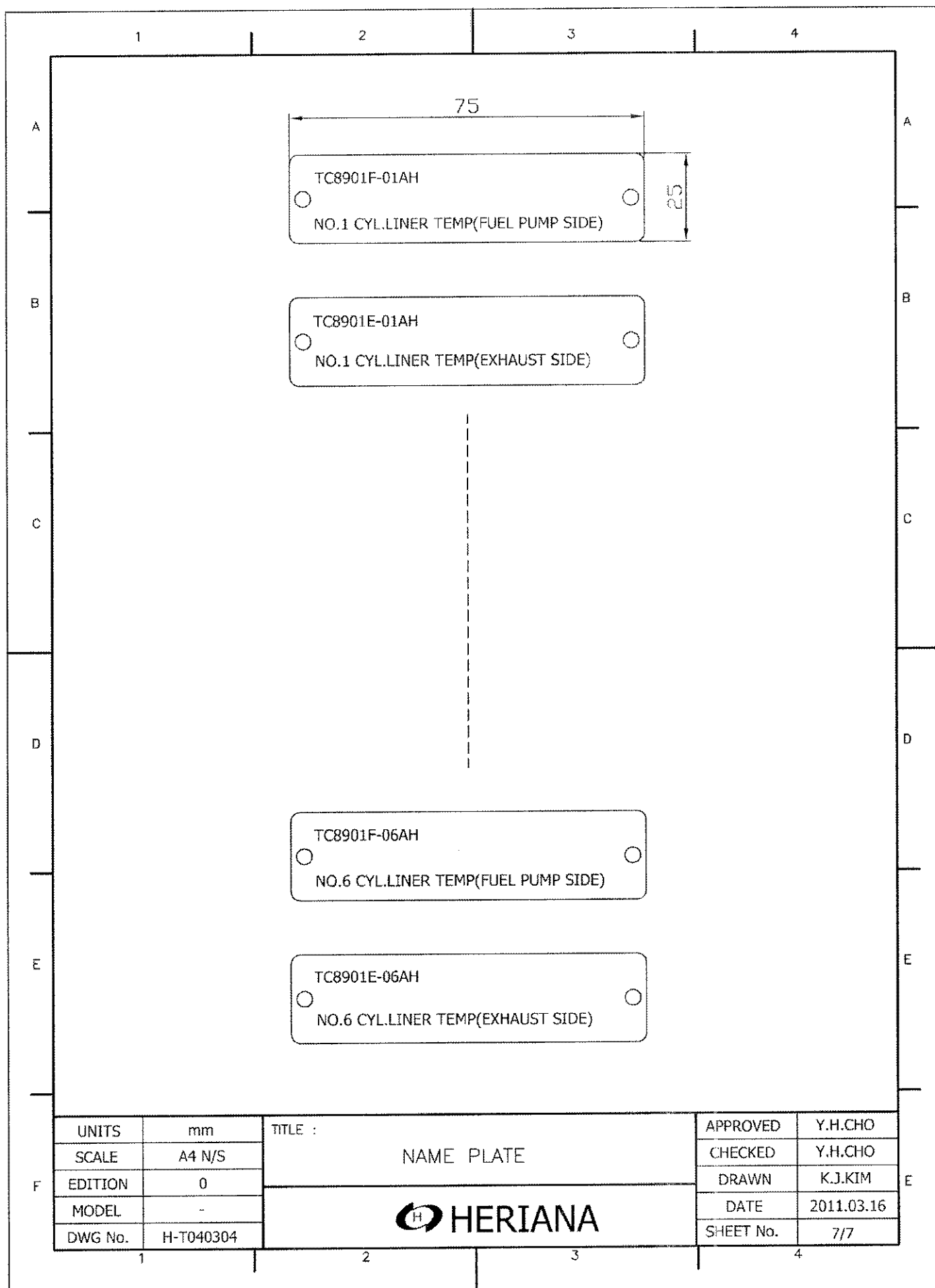
NAME PLATE(N.P)



AMPLIFIER DIAGRAM



UNITS	mm	TITLE : CONNECTION BOX (WITH AMPLIFIER)	APPROVED	Y.H.CHO
SCALE	A3 N/S		CHECKED	Y.H.CHO
EDITION	mm		DRAWN	K.J.KIM
MODEL	-	HERIANA	DATE	2011.03.16
DWG No.	H-T040304		SHEET No.	6/7



Cylinder Liner Temperature Sensor Alarm Value Setting

Please refer to the next page the technical information in English version, the following explanation in Korean is only for AMS(ICMS) maker in Korea.

1. 엔진 90% load 이전 초기 default setting 은 다음과 같이 설정바랍니다.

Default Tmax = 160 도

Default Δ Tmaxdev = 20 도

2. 엔진 90% load에서 각 실린더의 평균값(Tavg)을 측정하여 다음과 같이 Tmax 값을 재 설정합니다.

$T_{max} = T_{avg} + 15\text{도}$

예) 각 실린더의 평균값 Tavg=145도 이면, Tmax=160도 입니다.

3. Tmax 값 설정 후, 90% load 이상의 운전구간에서 상기 설정한 Tmax 값의 5도 이내의 값이 측정되거나 Tmax 값 이상의 값이 측정된 경우, 측정된 값(Tmes)에 +5도를 더한 값을 Tmax 로 재 설정합니다.

예) Tmax = 160도로 setting되어 있고, 90% load 이상의 운전구간에서 측정된 값 Tmes = 158도 이면, Tmax와의 차이가 3도 이내에 있음으로,

$T_{max} = 158 + 5 = 163\text{도}$ 가 되며, Tmax 값을 163도로 재 설정해 주어야 됩니다.

Setting 방법관련 보다 상세한 설명은 유점의 Technical information letter 3page 를 참조하시기 바랍니다.

Cylinder liner temp. Alarm 발생시 조치할 사항

1. Increase of lubrication feed rate to 1.2 g/kWh

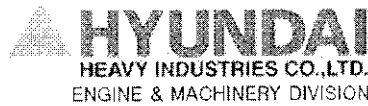
2. Reduction of load and Pmax by 15-25%

Alarm 발생시 조치할 사항관련, 상세 사항에 대하여서는 유점의 Technical information letter 4page 를 참조하시기 바랍니다.

Slowdown setting value

Generally, the slowdown setting value is +5 (degree) higher than the alarm setting value.

For example) "Alarm setting = 158, then Slowdown setting value is 163 degree."



HEAD OFFICE: 1, CHONGDAE-DONG, LUNGMUN-GU, SEOUL, KOREA TEL: +82 52 2100-2111 FAX: +82 52 2100-2100 TEL: +81 3 4301-6000 FAX: +81 3 4301-6000
SEOUL OFFICE: 140-2, GYE-DONG, JONGRO-GU, SEOUL, KOREA TEL: +82 2 1741-1301 FAX: +82 2 1741-1301 CABLE: HHIAPD SEOUL
LONDON TEL: +44 181 592 1720 NEW JERSEY TEL: +1 201 592 1720 TOKYO TEL: +81 3 6510-9511

TECHNICAL INFORMATION

Date : 2009. 03. 27.
Our Ref. : HHI-TI-0128
Tel. : +82 52 202-7327~9
Fax. : +82 52 202-7692

To whom it may concern.

Subject: **LWM system as an optional application**

(For all Hyundai-MAN B&W 2-stroke engines)

Dear Sirs,

We have a pleasure in sending Technical Information Letter, ref. HHI-TI-0128 attached herewith.

Questions or comments relating to this Technical Information Letter should be directed to our 2-Stroke Engine Design Dept.

Best regards,

J. R. Son / General Manger

Two-Stroke Engine Design Dept

DOC. NO. : HHI-TI-0128

 27th March 2009

Engine Type :

**All HYUNDAI-MAN B&W
 2-stroke Engines**

PAGE 1 OF 1

SUBJECT: Liner Wall Monitoring (LWM) system as an optional application

MAN Diesel SE recently informed us that they intend to specify the subjected monitoring systems, Liner Wall Monitoring (LWM) system as their formal standard for K80ME-C9, K/S90-98MC/ME/MC-C/ME-C engine types (regardless of Mk No.) on the new vessels with contracts signed after 1 April 2009.

However, we, HHI decided to introduce the LWM system as an optional application for all HYUNDAI-MAN B&W 2-stroke engines as we have done so far due to the fact that the customers should have flexibility to choice the monitoring system, the LWM can be also applied for WÄRTSILÄ 2-stroke engines and there are several suppliers available for the systems in the market.

Thus, aforementioned monitoring system, LWM can be provided **as an option** on the customer's request. That is, HHI's basic offer for the main 2-stroke engines will **not** include the LWM.

Anyway, the scope of supply for the LWM will be in accordance with our Doc. K2109/HHJ/0308-07(2009-03-08) in case that the LWM as an optional application is agreed to be supplied by HHI.

The shipyards are, therefore, should confirm whether the customers want to adopt the LWM system for their specific projects when the new vessels are negotiated.

The setting parameters specified in this Technical Information for the safety automation are prevailing against all those specified in the documents previously issued for the LWM or whatsoever as name of Cylinder Liner Wall Temperature Monitoring System.

Enclosure: 1. A14-360105-6(rev.0), LWM (Liner Wall Monitoring) system.

2. Doc. K2109/HHJ/0308-07(2009-03-08).

TWO-STROKE ENGINE DESIGN DEP'T

☎ +82 52 202-7327~9, FAX: +82 52 202-7692, E-mail: k210hhi@hhi.co.kr

Info No. 000000		LWM (LINER WALL MONITORING) SYSTEM				Ident. No. A14-360105-6	
Scale: NONE	Size A4	Type All HYUNDAI-MAN B&W 2-stroke Engines				Page No. 1 (5)	
Similar Ident. No.:		Replacement for Ident.No.:			Licensor Ident. No.:		
Date	Des.	Chk.	Appd.	A.C.	Change / Replacement	C.No.	
				*		5	
				*		4	
				*		3	
				*		2	
				*		1	
2009-03-21	HJS	HJS	SJR	*	Based on MD's document, 2009.01.07 / Jens Bagge LDD3	0	
Suppl. Ident. No.:							

1. INTRODUCTION

During the past few years a number of scuffing incidents have been reported on our large-bore engines. Several initiatives have improved the margin against cylinder liner lubrication oil film break down and consequential scuffing of the cylinder liner and piston rings. To improve the situation even further and to increase and optimize the influence of the ship operators and crews, a LWM (Liner Wall Monitoring) system can be applied as an option for all HYUNDAI-MAN B&W 2-stroke engines.

2. APPLICATIONS

This document is valid for all HYUNDAI-MAN B&W 2-stroke engines.

3. FUNCTIONALITY OF LWM

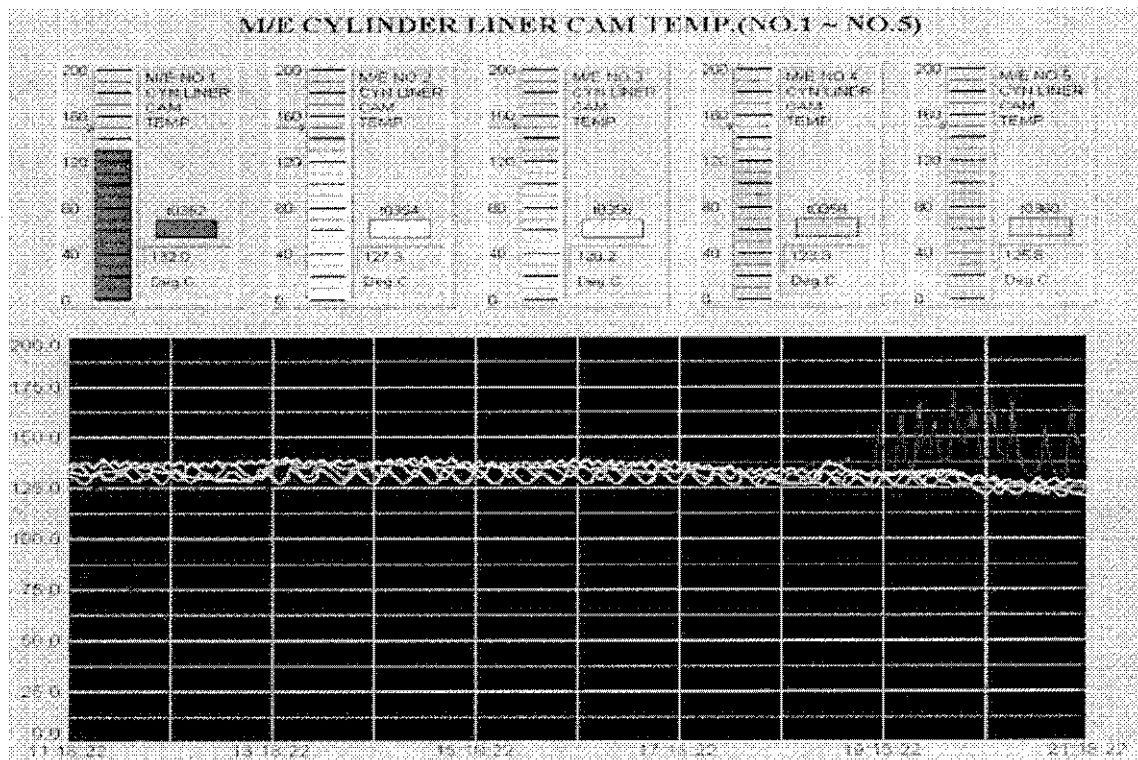
The LWM system includes two sensors placed in the manoeuvring and the exhaust sides of the liners, approximately by the piston skirt TDC position. The sensors are interfaced to the ship alarm system, which monitors the liner temperature. The system is also available as retrofit for engines already in service. Concerning the set default values, we emphasize that optimization during sea trial, and most likely also during service, is considered necessary as each engine and even each unit, in general, will have significant variations in liner temperature levels.

The LWM system is to be regarded as a tool providing the engine room crew with the possibility to react with appropriate countermeasures, in case the oil film is indicating early signs of breakdown. Signs of oil film breakdown in a specific liner will appear by way of increased and fluctuating temperatures. Comparison with a pre-set value of an absolute maximum allowable temperature, and with a maximum allowed deviation from a calculated average of all sensors, will enable the alarm system to assist the crew in the recognition phase.

Optimization for each individual engine is carried out by monitoring the temperature level of each sensor during normal service conditions and adjusting the set values accordingly.

Info No. 000000		LWM (LINER WALL MONITORING) SYSTEM				Ident. No. A14-360105-6	
Scale: NONE	Size A4	Type All HYUNDAI-MAN B&W 2-stroke Engines				Page No. 2 (5)	
Date 2009-03-21	Des. HJS	Chk. HJS	Appd. SJR	A.C. *	Change / Replacement Based on MD's document, 2009.01.07 / Jens Bagge LDD3		C.No. 0

The objective is to avoid too many false alarms while ensuring that any possible deterioration is detected. The illustration below gives an example of a negative liner temperature development on a large-bore engine at relatively high load. The cam side sensors for cylinder unit No. 1 to 5 are represented, and unit No. 1 is clearly seen to be exposed to instability, which is revealed by the increased temperature level and large temperature variation. The maximum temperature limit has been set at 150°C, which would have led to an alarm approx. 30 minutes after the first signs of instability were detected.



To ensure knowledge from earlier temperature developments, we recommend that data from the LWM system is logged on a PC for no less than one week, and preferably for the duration of a round trip. Our general recommendation when detecting irregularities as described above is, as early as possible for the unit in question to increase the cylinder oil feed rate to 1.2 g/kWh or a certain level with taking into consideration of lubricator type and irregularities on liner wall temperature, and reduce the load and Pmax by 15-25%, until stable conditions have been re-established, followed by a slow reversion to the standard settings

Info No. 000000		LWM (LINER WALL MONITORING) SYSTEM				Ident. No. A14-360105-6	
Scale: NONE	Size A4	Type All HYUNDAI-MAN B&W 2-stroke Engines				Page No. 3 (5)	
Date 2009-03-21	Des. HJS	Chk. HJS	Appd. SJR	A.C. *	Change / Replacement Based on MD's document, 2009.01.07 / Jens Bagge LDD3		C.No. 0

4. ADJUSTMENT AND OPTIMIZATION OF LWM SYSTEM PARAMETERS

The purpose of the LWM system is to supply the engine room crew with a tool enabling them to recognize instability of liner running surface temperatures. Such instability could be indicating oil film break down between liner and piston rings. Even without knowing the reason for oil film break down, early and appropriate action can re-stabilize the situation. An early and reliable warning is thus of decisive importance. The key-word in optimal adjustment and use of the system is sensitivity. The crew confidence in the system will improve if the alarm is triggered when necessary and is not causing too many false alarms. The following will explain how to adjust and optimize this "semi-automatic" warning system.

5. SHOP TRIAL

The system is not required active during shop trial.

6. SEA TRIAL (initial setting and adjustment of system / commissioning)

During the initial hours of the sea trial, before reaching high engine loads, it should be confirmed that the system is active and that the two parameters Tmax (absolute temperature alarm limit) and ΔT_{maxdev} (maximum allowed deviation of one single sensor from average of all sensors) is set to the following default values:

Default Tmax = 160°C

Default ΔT_{maxdev} = 20°C

When high engine load is obtained the first time, the system monitoring device must be engaged to display the liner wall temperature development. At 90% load during stable temperature conditions, Tmax should be set approx. 15°C higher than the average of all sensors.

At full load and stable conditions, it should be checked that none of the sensors are interfering with the set Tmax value. If the margin to the highest temperature reported by any sensor is less than 5°C, Tmax should be adjusted accordingly.

Info No. 000000		LWM (LINER WALL MONITORING) SYSTEM				Ident. No. A14-360105-6	
Scale: NONE	Size A4	Type All HYUNDAI-MAN B&W 2-stroke Engines				Page No. 4 (5)	
Date 2009-03-21	Des. HJS	Chk. HJS	Appd. SJR	A.C. -	Change / Replacement Based on MD's document, 2009.01.07 / Jens Bagge LDD3		C.No. 0

7. SERVICE (optimization of system)

During normal service load, around 85%, both Tmax and ΔT_{maxdev} should be ensured not to cause false alarms. False alarms will occur if the parameters are set too low. On the other hand it must be assured that both parameters are adjusted and set as close to the temperature band of all sensors as possible to ensure fair sensibility. ΔT_{maxdev} must be limited to the smallest possible value without causing false alarms at high loads. This will call for a sooner reaction in case of abnormal temperature deviations at part loads.

The parameter Tcutout is defining the lower temperature value for the active range of the system. To restrict the active range of the LWM system, Tcutout is to be increased.

Default Tcutout = 100°C

8. COUNTERMEASURES (in case the alarm is triggered)

If the temperature development of one or both sensors of a single unit is clearly indicating an unstable situation, i.e. development of scuffing (seen by persistent temperature deterioration and different behaviour in relation to the remaining engine), the following actions must be taken on the topic unit:

Increase of lubrication feed rate to 1.2 g/kWh

Reduction of load and Pmax by 15-25%

When stable conditions are re-established, standard settings must be resumed slowly and gradually. The situation is considered stable if no new alarms have occurred after 24 hours and if both sensors are fluctuating within approx. $\pm 5^\circ\text{C}$. Returning to normal cylinder oil feed rate setting must be adjusted by small step-downs of approx. 0.1g/kWh / 2-3 days, provided the temperature is not again starting to increase and fluctuate. Load and Pmax increase should be adjusted in steps following the cylinder oil feed rate reduction so that standard settings are obtained simultaneously for all three parameters.

The slow pace back to standard is essential to allow recovery of the seized parts (rings and liner) which is a slow process.

Info No. 000000		LWM (LINER WALL MONITORING) SYSTEM			Ident. No. A14-360105-6	
Scale: NONE	Size A4	Type All HYUNDAI-MAN B&W 2-stroke Engines			Page No. 5 (5)	
Date 2009-03-21	Des. HJS	Chk. HJS	Appd. SJR	A.C. *	Change / Replacement Based on MD's document, 2009.01.07 / Jens Bagge LDD3	C.No. 0

Should light instability reappear during the process of re-establishing standard settings for feed rate, load and Pmax, the settings must be adjusted to the last experienced stable level and the situation be carefully monitored. If the alarm is triggered during the attempt to return to standard settings the situation is regarded a new case of potential scuffing and the above mentioned counter measures must be resumed.

NOTE:

After long/extended periods of constant (low) load operation, light instability must be expected when changing (increasing) the load, due to the changed ring profile. This is normal but the magnitude and pattern is unpredictable. Thus, patience and time for geometrical adaption must then be allowed.

Liner Wall Monitoring System

Shipyard's scope

AMS

Alarm & Slow down

Alternative 1.

Temp. monitor

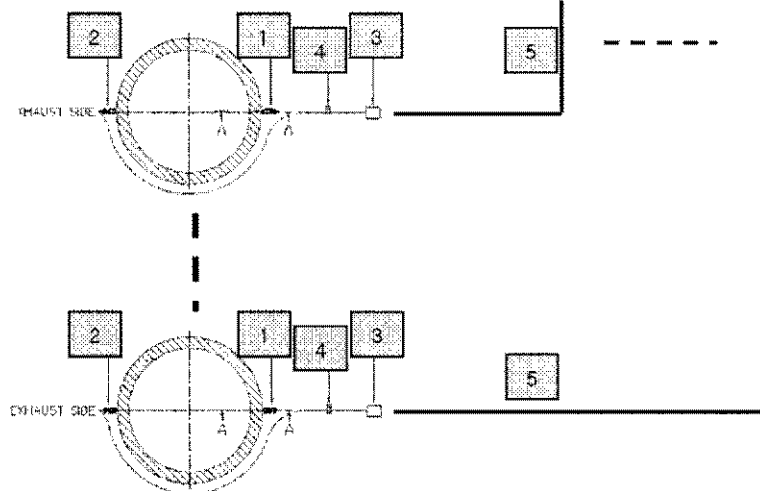
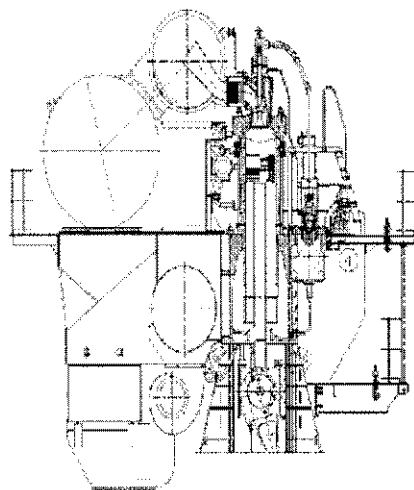
For Stand-alone monitoring

Alternative 2.

1. Alarm Monitoring System
(or Liner temperature monitor)
2. Cabling from M/E Junction box to AMS
(or Liner temperature monitor)

Engine maker's scope

M/E Junction Box



1. Temp.sensor (Pump side) – 1/Cyl
2. Temp.sensor (Exh.side) – 1/Cyl
3. Amplifier – 1/Cyl
4. Cabling from sensor to Amp.
5. Cabling from Amp. to M/E Junction Box

		S. PAGE	T. PAGE
PLAN HISTORY	ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2	
	MESSRS.	H.H.I.	
	RULE	LR + UMS	
	SHIP NO.	2585/86/87/88/89	
	ENG. NO.	AA4624/25/26/27/28	

TITLE : CYL. LUB. OIL HEATING SYSTEM

Date	Des.	Drk.	Appd.	A.C	Replace for Ident.no.:	Replace by Ident.no.:	R
20110718	BSH	BSH	JCM		FOR WORKING.		I
20110301	BSH	BSH	JCM				O
Licensor Ident.no.:		Type:		6S90ME-C			
Info.no.:		Description:		CYL. LUB. OIL HEATING SYSTEM		Ident.no.:	
Page.no.:		Confidential:		01 01 C		A14-415842-0	

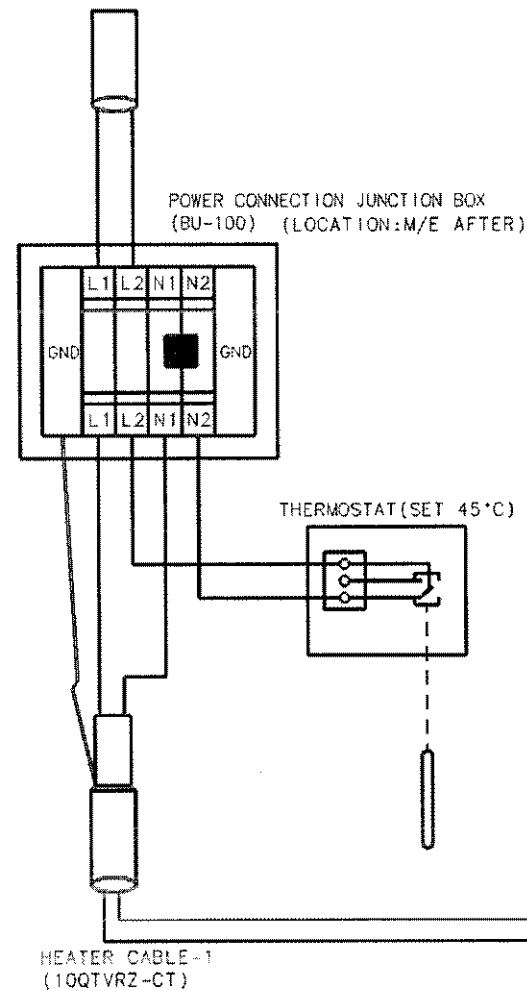
INDEX

NO.	DESCRIPTION	DWG. NO.
1	ELECTRIC HEATING CABLING FOR CYL. L.O.	
	1) ARR. OF CYL. LUB. OIL HEATING SYSTEM	A10-260629-5
	2) POWER CONNECTION J/B & TEE CONNECTION	A13-291363-4
	3) TEMPERATURE SWITCH	A13-291364-6
	4) INSTALLATION GUIDANCE FOR HEAT. CABLE	A14-316874-2
2	CYL. L.O. HEATING UNIT	
	1) CYL. LUB. OIL HEATING UNIT	A12-278511-2
	2) COUPLING BOX FOR CYL. LUB. OIL HEATING UNIT	A13-291398-0

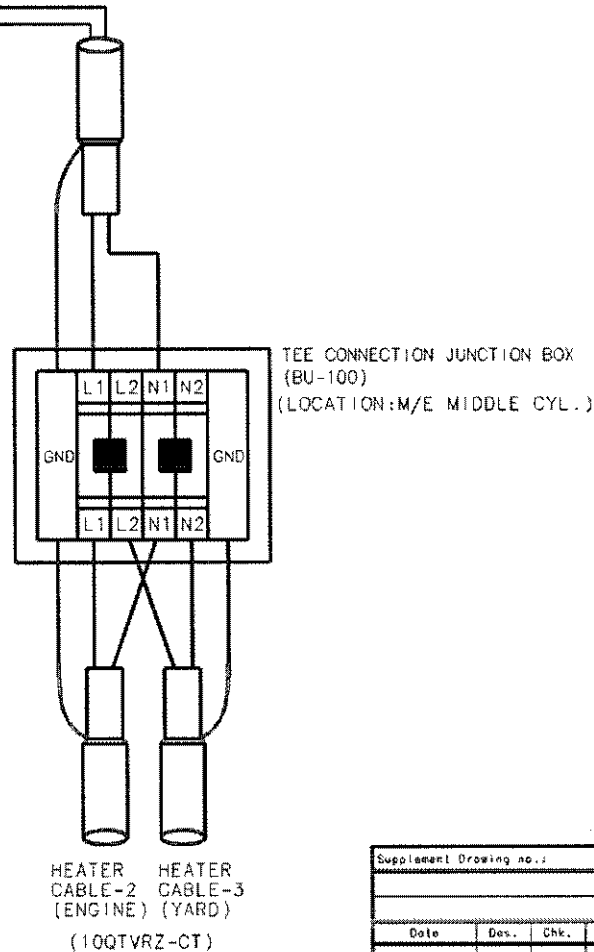
Date	Des.	CHK.	Appd.	A.C	Replace for Ident.no.:	Replace by Ident.no.:	R
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20110301	BSH	BSH	JCM				O
Licensor Ident.no.:		Type:				6590ME-C	
Info.no.:		Description:				Ident.no.:	
Page.no.:		CYL. LUB. OIL HEATING SYSTEM				A14-415842-0	
01 01		C					

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

POWER CABLE (AC220, 60Hz)



POWER CONNECTION J/B



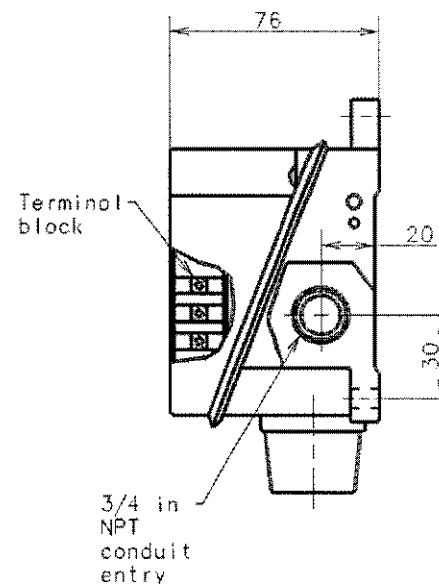
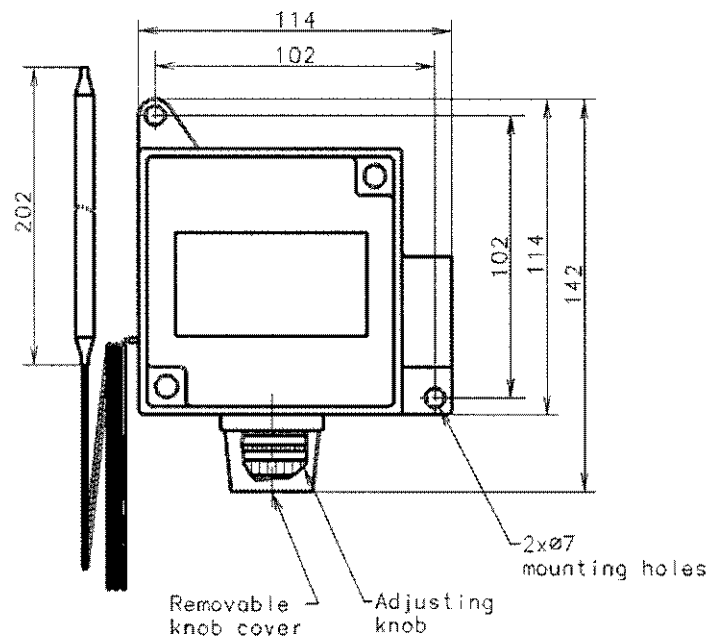
TEE CONNECTION J/B

FOR MIDDLE OF CHAIN CASE
(USE TEE CONNECTION JUNCTION BOX)

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Standard for surface roughness												Tolerances for dimensions without tolerance indication (ISO 2768-1989)					
The basic symbols and class numbers are in accordance with ISO 1302-1978.												This standard states the permissible deviations for dimensions without direct tolerance indications on metallic components manufactured by machining.					
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	Permissible deviations	0.5	0.8	1.2	2.0
R _a max. value on	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50	Medium series	±0.1	±0.2	±0.3	±0.5

Supplement Drawing no.:					Projection:		Mass (kg):		Material / Blank:		
					Licensor's Ident. no.:		Dist.:		Licensor's Material / Blank:		
					A92						
Date	Des.	Chk.	Appd.	A.C.	Change / Replacement					C.No	
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				*						8	
				*						7	
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070309HAYBYJKJG					DRAWING ARE MODIFIED.						
061017HAYBYJKJG											
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Scale:					Size:		Type:		Page No.:		
1:1					A3				01 (01)		
Info. No.:					Description:					Ident. No.:	
000000					POWER CONNECTION J/B & TEE CONNECTION J/B					A13-291363-4	



Specifications

Enclosure	NEMA 4X, polyurethane-coated cast-aluminum housing, stainless-steel hardware
Entries	One 3/4 in NPT conduit hub
Set-point range	25°F to 325°F (-4°C to 163°C)
Sensor exposure limits	-40°F to 420°F (-40°C to 215°C)
Housing exposure limits	-40°F to 160°F (-40°C to 71°C)
Switch	SPDT
Electrical rating	22 A at 125/250/480 Vac
Accuracy	±6°F (±3.3°F)
Deadband	3°F to 9°F (1.7°C to 5°C) above actuation temperature
Set-point repeatability	±3°F (±1.7°C)
Sensor type	Fluid-filled (silicone) bulb and 9 ft (2.7m) capillary
Sensor material	300 series stainless steel
Connection terminals	Screw terminals, 10-14 AWG (2-5mm²)

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Standard for surface roughness													Tolerances for dimensions without tolerance indication (ISO 2768-1989)				
The basic symbols and class numbers are in accordance with ISO 1305-1978.													This standard states the permissible deviations for dimensions without direct tolerance indications on metallic components manufactured by machining.				
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	Permissible deviations	0.5	over 0.5	over 30	over 120
R _a max. value μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50	Medium series	±0.1	±0.2	±0.3	±0.5

Supplement Drawing no.:						Projection:		Mass (kg):		Material / Blank:		
Licensor's Ident. no.:						Dist.:		Licensor's Material / Blank:				
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1:1.8		A3				01 (01)						
Info. No.:						Description:						Ident. No.:
696104						TEMPERATURE SWITCH						A13-291364-6



Building a better future
Global Leader

ELECTRIC HEATING TRACING FOR ME ALPHA LUBRICATOR

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

INSTALLATION GUIDANCE

(Electric Heating Tracing for ME Alpha lubricator)

HHI-EMD

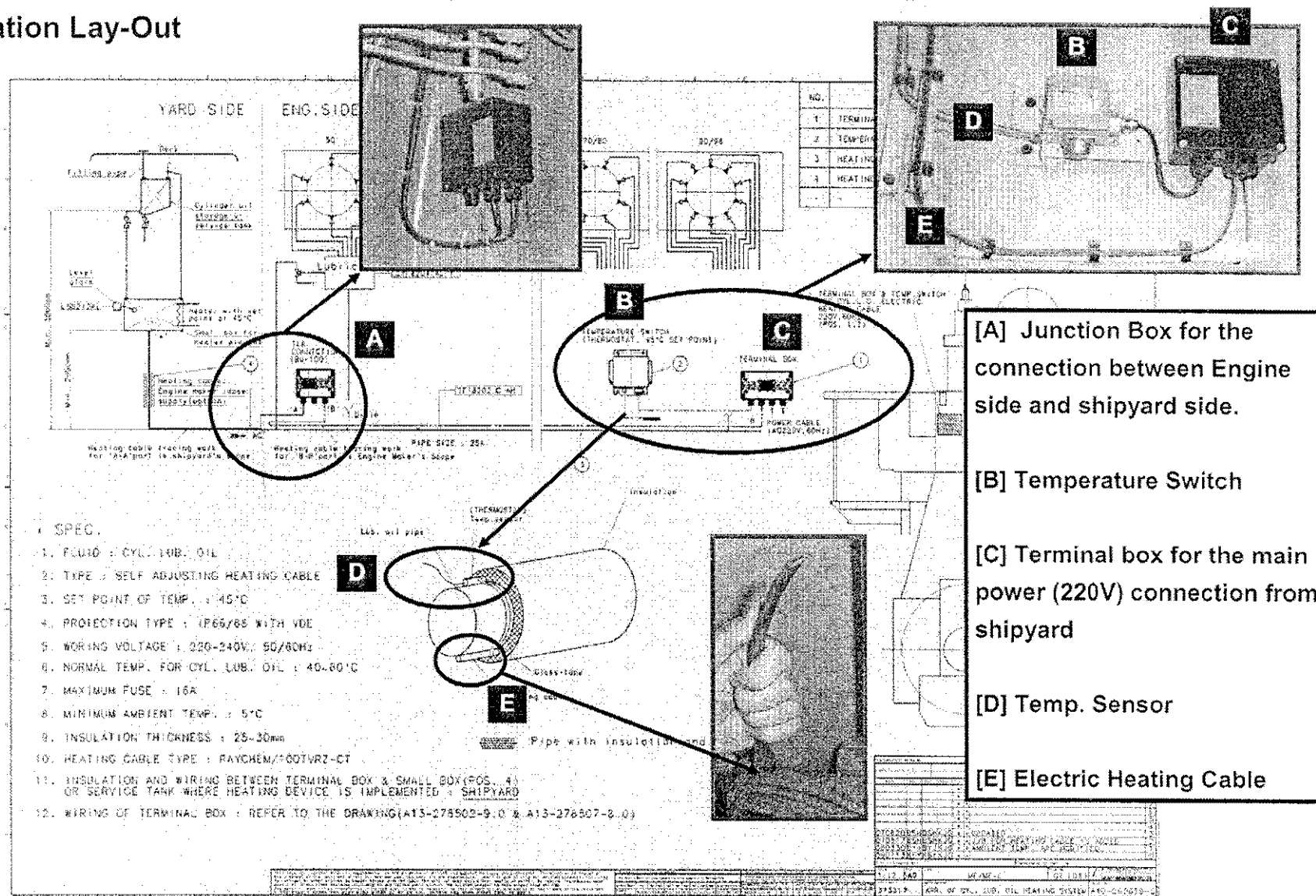


Building a better future
Global Leader

ELECTRIC HEATING TRACING FOR ME ALPHA LUBRICATOR

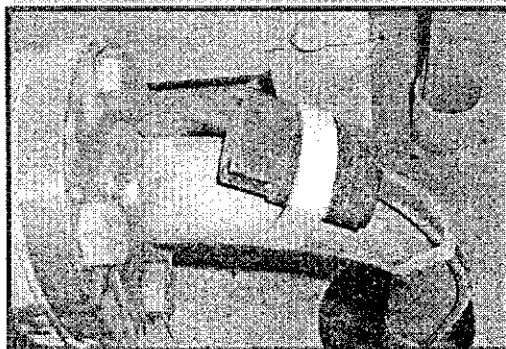
HYUNDAI
HEAVY INDUSTRIES CO., LTD.

1. Installation Lay-Out

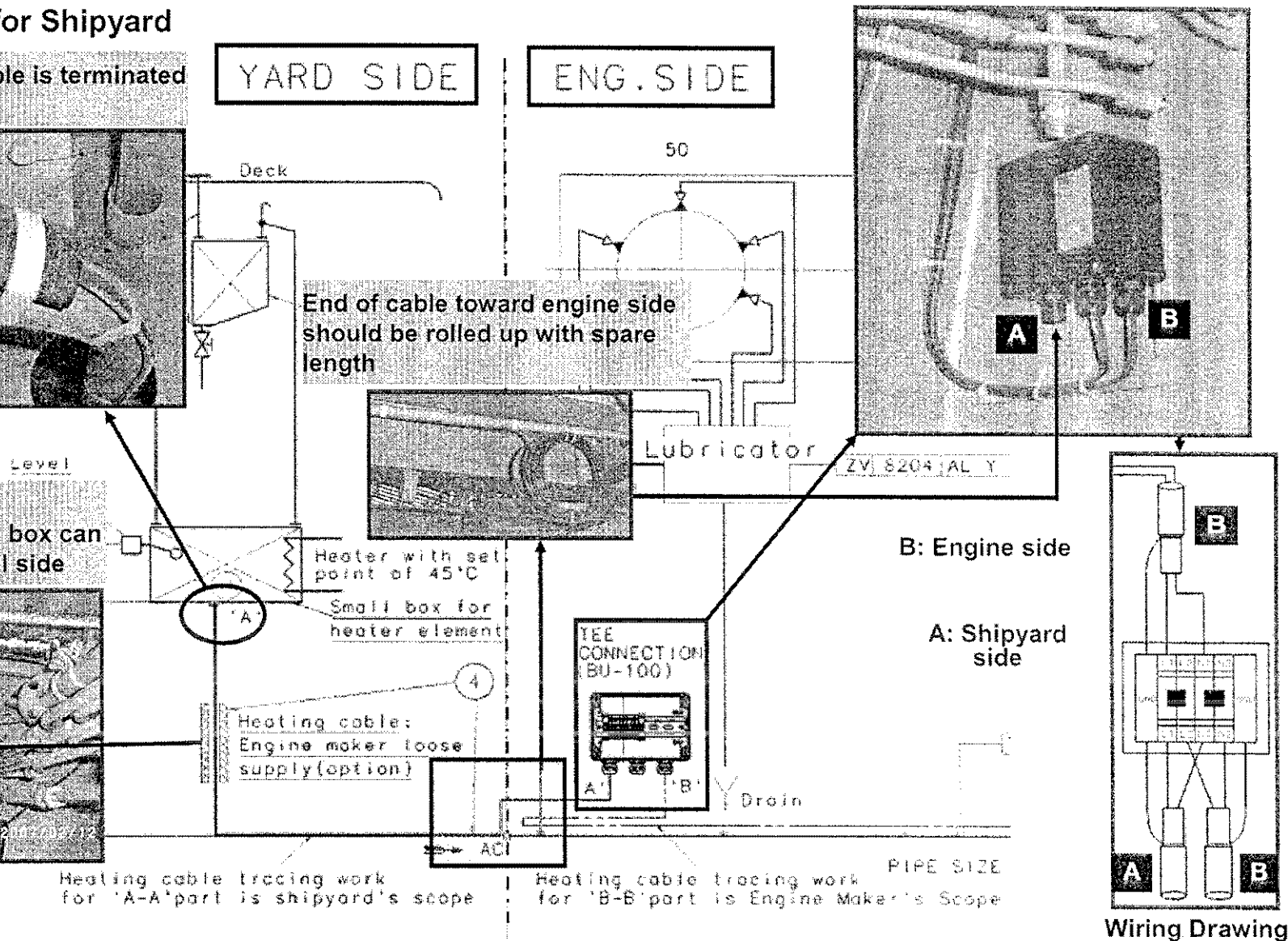
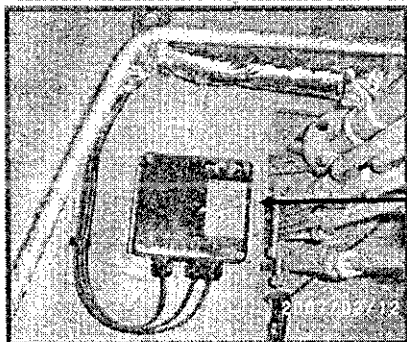


2. Work Scope for Shipyard

End of heating cable is terminated by end seal kit



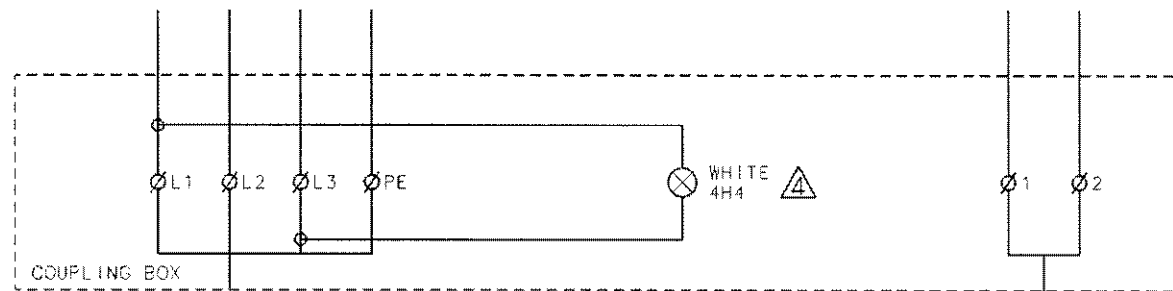
Depending on hull structure, junction box can be installed on hull side



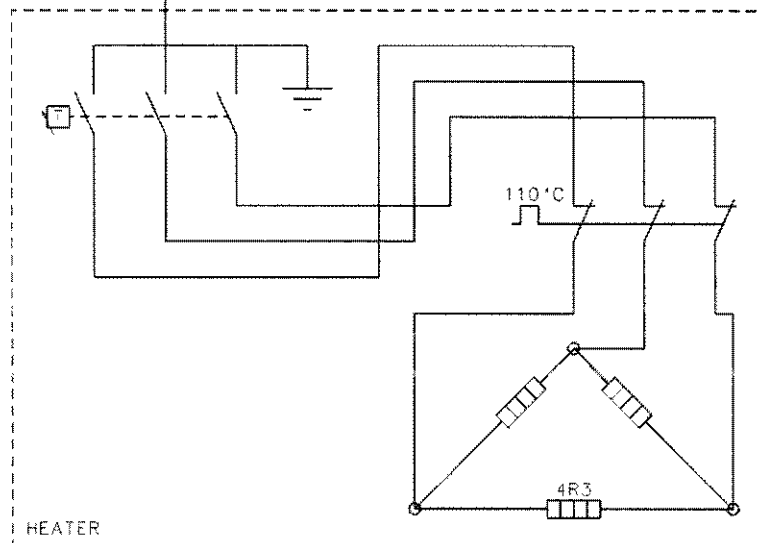
SUPPLY VOLTAGE *)

HEATER POWER

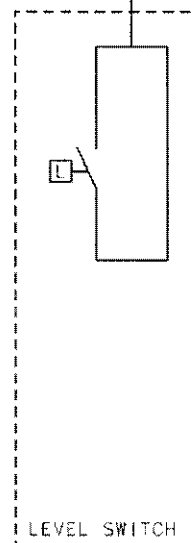
ALARM SYSTEM *)



COUPLING BOX

-W1
4x0.75"

HEATER

-W2
2x0.75"

LEVEL SWITCH



NOTE *) YARD SUPPLY

Supplement Drawing No.:					Revision:		Work Item:		Material / Blank:		
					Licensor's Ident. No.:		Dist.:		Licensor's Material / Blank:		
					0785247-0.1		A98				
Date	Des.	Chr.	Appr.	A.C. IZ	Change / Replacement					C.No.	
					Replaced by Ident. No.					0	
101123	KYWRSHSJR	Z3			Name plate/paint color added.					8	
101123	KYWRSHSJR	Z4			DWG. revision no. error					7	
100823	KYWRSHSJR	Z4			Disassemble space, level alarm point added.					6	
090520	KYWRSHSJR				Page 2 revised.					5	
080123	KYWRSHSJR	Z2			Cable 6 ord. NOTE: 4H4 added.					4	
081024	HAYBYJKJG				PAGE 1 ARE MODIFIED.					3	
081024	HAYBYJKJG				PAGE 1 ARE MODIFIED.					2	
060418	BYBYJKJG				PAGE 3 ARE DELETED.					1	
060218	BYBYJKJG									0	
Similar Drawing No.:					Replacement of Ident. No.:						
Scale:		Size:		Type:		Page No.:		Total No.:			
NON		A2		ME/ME-C		02 (02)		△HMUNDAI HEAVY INDUSTRIES CO. LTD.			
Info. No.:		382634		Description:		CYL. LUB. OIL HEATING UNIT		Ident. No.:			
Info. Date:		2006						A12-278511-2			

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Standard for surface roughness												
Class No.	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12
Value, µm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50

Tolerances for dimensions without reference indication (ISO 2868:2000)												
Deviation	ES	EI	ES	EI	ES	EI	ES	EI	ES	EI	ES	EI
Medium series	+0.1	-0.2	+0.3	-0.5	+0.5	-0.8	+0.8	-1.2	+1.2	-1.8	+1.8	-2.5

HGF-1240-011(01)

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A12-278511-2

PAGE	DESCRIPTION
2	COUPLING BOX LAYOUT
3	HEATER & SENSOR CIRCUIT
4	TERMINAL BLOCK

Supplement Dwg. No.:				Projection: 		Mass (kg):		Material / Blank:	
				Licensor's Ident. No.:		Dist.:		Licensee's Material / Blank:	
						A92			
Date	Dwg.	Chk.	Appd.	A.C.	E	Change / Replacement			
				*	*	Replaced by Ident. No.:			
				*	*				
				*	*				
				*	*				
				*	*				
				*	*				
				*	*				
090520KYWRSHSJRP					*	*	Drawing revised.		
090320BSHSHJCM					*	*	SPECIFICATION FOR POWER IS CORRECTED		
061123HAYBYJKJG					*	*			
Similar Drawing No.:						Replacement of Ident. No.:			
Scale:	Size:	Type:	ME/ME-C			Page No.:	01 (04)		
NON	A3					 MUNDOVAL PUMP INDUSTRIES CO. LTD.			
Info. No.:			Description:			Ident. No.:			
382634			COUPLING BOX FOR CYL. LUB. OIL HEATING UNIT			A13-291398-C			

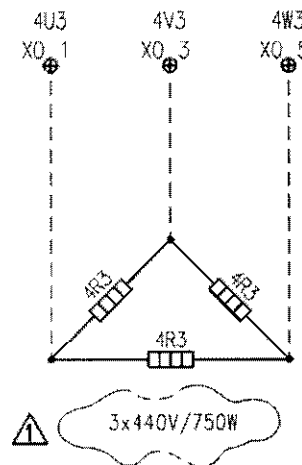
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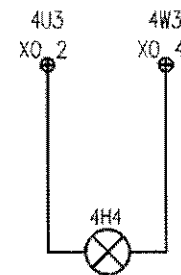
CAD Drowning - do not correct by hand

A3: 420 with 297 (red) 2000

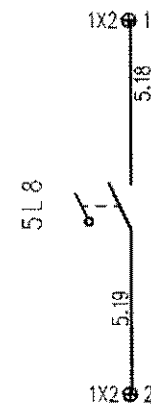
HEATER & SENSOR CIRCUIT



HEATER



HEATER LAMP



LEVEL SWITCH

1X2.3

1X2.5

1X2.7

1X2.9

1X2.4

1X2.6

1X2.8

1X2.10

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Standard for surface roughness												
The basic symbols and class numbers are in accordance with ISO 1302-1978.												
Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
R _a max. value in μ m	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50

Supplement Des. no.:		Projection:		Mass (kg):		Material / Blank:	
		ET					
Licensor's Ident. no.:		Dist.:		Licensor's Material / Blank:			
		A92					
Date	Des.	Chk.	Appd.	A.C.	E	Change / Replacement	C.No.
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				*	*		2
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				*	*		6
				*	*		7
				*	*		8
				*	*		9
				*	*		10
090520KYWRSHSJR * * Drawing revised.							2
090320BSHBSHJCM * * SPECIFICATION FOR POWER IS CORRECTED							1
061123HAYBYJJKIG * *							0
Similar Drawing No.:				Replacement of Ident. No.:			
Scale:	Size:	Type:	Page No.:		REMYUNDAI		
NON	A3	ME/ME-C	03 (04)		HEAVY INDUSTRIES CO. LTD.		
Info. No.:		Description:		Ident. No.:			
382634		COUPLING BOX FOR CYL. LUB. OIL HEATING UNIT		A13-291398-08			

F



CAP Browning - do not connect by hand

					S. PAGE	T. PAGE
PLAN HISTORY				ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2	
				MESSRS.	H.H.I.	
				RULE	LR + UMS	
				SHIP NO.	2585/86/87/88/89	
				ENG. NO.	AA4624/25/26/27/28	
TITLE : HYD. START-UP PUMP MOTOR STARTER						
Date	Des.	Drk.	Appd.	A.C	Replaced by Ident.no.:	Replacement for Ident.no.:
20110718	BSH	BSH	JCM		FOR WORKING.	
20110217	BSH	BSH	JCM			
Licensor Ident.no.:				Type:		
				6S90ME-C		
Info.no.:				Description:		Ident.no.:
				HYD. START-UP PUMP MOTOR STARTER		
Page.no.:		Security:				
(01) 01		C				

HYUNDAI
HEAVY INDUSTRIES CO., LTD.

A14-413507-7

GENERAL SPECIFICATION

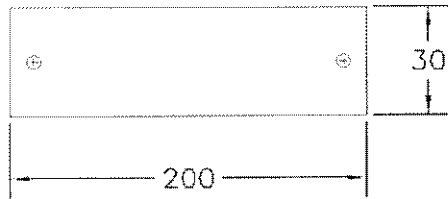
1. AMBIENT TEMP. : 45℃
2. CONSTRUCTION OF PANEL
 - MOUNTING METHOD : WALL MOUNTING
 - MATERIAL : SHEET STEEL 2.3t
 - PAINT COLOR : RAL7032
 - PROTECTION DEGREE OF PANEL : IP44
 - MAINTENANCE SPACE : FRONT SIDE
3. NAME PLATE
 - LETTER : ENGLISH
 - MATERIAL : PHENOLIC
4. ELECTRIC SOURCE
 - POWER SOURCE : 3PH, 440V 60Hz
5. CABLE (INTERNAL)
 - POWER CIRCUIT : 660V, SYP-22sq (BLACK)
 - CONTROL CIRCUIT : 500V, SYP-1.25sq (GRAY)
6. DISTINGUISH BETWEEN COLOR OF CABLE LUG CAP
 - POWER CIRCUIT(3PH) : R.U.X (RED), S.V.Y(WHITE), T.W.Z(BLACK)
 - CONTROL CIRCUIT(1PH) : WHITE WITH NUMBER
7. MOTOR CAPACITY :
 - 26kW
 - 44A
8. SCOPE OF SUPPLY : 2SET/SHIP

Date	Des.	Chg.	Appd.	A/C	Replace by Ident.no.:	R
				*		5
				*		4
				*		3
110729	BSH	BSH	JCM	*	Shipping comment(PAGE: 1,5)	2
110719	BSH	BSH	JCM	*	For loading (page1,4)	1
110218	BSH	BSH	JCM	*		0

Licensor Ident.no.:		Type:		6S90ME-C8.2			
Info.no.:		Description:		GENERAL SPECIFICATION		Ident.no.:	
Page.no.: 02 OF 08						A14-229618-0	

TYPE : LP-M1A

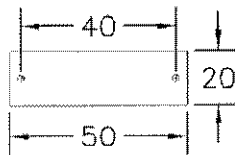
- MATERIAL : PHENOL
- GROUND : WHITE
- LETTER : BLACK



DESC.	Q'TY
NO.1 STARTER FOR START UP PUMP	1
NO.2 STARTER FOR START UP PUMP	1

TYPE : LP-M1A

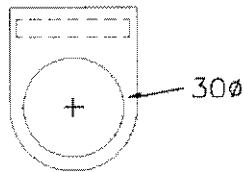
- MATERIAL : PHENOL
- GROUND : WHITE
- LETTER : BLACK



DESC.	Q'TY
SOURCE	2

TYPE : LP-P1B

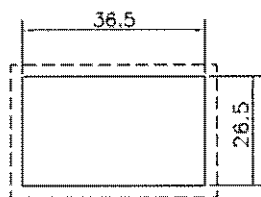
- MATERIAL : PHENOL
- GROUND : WHITE
- LETTER : BLACK



DESC.	Q'TY
START	2
LOCAL REMOTE	2
STOP	2

TYPE : RAL

- MATERIAL : METHACRYLATE
- THICKNESS : 1.0mm
- GROUND : WHITE
- LETTER : BLACK



DESC.	Q'TY
SOURCE	2
RUNNING	2
SPACE HEATING ON	2

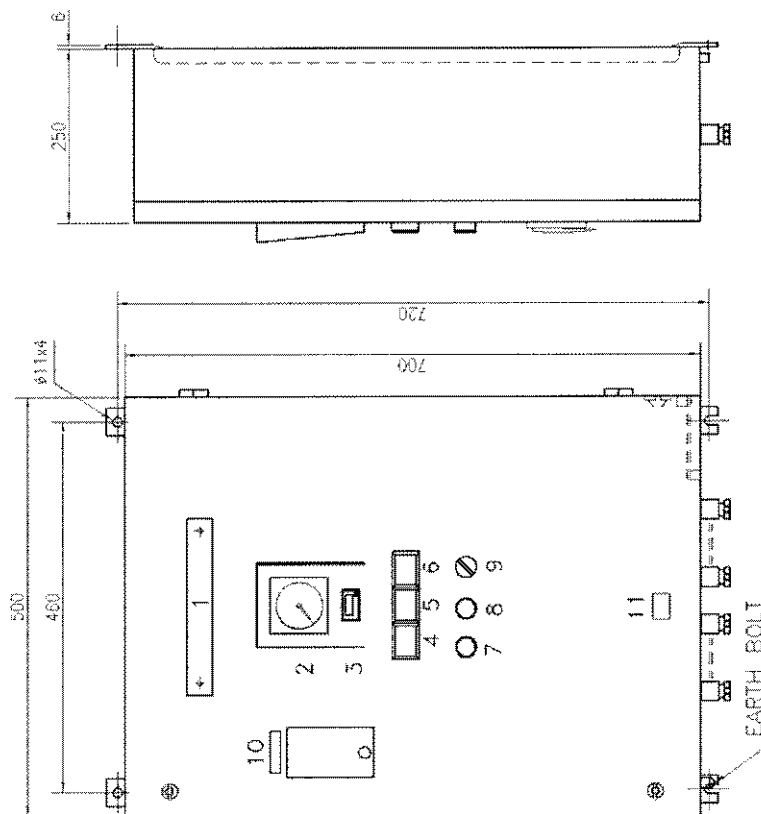
Date	Des.	Chk.	Appd.	A.C	Revised by (Rev.No.)	R
				*		5
				*		4
				*		3
110729	BSH	BSH	JCM	*	Shinyang comment(PAGE: 1,5)	2
110719	BSH	BSH	JCM	*	For working (page 1,4)	1
110218	BSH	BSH	JCM	*		0
Licensee Ident.no.:				Type:		
Info.no.:				6S90ME-C8.2		
Page.no.:				NAME PLATE		
03 OF 08				Description:		Ident.no.:
						A14-229618-0



NO.	SYMBOL	NAME	TYPE & SPEC.	Q'TY	MAKER
01	1K10	MAGNETIC CONTACT	HIMC65W 22NR A024 (2a2b)	2	HYUNDAI
02	1K12	MAGNETIC CONTACT	HIMC9W 11NR A024 (1a1b)	2	HYUNDAI
03	1F1	O.C.R	HiTH65K N0065R (36~50A)	2	HYUNDAI
04	T1	TRANSFORMER	440/24 200VA	2	H.K.T
05	T2	TRANSFORMER	440/240V, 100VA	2	H.K.T
06	Q2,Q4,Q5	M.C.B	S202-C2 / 63AF / 2AT	6	ABB
07	Q3	M.C.B	S201-C2 / 63AF / 6AT	2	ABB
08	CT1	C.T	KBJ-25 75/5 2.5VA	2	LIGHT STAR
09	A1	A-METER	TYPE : BE-96 / RANGE : 0~75A O.S : 300 / F.S : 5A	2	BEW
10	HM1	HOUR METER	H7ET-NFV	2	OMRON
11	1Q1	M.C.C.B	HiBS103AF / 75AT	2	HYUNDAI
12	WL1	LAMP	YSNRL34-024-W AC24V	2	YONG SUNG
13	GL1	LAMP	YSNRL34-024-G AC24V	2	YONG SUNG
14	OL1	LAMP	YSNRL34-024-O AC24V	2	YONG SUNG
15	S1	SELECTOR S/W	YSAR3-222KB (ø30, 2a2b)	2	YONG SUNG
16	S2	PUSH BUTTON S/W	YSP13-11G (ø30, 1a1b, GREEN)	2	YONG SUNG
17	S3	PUSH BUTTON S/W	YSP13-11R (ø30, 1a1b, RED)	2	YONG SUNG
18	1K9,1K11 1K13	RELAY	SZR-MY4-N1 AC24V	6	HONEYWELL
19	X1	TERMINAL BLOCK	500V, 60A	14	DONG SEO
20	X2	TERMINAL BLOCK	500V, 15A	28	DONG SEO

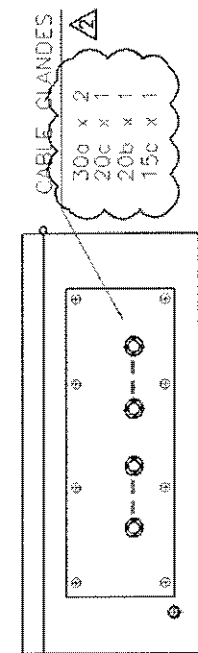
Date	Des.	CHK.	Appr.	A/C	Replace by client, no.	R
				*		5
				*		4
				*		3
110729	BSH	BSH	JCM	*	Shayard comment(PAGE: 1,5)	2
110715	BSH	BSH	JCM	*	For writing(page:1,4)	1
110218	BSH	BSH	JCM	*		0
Licence Ident.no.:				Type:		 Ident.no.:
Inf.no.:				6S90ME-C8.2		
Page.no. 04 OF 08				Description:		
				PARTS LIST / SHIP (26kW)		A14-229618-0

NO	SYMBOL	NAME PLATE	DESC.	TYPE	QTY
1		NO.1,2 STARTER FOR START UP PUMP			2
2	A1	A-METER			2
3	HM1	HOUR METER			2
4	WL1	SOURCE	LAMP (WHITE)		2
5	GL1	RUNNING	LAMP (GREEN)		2
6	OL1	SPACE HEATING ON	LAMP (ORANGE)		2
7	S2	START	P.B S/W (GREEN)		2
8	S3	STOP	P.B S/W (RED)		2
9	S1	LOCAL/REMOTE	SELECT S/W		2
10	1Q1	SOURCE			2
11		MAKER PLATE			2



SIDE VIEW

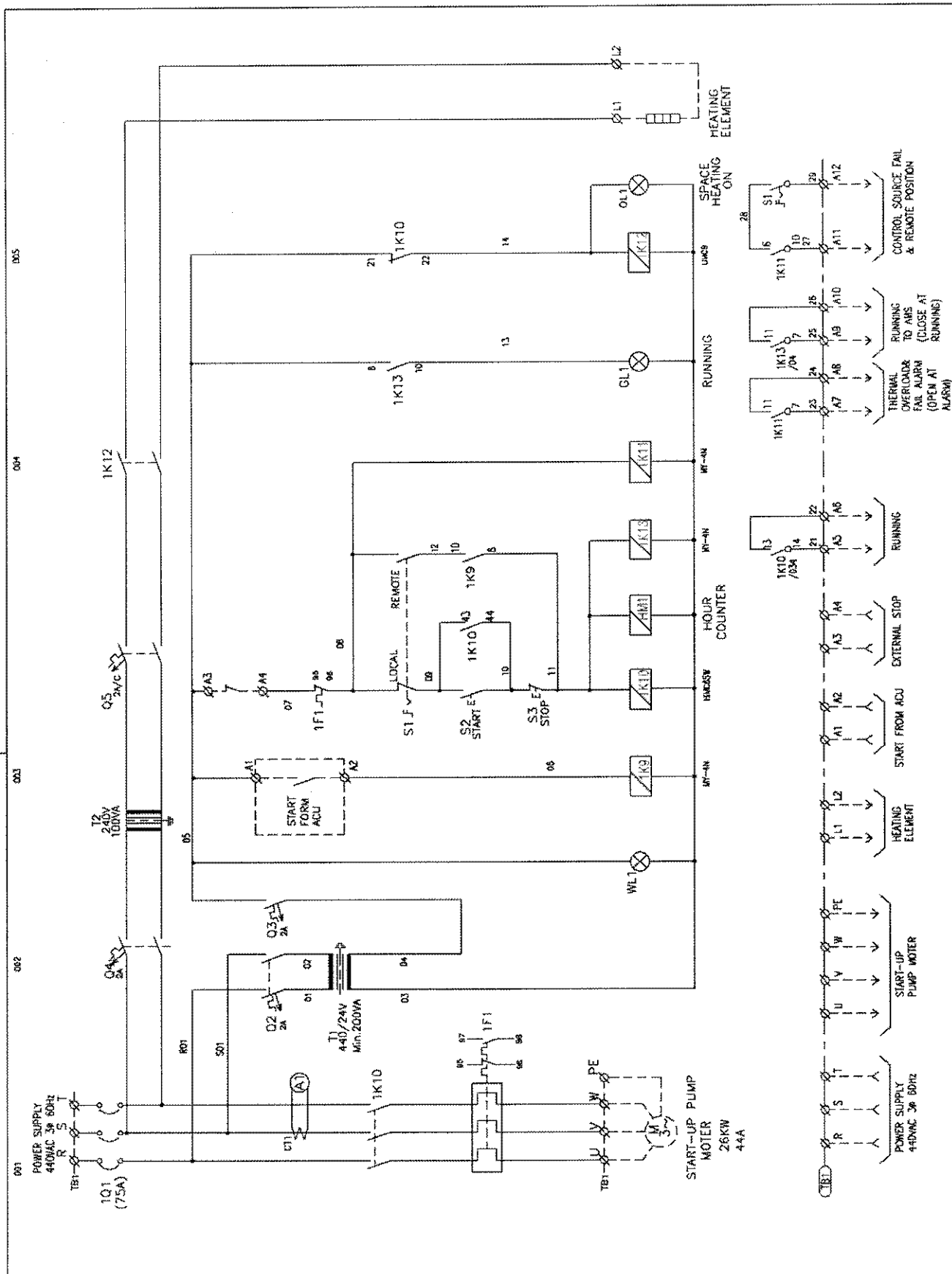
FRONT VIEW



BOTTOM VIEW

- NOTE :
1. MAT'L : SHEET STEEL 2.3t
 2. PAINT COLOR : RAL7032
 3. MOUNTING METHOD : WALL MOUNTING TYPE
 4. PROTECTION : IP44
 5. WEIGHT : 661.30Kg
 6. Q'TY : 2SET/SHIP

Date	Des.	CHK.	Appd.	A/C	Replace by Ident.no.2	R
				*		5
				*		4
				*		3
110729	BSH	BSH	JCM	*	SHipped comment PAGE: 1, 5	2
110719	BSH	BSH	JCM	*	For working page: 1, 4	1
110218	BSH	BSH	JCM	*		0
Licensor Ident.no.:				Type: 6S90ME-C8.2		
Info.no.:				Description: ME STARTER FOR START UP PUMP		
Page.no.: 05 OF 08				Ident.no.: A14-229618-0		

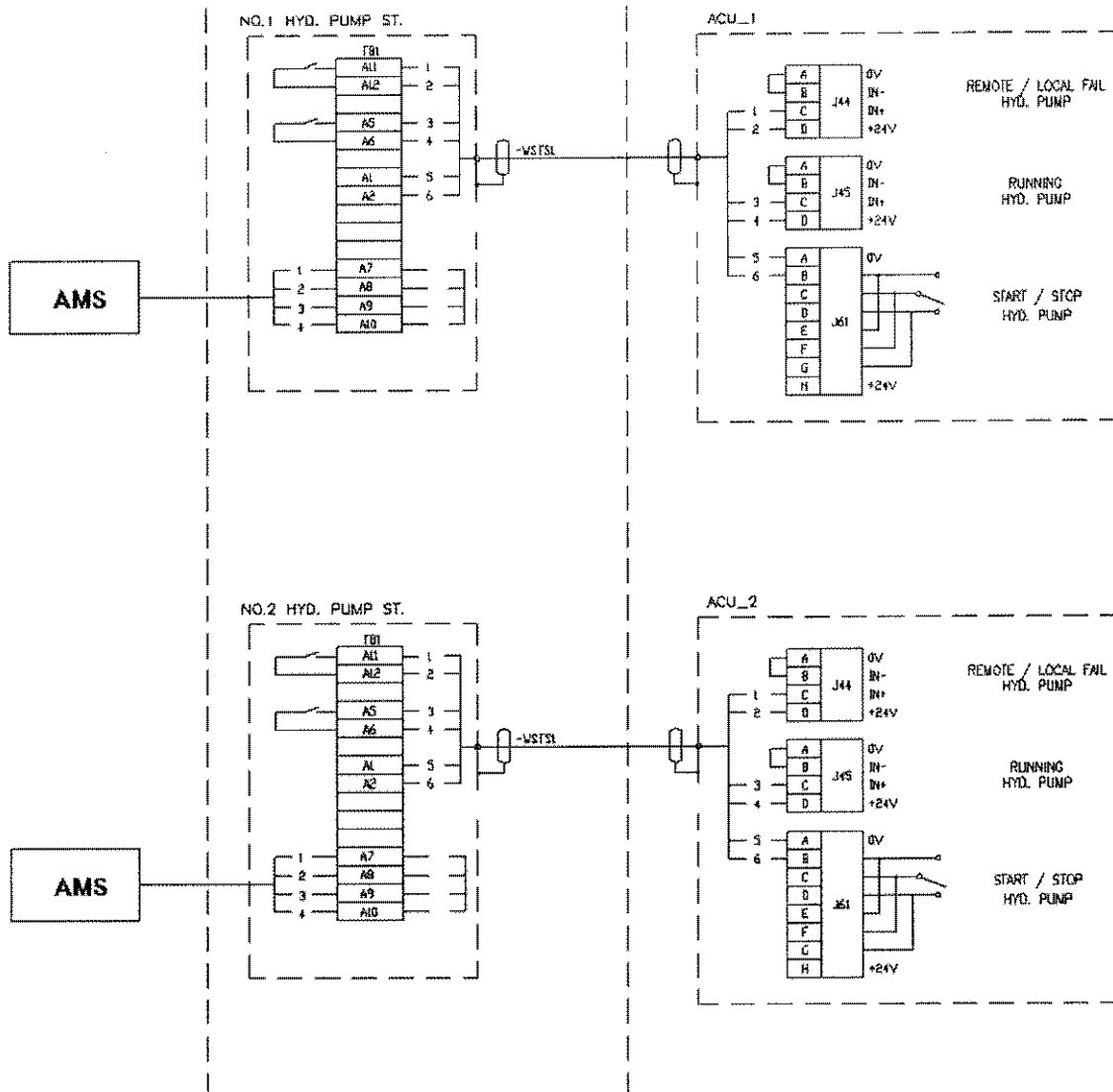


Date	Des.	Dir.	Appr.	A.C.	Replaces by Inter-Lock	
				*		
				*		
				*		
119729	BSH	BSH	JCM	*	Shayard control (PAGE: 1-5)	
119719	BSH	BSH	JCM	*	For wiring (page: 4)	
110215	BSH	BSH	JCM	*		
Licensor Ident.no.:				Type:		
Info.no.:				6S90ME-C8.2		
Page.no.:				06 OF 08		
				Description:		Ident.no.:
				ME STARTER FOR START UP PUMP		A14-229618-0

ECR

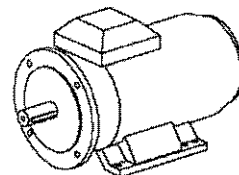
E/R

ENGINE SIDE



Date	Des.	CHK.	Appr.	A/C	Revised by	Ident.no.	R
				*			5
				*			4
				*			3
110719	BSH	BSH	JCM	*	SH (typed) corrected (PAGE: 1.5)		2
110719	BSH	BSH	JCM	*	For wiring (page 1.4)		1
110218	BSH	BSH	JCM	*			0
Licensor Ident.no.:				Type:		6S90ME-C8.2	
Info.no.:				Description:		Ident.no.:	
Page.no.:				TERMINAL BLOCK		A14-229618-0	
07 OF 08							

Voltage.....:	440 V Δ
Frequency.....:	60 Hz
Start Current.....:	282 A
Normal Current.....:	44 A
Specified Output.....:	26 kW
Number of poles.....:	4 poles
Degree of protection:	IP 55
Heating element.....:	240 V, 25 W

[illegible]

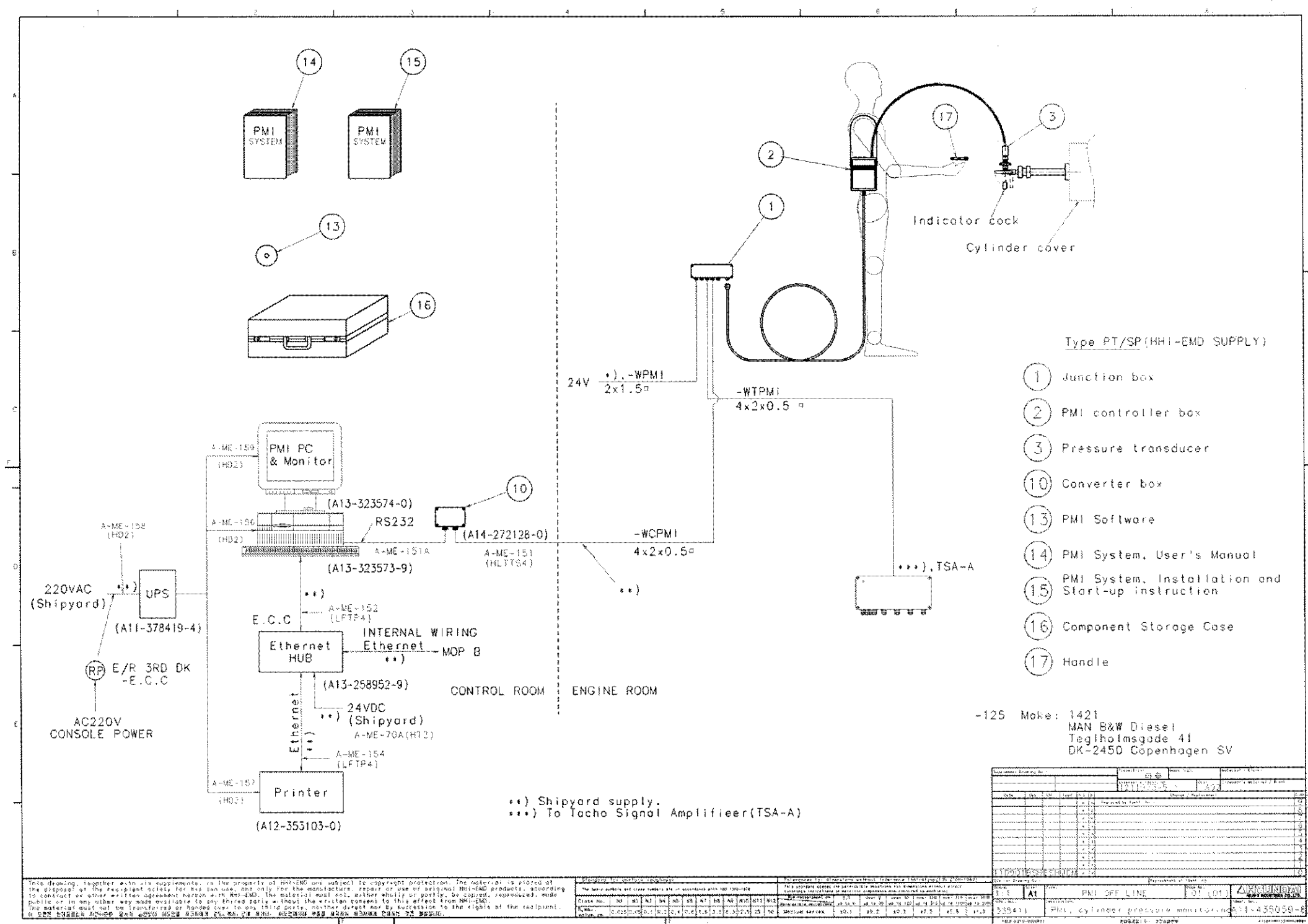
					S. PAGE	T. PAGE
PLAN HISTORY				ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2	
				MESSRS.	H.H.I.	
				RULE	LR + UMS	
				SHIP NO.	2585/86/87/88/89	
				ENG. NO.	AA4624/25/26/27/28	
TITLE : PMI OFF LINE SYSTEM						
Date	Des.	CHK.	Appd.	A.C	Replaced by Ident.no.:	Replacement for Ident.no.:
20110718	BSH	BSH	JCM		FOR WORKING.	
20110217	BSH	BSH	JCM			
Licence Ident.no.:				Type:		
				6S90ME-C		
Info.no.:				Description:		Ident.no.:
				PMI OFF LINE SYSTEM		
Page.no.:		Security:				
(01) 01		C				
						
						A14-413508-9

D

Standard for surface roughness												
The basic symbols and class numbers are in accordance with ISO 1302-1978												
Gloss No.	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12
0.008 value of	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50

Tolerances for components of total tolerance implications (5) (1995)						
This statement states the permitted deviation for dimension without direct tolerance implications on a per cent component basis, as a guideline						
Size, Manufacture	5%	10%	15%	20%	25%	30%
Maximum dia. of hole	up to 8	up to 30	up to 100	up to 315	up to 1000	up to 2000
Minimum tolerance	±0.1	±0.2	±0.5	±0.8	±1.5	±2

HSEF-KI10-D11(R3)
 全周回線 (2) 全周回線
 A2: 594mm, 420mm, 420mm



Type PT/SP (HHI-EMD SUPPLY)

- ① Junction box
- ② PMI controller box
- ③ Pressure transducer
- ⑩ Converter box
- ⑬ PMI Software
- ⑭ PMI System, User's Manual
- ⑮ PMI System, Installation and Start-up instruction
- ⑯ Component Storage Case
- ⑰ Handle

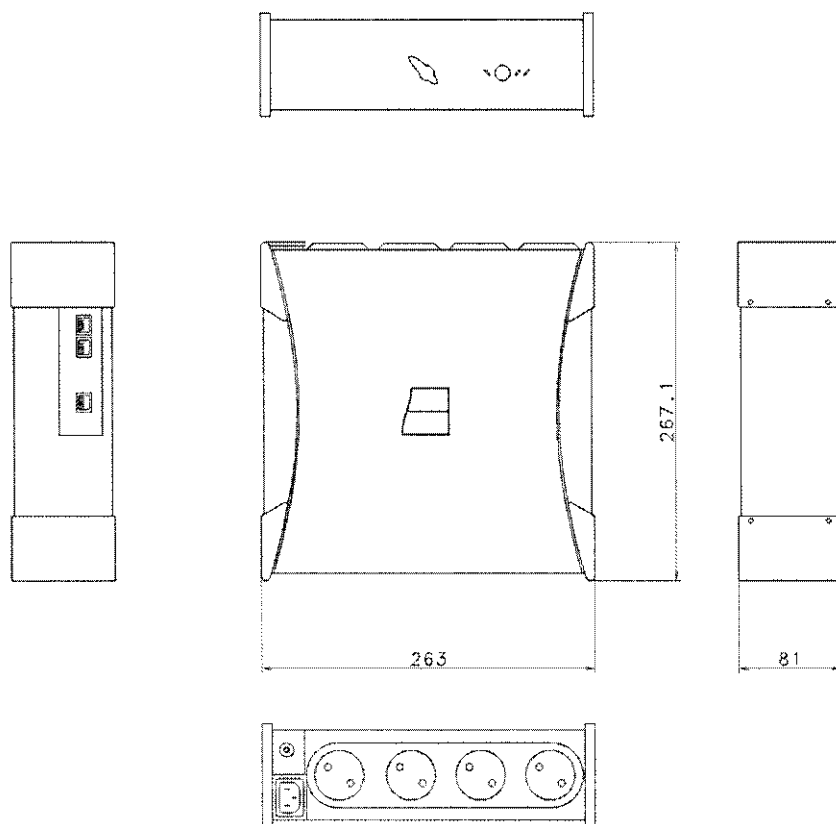
-125 Make: 1421
MAN B&W Diesel
Tegls holmsgade 41
DK-2450 Copenhagen SV

**) Shipyard supply.
***) To Tacho Signal Amplifier (TSA-A)

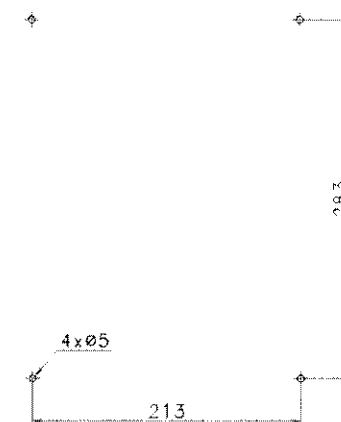
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Item	Description	Remarks
1	Junction box	
2	PMI controller box	
3	Pressure transducer	
10	Converter box	
13	PMI Software	
14	PMI System, User's Manual	
15	PMI System, Installation and Start-up instruction	
16	Component Storage Case	
17	Handle	

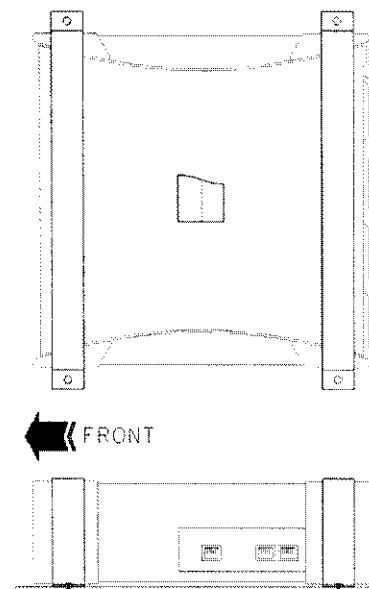
Item	Description	Remarks
1	Junction box	
2	PMI controller box	
3	Pressure transducer	
10	Converter box	
13	PMI Software	
14	PMI System, User's Manual	
15	PMI System, Installation and Start-up instruction	
16	Component Storage Case	
17	Handle	

A
B
C
D
E

FIXING HOLE SIZE

FIXING HOEL : MAXIMUM 5mm
TAP FIXING or BOLT + NUT FIXING

EXAMPLES OF FIXING DEVICE



TECHNICAL SPECIFICATIONS

- POWER RATING : 600VA/360W
- VOLTAGE(FREQUENCY) : IN 184~264V/OUT 230V (50-60 Hz)
- OUTPUT RECEPTACLES : DIN TYPE/4 Ports
- BATTERY TYPE : MAINTENACE FREE LEAD-ARID BATTERY
- BATTERY HALF LOAD RUNTIME : 15MIN
- BATTERY FULL LOAD RUNTIME : 7MIN
- COMMUNICATION PORTS : USB
- COLOR : TITANIUM GREY
- WEIGHT : 4.2KG
- WARRANTY : TWO YEAR FACTORY WARRANTY

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REVISIONS

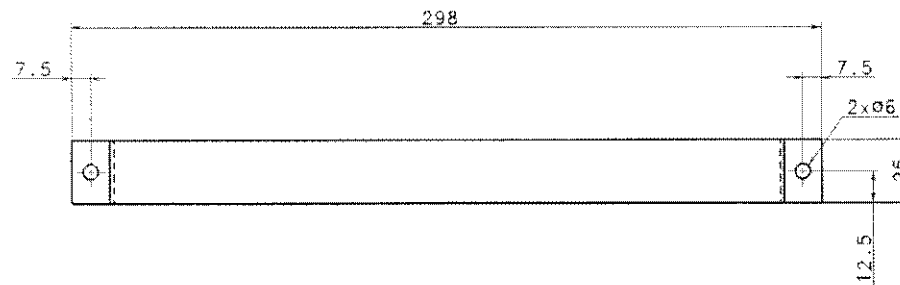
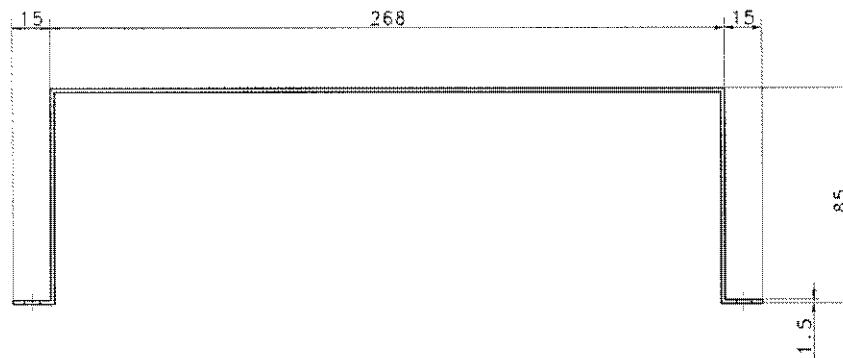
Rev.	Desc.	Date
1	Initial release	2008-01-01

DIMENSIONS

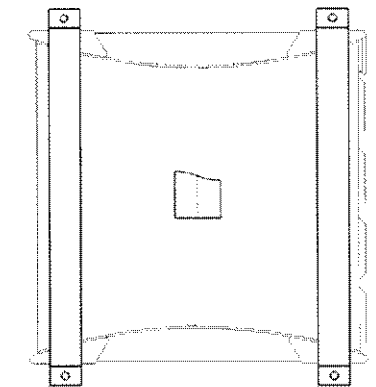
Item	Value	Unit
Overall width	263	mm
Overall height	267.1	mm
Overall depth	81	mm

Rev.	Desc.	Date
1	Initial release	2008-01-01

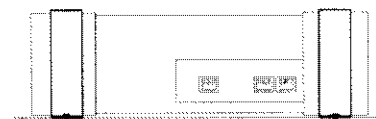
Item	Value	Unit
Overall width	263	mm
Overall height	267.1	mm
Overall depth	81	mm



EXAMPLES OF DESKTOP TYPE FIXING DEVICE



FRONT



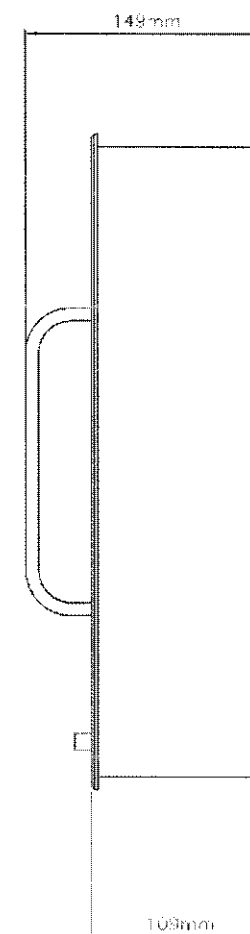
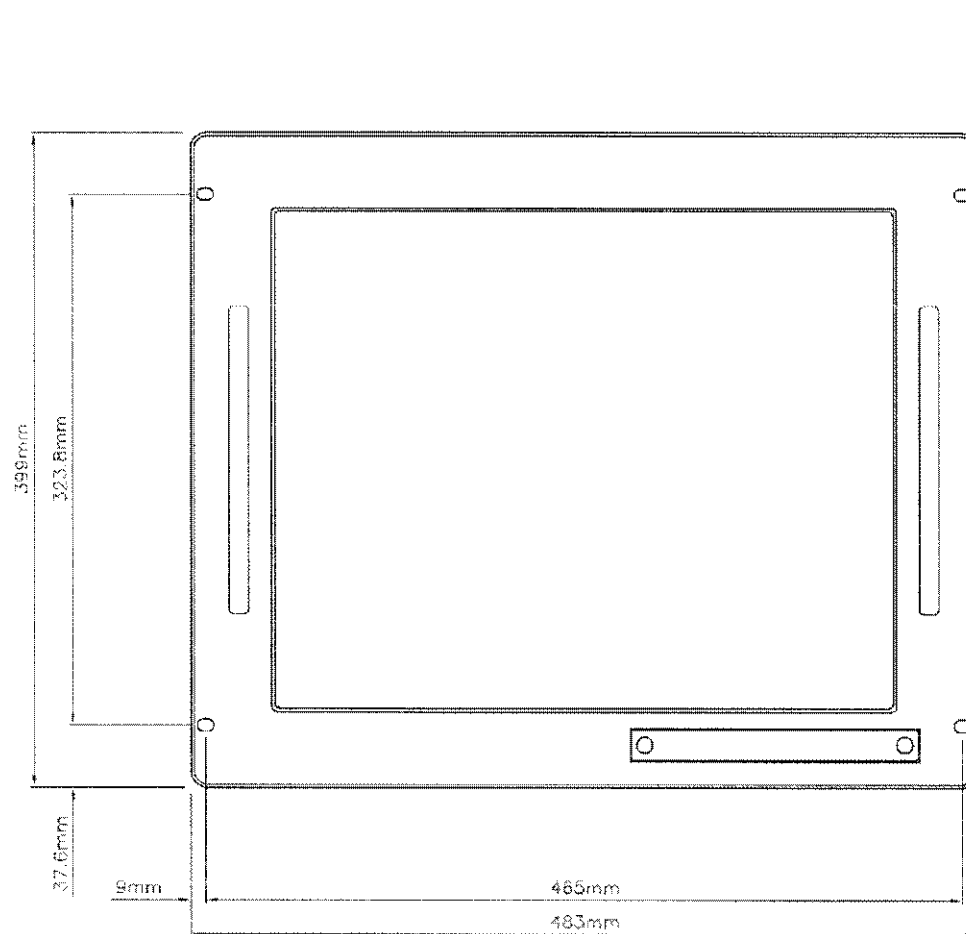
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REVISIONS									
Rev.	Date	Description	By	Appr.	Rev.	Date	Description	By	Appr.
1	01.01.80	First issue			2	01.01.80	First issue		

REVISIONS									
Rev.	Date	Description	By	Appr.	Rev.	Date	Description	By	Appr.
1	01.01.80	First issue			2	01.01.80	First issue		

Drawing No.		Revision		Date		Author		Checker	
1-1		1		01.01.80		H. J. J.		H. J. J.	
Title		Description		Material		Quantity		Unit	
DESKTOP TYPE FIXING DEVICE		DESKTOP TYPE FIXING DEVICE		ALUMINUM		1000		mm	
Scale		1:1		1:1		1:1		1:1	
Drawing No.		Revision		Date		Author		Checker	
1-1		1		01.01.80		H. J. J.		H. J. J.	
Title		Description		Material		Quantity		Unit	
DESKTOP TYPE FIXING DEVICE		DESKTOP TYPE FIXING DEVICE		ALUMINUM		1000		mm	
Scale		1:1		1:1		1:1		1:1	

11-1378419-4



- NOTES: 1) SECURE TO CONSOLE / RACK USING M6 x 16mm (4 OFF)
 2) REFER TO MS1120_DD FOR CONSOLE CUTOUT DETAILS
 3) ANTI-VIBRATION MOUNT DETAIL: BARRY CONTROLS / STOP-CHOC M2K22-00181 (4 OFF)
 4) POWER CABLE : DIN TYPE, 1.8M
 5) VGA CABLE : 15PIN MINI D-SUB VGA, 1.8M

HHI-EMD drawing no.: A10-229529-2, (1/2page)

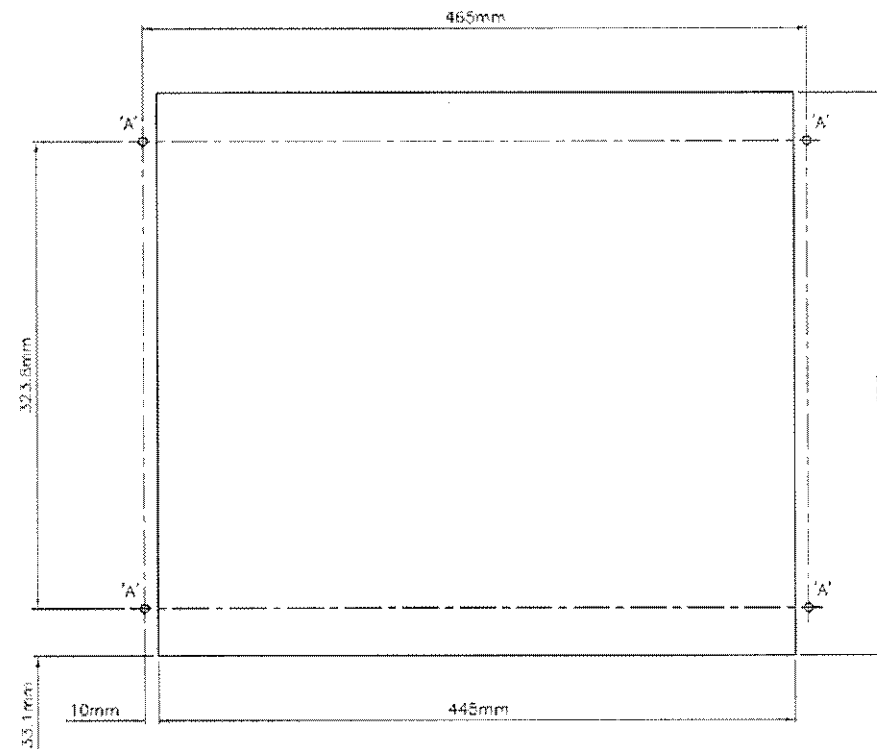
MARINER
SYSTEMS
(UK) LTD

USED IN CONJUNCTION WITH:
 HP LA1951g 19" TFT MONITOR
 (CONSOLE MOUNT)

DRAWING TITLE: MS1090 ASSEMBLY

SCALE: DRAWN 1:1
 ISSUE: 1

DWG NO: MS1090_A
 DATE: 10 DEC 2009



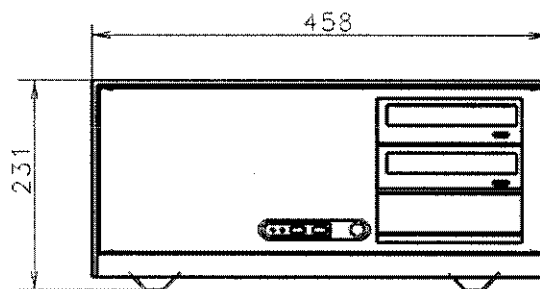
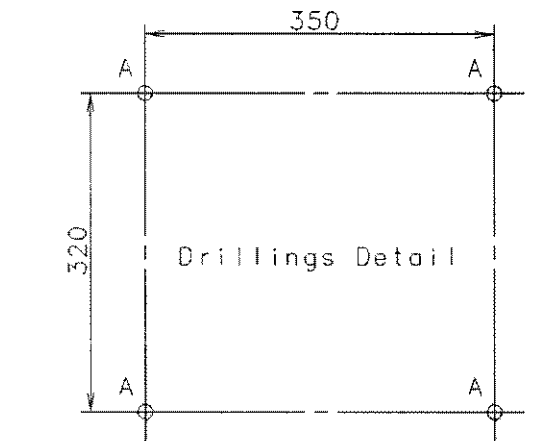
NOTES: 1) HOLE DETAIL:
'A': M6 CLEARANCE (4 OFF)

HHI-EMD drawing no.: A10-229529-2, (2/2page)

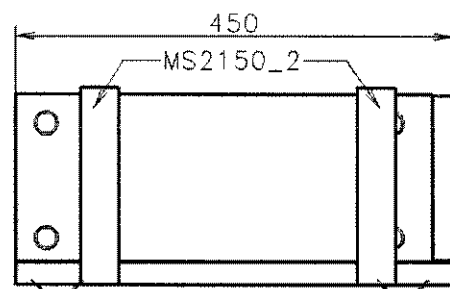
MARINER
SYSTEMS
(UK) LTD

USED IN CONJUNCTION WITH:
HP LA1951g 19" TFT MONITOR
(CONSOLE MOUNT)

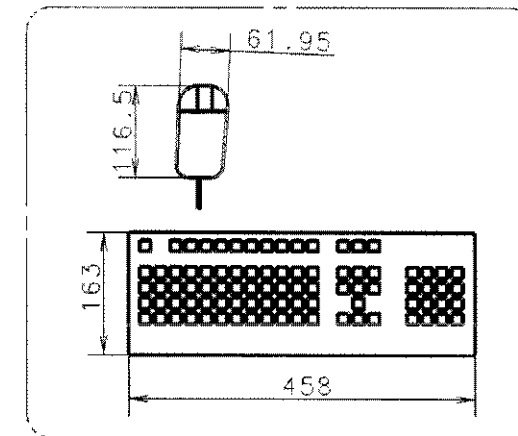
DRAWING TITLE: MS1090 DRILLING DETAIL
SCALE: DRAWN 1:1 DWG NO: MS1090_00
ISSUE: 1 DATE: 10 DEC 2009



FRONT ELEVATION



SIDE ELEVATION



Keyboard cable : PS2 type, 1.8m

Mouse cable : USB type, 1.8m

125 Make: 1421

455 Type: PMI/COCOS PC, with Marine KIT
HP Compaq dc7900 CMT
Power cable length : 1.8m

NOTES:

- 1) SECURE TRAY TO WORKTOP USING M6 x 30mm PAN(4 OFF)
- 2) MAXIMUM WORK TOP DEPTH ASSUMED TO BE 10mm
- 3) HOLE DETAILS:
'A': M6 CLEARANCE(4 OFF)
- 4) ALLOW 10mm CLEARANCE ON OVERALL DIMENSIONS FOR VIBRATION & BENTILATION
- 5) ANTI-VIBRATION MOUNT DETAIL: BARRY CONTROLS / STOP-CHOC MIJ99-00180(4 OFF)
- 6) COMPATIBLE ACCESSORIES: AB300, CM200, KB100

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Standard for surface roughness

The basic symbols and class numbers are in accordance with ISO 1302-1976.

Class No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
R _{max} value μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50

Tolerances for dimensions without tolerance indication(ISO 2768-1989)

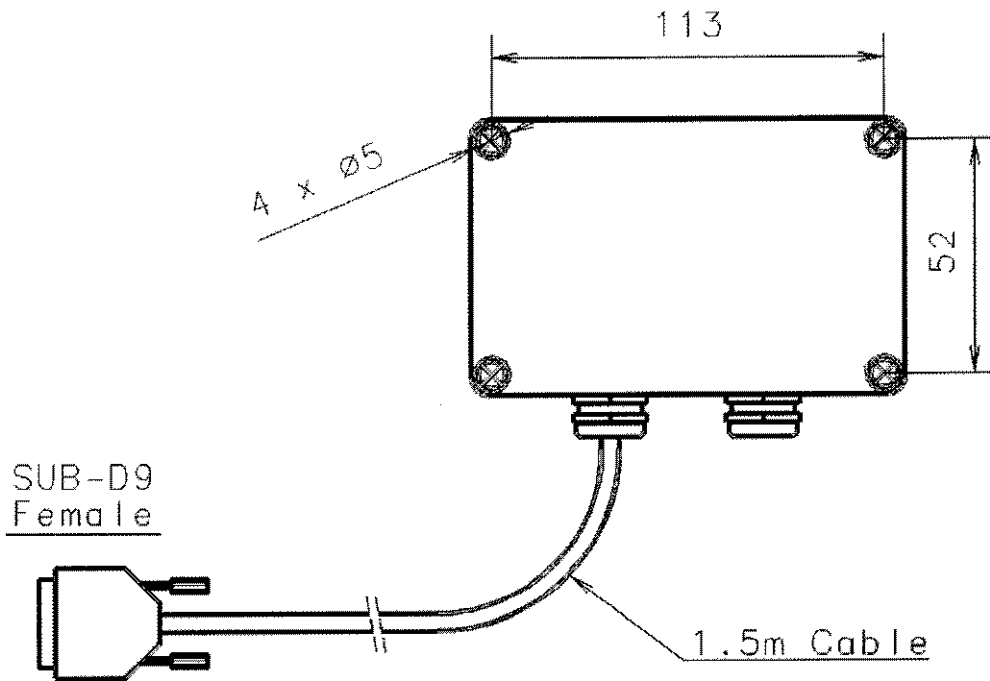
This standard states the permissible deviations for dimensions without direct tolerance indication on metallic components manufactured by machining.

Non-measurement	0.5	over 0.5	over 30	over 120	over 315	over 1000
Permissible deviation mm	up to 4	up to 30	up to 120	up to 315	up to 1000	up to 2000
Medium series	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2

Supplement Drawing No.:					Projection:		Mass (kg):		Material / Blank:			
					Licensor's Ident. no.:		Dist.:		Licensor's Material / Blank:			
					1881451-3.2							
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					*	Replaced by Ident. No.:					9	
					*						8	
					*						7	
					*						6	
					*						5	
					*						4	
					*						3	
					*						2	
					*						1	
					*						0	
111108KYYKYYJCM					*	Cable length added					9	
101122HHJHHJJCM					*	cable length added					8	
090720HHJHHJJCM					*	PC TYPE UPDATED					7	
060526BSHBSHJCM					*						6	
Similar Drawing No.:					Replacement of ident. No.:							
Scale:					Size:		Type:		Page No.:		HYUNDAI	
1:1					A3		ME/ME-C		01 (01)		HEAVY INDUSTRIES CO., LTD.	
Info. No.:					Descriptions:					Ident. No.:		
693150					PMI/COCOS-EDS PC					A13-323573-9		

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-125 Make:1368

-455 Type:77.1299.02

Supplement Dwg no.:		Projection:		Mass (kg):		Material / Blank:	
		Licensor's Ident. no.:		Dist.:		Licensor's Material / Blank:	
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				*	*		7
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				*	*		3
				*	*		2
				*	*		1
051129BYJBYJKJG				*	*		0
Similar Drawing No.:				Replacement of Ident. No.:			
Scale:	Size:	Type:		Page No.:		HYUNDAI HEAVY INDUSTRIES CO., LTD.	
1:1	A4	ME/ME-C		01 (01)			
Info. No.:		Description:				Ident. No.:	
691177		CONVERTER BOX FOR PMI				A14-272128-0	

PMI WIRING FOR SHIPYARD

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Standard for surface roughness												
The basic symbols and class numbers are in accordance with ISO 1302-1978.												
Class No.	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12
Ra	0,025	0,050	0,10	0,20	0,40	0,80	1,6	3,2	6,3	12,5	25	50

Tolerances for dimensions without tolerance indication (ISO 2768-1979)												
This system is valid for the production of parts without direct tolerance indications in technical drawings or drawings.												
Class No.	h1	h2	h3	h4	h5	h6	h7	h8	h9	h10	h11	h12
h1	±0,15	±0,10	±0,075	±0,050	±0,035	±0,025	±0,018	±0,012	±0,008	±0,005	±0,003	±0,002

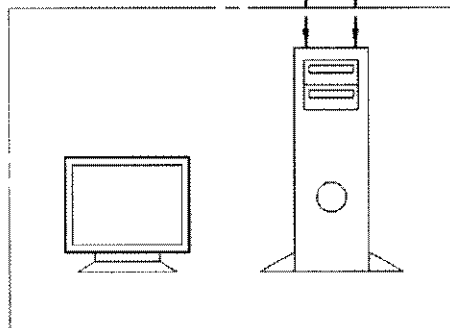
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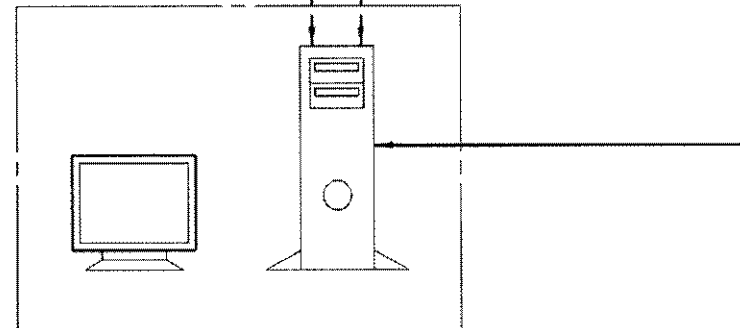
ECS Network A

ECS Network B

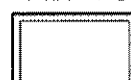
MOP A, Configuration



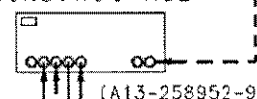
MOP B, Configuration



PMI PC

-WETH102
(A13-323574-0)

Ethernet HUB



(A13-258952-9)

24VDC Power Supply

(Power supply come from PDB on the engine control panel)

-WETH100
*Ethernet
(Shipyard supply)-WETH300
To Ship LAN
(Option)
-WETH201
** Serial from AMS
(Option)
* Ethernet cable from AMS
(Option)

(A13-323573-9)

-WETH200

* Ethernet cable from AMS

-WETH101
*Ethernet
(Shipyard supply)

Printer

(A12-353103-0)

- *) Ethernet, supply with HUB, cable length 10 metres
Type : RJ45, STP, (Shielded Twisted Pair), CAT5
#) AC220V Power supply form shipyard's UPS.
**) When the serial interface is needed

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Standard for surface roughness
The basic symbols and class numbers are in accordance with ISO 1502-1978.

Tolerances for dimensions without tolerance indication (ISO 2768-1989)
This standard classifies the permissible deviations for dimensions without direct tolerance indications on metallic components manufactured by machining.

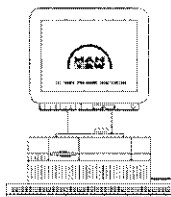
Class No.	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12
R _a max. value μm	0,025	0,05	0,1	0,2	0,4	0,6	1,6	3,2	6,3	12,5	25	50
Permissible deviations												
Medium series	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2						

Supplement Drawing no.:		Projection:		Mass (kg):		Material / Block:	
		A3					
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0787478-1		A92					
Date	Des.	Chk.	Appd.	A.C.	E	Change / Replacement	C.No
				*	*	Replaced by Ident. No.:	9
				*	*		8
				*	*		7
				*	*		6
110811	KYYKYYJCM	*	*	*	*	UP TO DATE.	5
090826	HHJHHJJCM	*	*	*	*	UP TO DATE.	4
090527	HHJHHJJCM	*	*	*	*	UP TO DATE.	3
090408	BSHBSSHJCM	*	*	*	*	CABLE SCOPE IS DEFINED	2
090107	HHJHHJJCM	*	*	*	*	UP TO DATE.	1
080623	BSHBSSHJCM	*	*	*	*		0
Similar Drawing No.:						Replacement of Ident. No.:	
N/S						A3	
Ethernet, ME-ECS						01 (01)	
Info. No.:						Description:	
7B4230						NETWORK	
Ident. No.:						A13-335097-4	

CONTROL ROOM

ENGINE SIDE

PERSONAL COMPUTER



Converter box

PMI 4

-WPMI-5

4x2x0.5 a

-WPMI

2x1.5 a

PDB

Junction box



Indicator cock

Cylinder cover

-WPMI-TSA

4x2x0.5 a

TSA-A

#) Cable delivered by Yord

*) Individually screened type cable

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Standard for unit components									
The following table shows the standard for unit components. The standard is given in the following table.									
Unit	NI	NI	NI	NI	NI	NI	NI	NI	NI
Unit	NI	NI	NI	NI	NI	NI	NI	NI	NI
Unit	NI	NI	NI	NI	NI	NI	NI	NI	NI
Unit	NI	NI	NI	NI	NI	NI	NI	NI	NI
Unit	NI	NI	NI	NI	NI	NI	NI	NI	NI
Unit	NI	NI	NI	NI	NI	NI	NI	NI	NI
Unit	NI	NI	NI	NI	NI	NI	NI	NI	NI
Unit	NI	NI	NI	NI	NI	NI	NI	NI	NI
Unit	NI	NI	NI	NI	NI	NI	NI	NI	NI

Standard for unit components									
The following table shows the standard for unit components. The standard is given in the following table.									
Unit	NI	NI	NI	NI	NI	NI	NI	NI	NI
Unit	NI	NI	NI	NI	NI	NI	NI	NI	NI
Unit	NI	NI	NI	NI	NI	NI	NI	NI	NI
Unit	NI	NI	NI	NI	NI	NI	NI	NI	NI
Unit	NI	NI	NI	NI	NI	NI	NI	NI	NI
Unit	NI	NI	NI	NI	NI	NI	NI	NI	NI
Unit	NI	NI	NI	NI	NI	NI	NI	NI	NI
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Unit	NI	NI	NI	NI	NI	NI	NI	NI	NI

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Check: 335411		Date: 1982	
Approval: 335411		Date: 1982	
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Unit: 335411		Date: 1982	
Weight: 335411		Date: 1982	
Volume: 335411		Date: 1982	
Surface: 335411		Date: 1982	
Perimeter: 335411		Date: 1982	
Area: 335411		Date: 1982	
Length: 335411		Date: 1982	
Width: 335411		Date: 1982	
Height: 335411		Date: 1982	
Depth: 335411		Date: 1982	
Radius: 335411		Date: 1982	
Diameter: 335411		Date: 1982	
Circumference: 335411		Date: 1982	
Volume: 335411		Date: 1982	
Weight: 335411		Date: 1982	
Quantity: 335411		Date: 1982	
Unit: 335411		Date: 1982	
Weight: 335411		Date: 1982	
Volume: 335411		Date: 1982	
Surface: 335411		Date: 1982	
Perimeter: 335411		Date: 1982	
Area: 335411		Date: 1982	
Length: 335411		Date: 1982	
Width: 335411		Date: 1982	
Height: 335411		Date: 1982	
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Radius: 335411		Date: 1982	
Diameter: 335411		Date: 1982	
Circumference: 335411		Date: 1982	
Volume: 335411		Date: 1982	
Weight: 335411		Date: 1982	
Quantity: 335411		Date: 1982	
Unit: 335411		Date: 1982	
Weight: 335411		Date: 1982	

					S. PAGE	T. PAGE
PLAN HISTORY				ENGINE TYPE	HYUNDAI - MAN B&W 6S90ME-C8.2	
				MESSRS.	H.H.I.	
				RULE	LR + UMS	
				SHIP NO.	2585/86/87/88/89	
				ENG. NO.	AA4624/25/26/27/28	
TITLE : BEARING WEAR MONITORING SYSTEM						
Date	Des.	Drk.	Appd.	A.C	Replaced by Ident.no.1	Replacement for Ident.no.1
20110718	BSH	BSH	JCM		FOR WORKING.	
20110217	BSH	BSH	JCM			
Licensor Ident.no.1				Type		
Info.no.1				Description		
Page.no.1 (01) 01				Security: C		
				6S90ME-C		Ident.no.1 A14-413514-7
				BEARING WEAR MONITORING SYSTEM		

PROJECT INFORMATION:

CUSTOMER : HHL-EMD

SHIP OWNER : BRIGHT PETROLEUM HK

HULL NO. : 2585-89

SHIP YARD : H.F.I

CLASS : LR

MAIN ENGINE TYPE : HYUNDAI-MAN B&W 6S90ME-C

DATE	MARK	DESCRIPTION	DESIGN	CHECK	APPR.
21-Feb-11		1.Prepared the approval drawing.	JWJ	KWL	KWL
29-Jul-11		1. Changed Hull no. H2484-88 to H2585-89.	MHG	DJS	KWL

Bearing Wear Monitoring System

CONTENTS OF DRAWINGS

CHAPTER 01: Scope of supply

CHAPTER 02: Project drawing

System Lay-out	1166695	B
CAN + power, internal wiring diagram	1166701	B

CHAPTER 03: Bearing Monitoring, Located: ECC

DGU module	HA460346	C2
PSO-P	HA464061	B

CHAPTER 04: Bearing Monitoring, Located: Engine

Engine layout	338640	A
Installation drawing engine	338641	A
Machining instructions	338638	A
BWM sensor PSS11	340912	A
Offset tool	339261	A
Cables inside engine	UX-788	D
Cables outside engine	UX-808	C
Cable gland	PS-045	A
Sensor bracket	338677	B
Engine end connection box	353392	B

CHAPTER 05: Cable specification

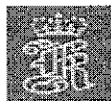
Cable list	AO-17959	P
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Chapter.1

Scope of supply

Packing & Supply List

2/21/2011



KONGSBERG

System: Sensor System.
Engine type: HYUNDAI-MAN B&W 6S90ME-C
Project Manager: K.W.L

Owner: BRIGHT PETROLEUM HK
Yard: H.H.I
Hull: 2585-89

Supply no:	Item no:	Unit:	Maker:	Ordered:	Dwg No.	Remarks
------------	----------	-------	--------	----------	---------	---------

Bearing Monitoring, Located: ECC						
1	8100272	DGU Module	KM-T	2		
2	8100334	PSO-P	KM-T	1		
Bearing Monitoring, Located: Engine						
3	329419	Sensor kit PS-11 (Containing Sensor, washers & nuts)	KM-T	12	340912	
4	338445	Offset gauge tool for PS-11	KM-T	1	339261	
5	314947	Cable gland, M20x1.5	KM-T	14	PS-045	
6	313756	CANopen Cable 7/8" - 7/8" 1.0m	KM-T	1	UX-808	
7	313760	CANopen Cable 7/8" - 7/8" 2.0m	KM-T	1	UX-808	
8	316423	CANopen Cable 7/8" - 7/8" 3.0m	KM-T	5	UX-808	
9	313749	CANopen T-piece 7/8" - M12 - 7/8"	KM-T	7	UX-808	
10	313750	CANopen Male Terminating Resistor 7/8" 120 ohm	KM-T	2	UX-808	
11	310826	CANopen cable M12-M12 0.5m	KM-T	5	UX-788	
12	313748	CANopen cable M12-M12 5.0m	KM-T	7	UX-788	

Packing & Supply List

2/21/2011



KONGSBERG

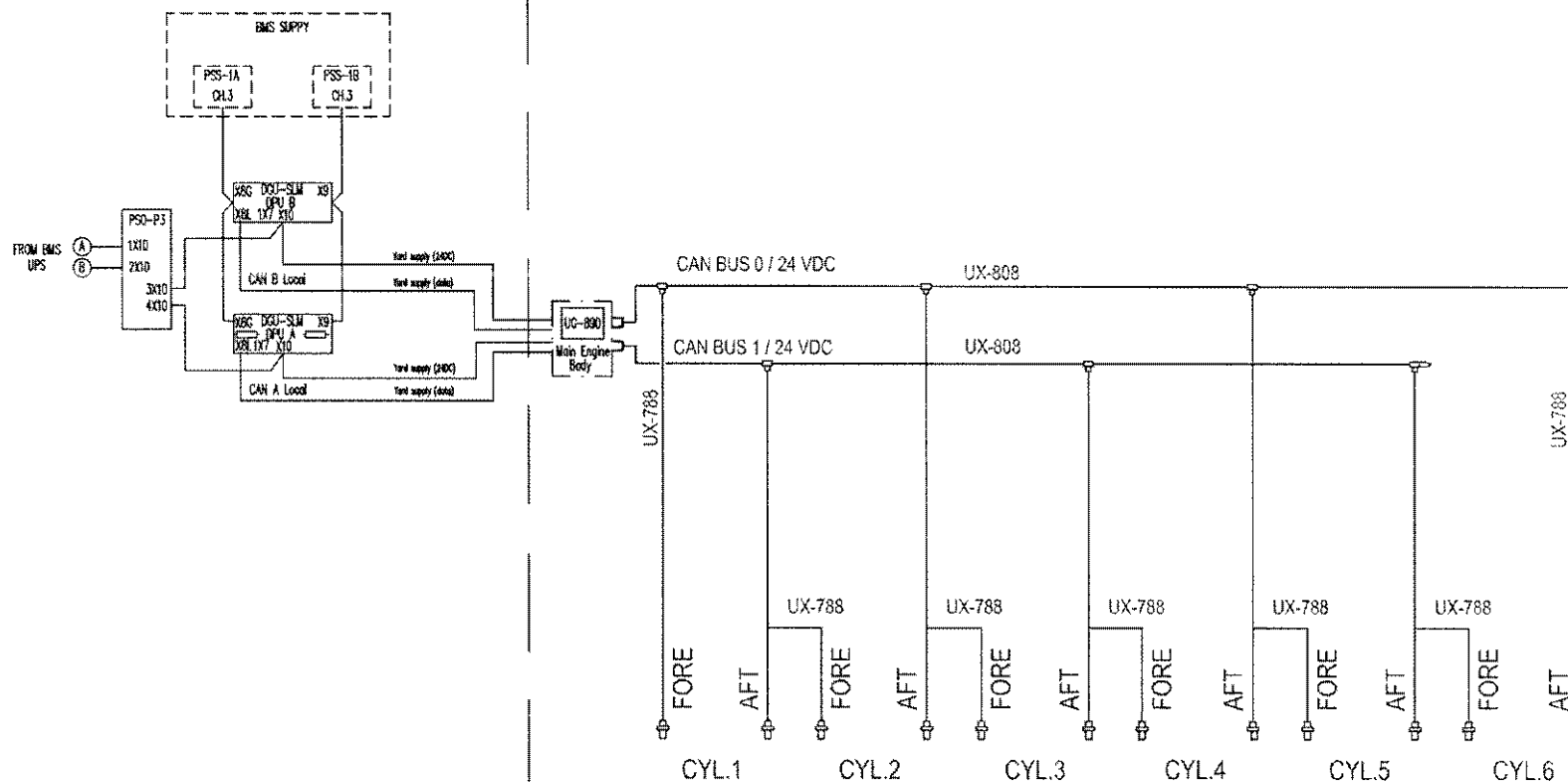
System: Sensor System.
 Engine type: HYUNDAI-MAN B&W 6S90ME-C
 Project Manager: K.W.L

Owner: BRIGHT PETROLEUM HK
 Yard: H.H.I
 Hull: 2585-89

Supply no:	Item no:	Unit:	Maker:	Ordered:	Dwg No.	Remarks
13	344433	CANopen Y-piece M12	KM-T	5	UX-788	
14	338439	Bracket	KM-T	7	338677	
15	353392	Engine Connection box, standard type. Cable Ø4.5 -10mm	KM-T	1	UG-890	
16	UT-283	Fastening equipment	KM-T	60	UT-283	
17	UTN011/6L	Screw, M6x25, DIN 912, Allan key	KM-T	2		
18	6261-001.0100	Lock wire, Ø1	KM-T	15		
19	6570-025.0011	Panduit, PA6	KM-T	100		
20	UT-226/14	Washer Ø8x4.3mm, brass	KM-T	7		
21	UTN011/4N	Screw, M4x35, DIN 912, Allan key	KM-T	7		
SPARE PARTS						
22	329419	Bearing Wear sensor kit	KM-T	1	340912	Sensor,

Chapter.2

Project Drawing



ECC

ENGINE ROOM

NOTE 1:

X10, VOLTAGE TO EACH 24VDC CONSUMER MUST BE BETWEEN 18-32V DC, MAX ±5% RIPPLE, VOLTAGE LOSS IN CABLES TO BE CALCULATED BY THE CUSTOMER. REF CHAPTER 10 FOR FUSE DISTRIBUTION AND POWER CONSUMPTION.

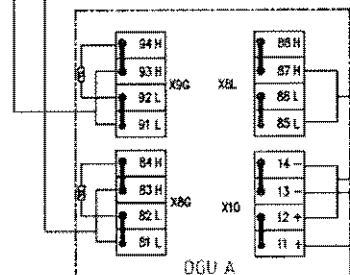
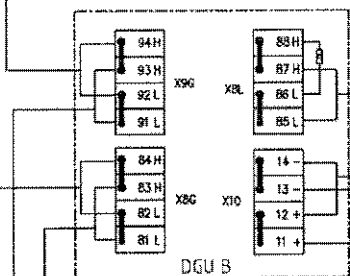
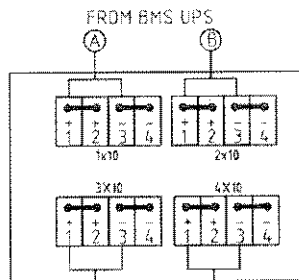
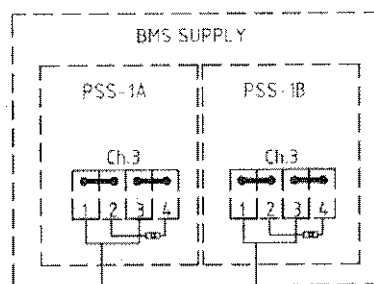
NOTE 2:

ALL BOLD CABLES AND JUNCTION BOXES ARE YARD SUPPLY EXCEPT CABLES MARKED W00-W039, REF CHAPTER 1 CABLE LIST.

NOTE 3:

24VDC UPS TO EACH DPU (X10) & PSC MUST HAVE TWO DIFFERENT 24V DC DPUs WITH CONTROL UNDER & PSC MUST HAVE SEGREGATION IN 24VDC SUPPLY

A	21.02.2011	1 PROD ISSUE		JWJ	JWJ	KWL
REV	DATE	DESCRIPTION	Designed by	Checked by	Approved by	
Yard/ Unit No.						
H2585-89						
 KONGSBERG			Kongsberg Maritime AS Merchant Automation Horten		Title Bearing Wear Monitoring System Combined with AC-C20	
Project / Product name: BWCM			Project number:		Drawing type: System drawing	
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REMARK

1. UX-808, UX-788 are KONGSBERG SUPPLY
SEE DWG UX-808, UX-788
2. W201, W203, W231 are yard cable
SEE DWG A0-17959N
3. CAN bus / Power
Optional for W203/W231 dual
CANopen/Power cable 310443 see UX-808
4. T3 : terminal resistor 120 ohm +- 1%/ 1W
5. TWIST PAIR W/BRAIDED SCREEN.

CAN B

CAN A

W231

ENGINE ROOM

UX-808 UX-808

CAN A CAN B

ECC

A	21.02.2011	Prod Issue	JWJ	JWJ	KWL
REV.	DATE	DESCRIPTION	Designed by	Checked by	Approved by
Yard/ Hull No. H2585-89					
 Kongsberg Maritime AS Merchant Marine Division Trondheim			Title Bearing Wear Monitoring System Combined with AC-C20		Sheet 1/1 Size A4 Scale
Project / Product name		Project number	Drawing type Internal Wiring Diagram		
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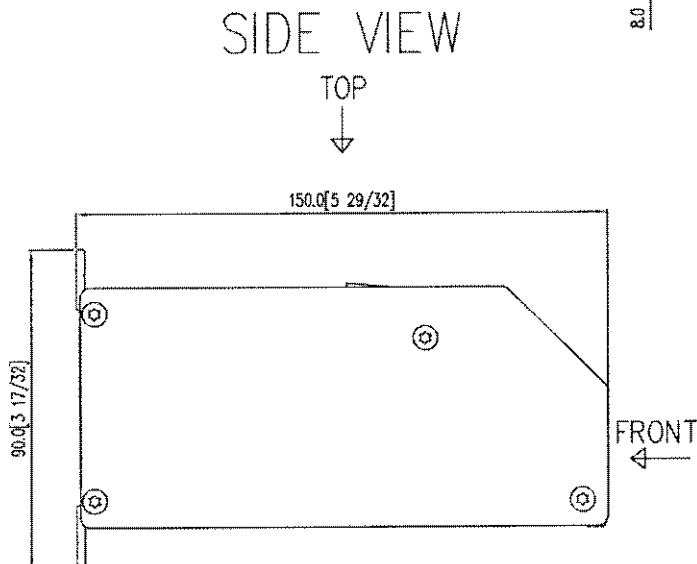
Chapter.3

Bearing Wear Monitoirng

Located : ECC

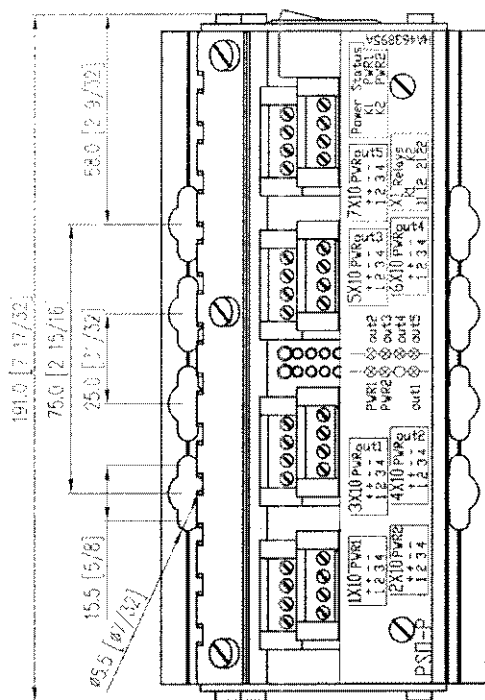


TWO SCREWS IN EACH END OF MODULE

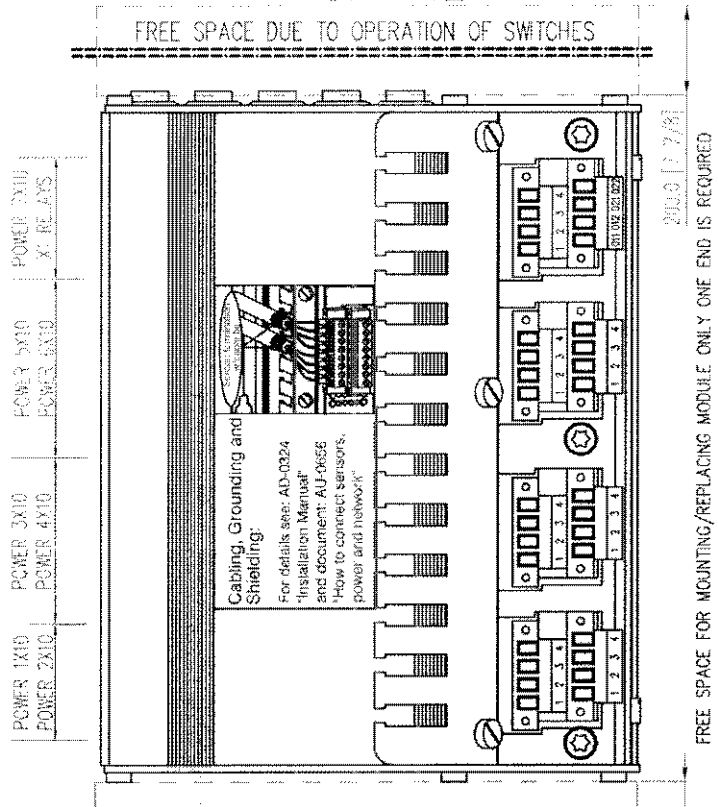


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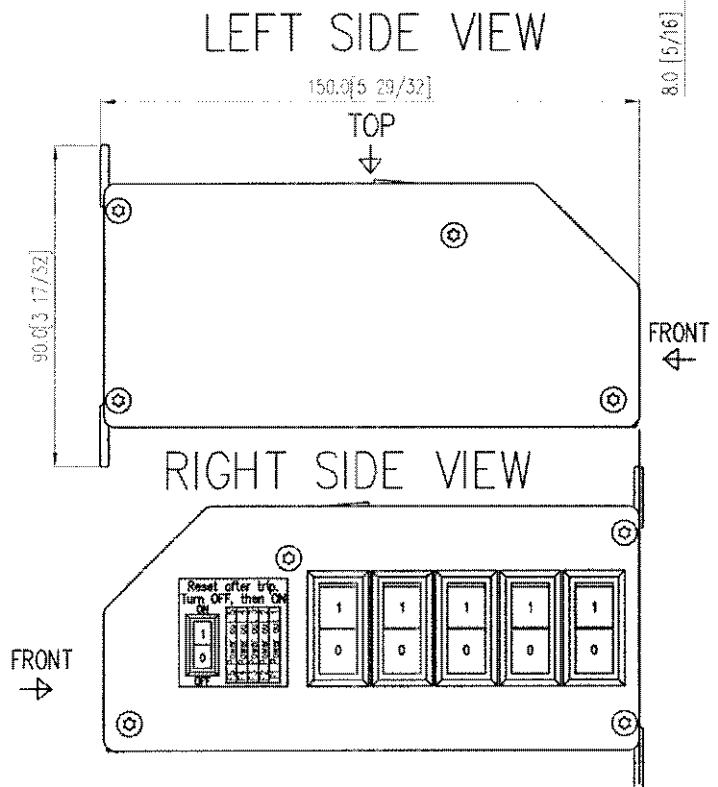
FRONT VIEW



TOP VIEW



LEFT SIDE VIEW



NOTES

FUZE SIZE	: 3A
GENERAL DIMENSION	
TOLERANCES	: +/-0.2mm 1/128inch
MOUNTING	: TO BE MOUNTED IN CABINET
INGRESS PROTECTION	: IP20
WEIGHT	: 0.9KG(4.2lbs)
WIRE CONNECTIONS	: 2.5MM2 MAX
MEASURES	: IN MM(INCH) KG(lbs)
FIX WITH	: 4 SCREWS; M5
TWO SCREWS IN EACH END OF MODULE	

B	21.10.2005	AUE-1277	BSK	BSK	TDS
REV.	DATE	DESCRIPTION	Designed by	Checked by	Approved by

Yard/ Hull No.



KONGSBERG

Kongsberg Maritime AS

Merchant Automation

Horten

Title	PSO-P module
-------	--------------

Sheet

11

Size	
------	--

A4

Scale

Project / Product name
Article number: 8100334

Project number

Drawing type	Dimension and fixing
--------------	----------------------

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Page 12 of 3

Document ID

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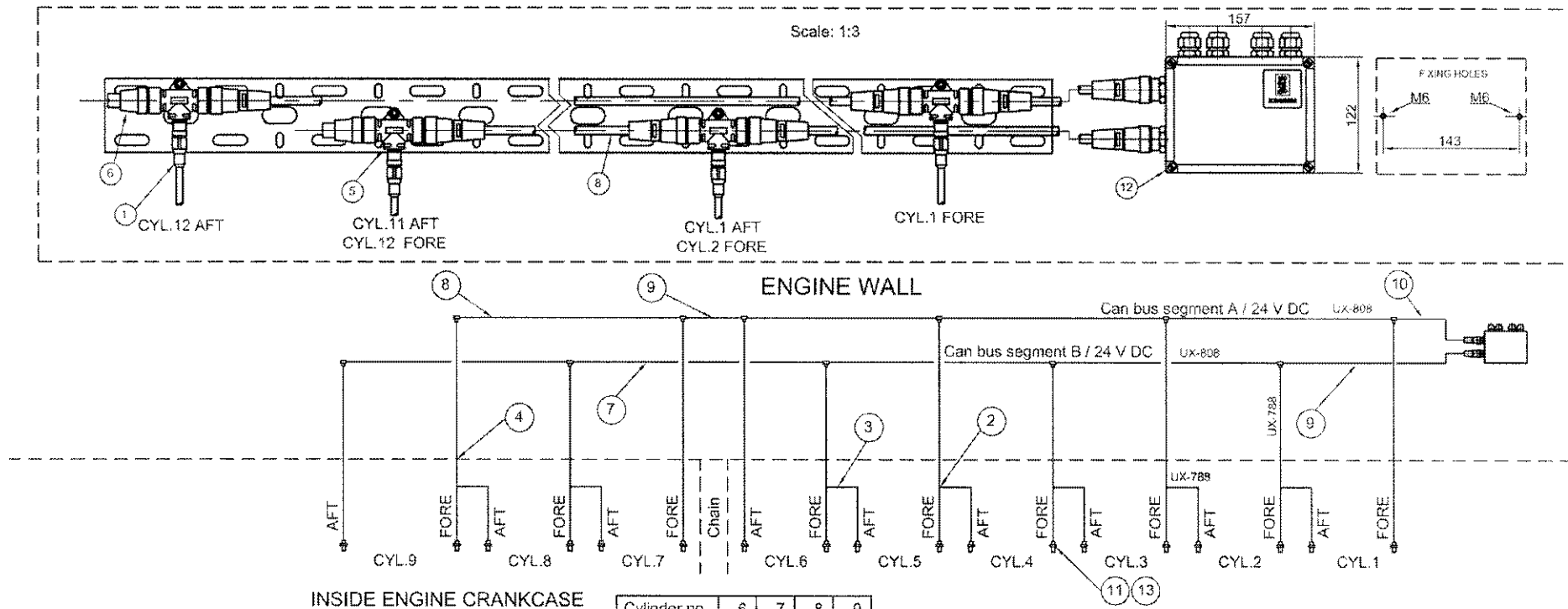
Revision/Version

B

Chapter.4

Bearing Wear Monitoirng

Located : Engine

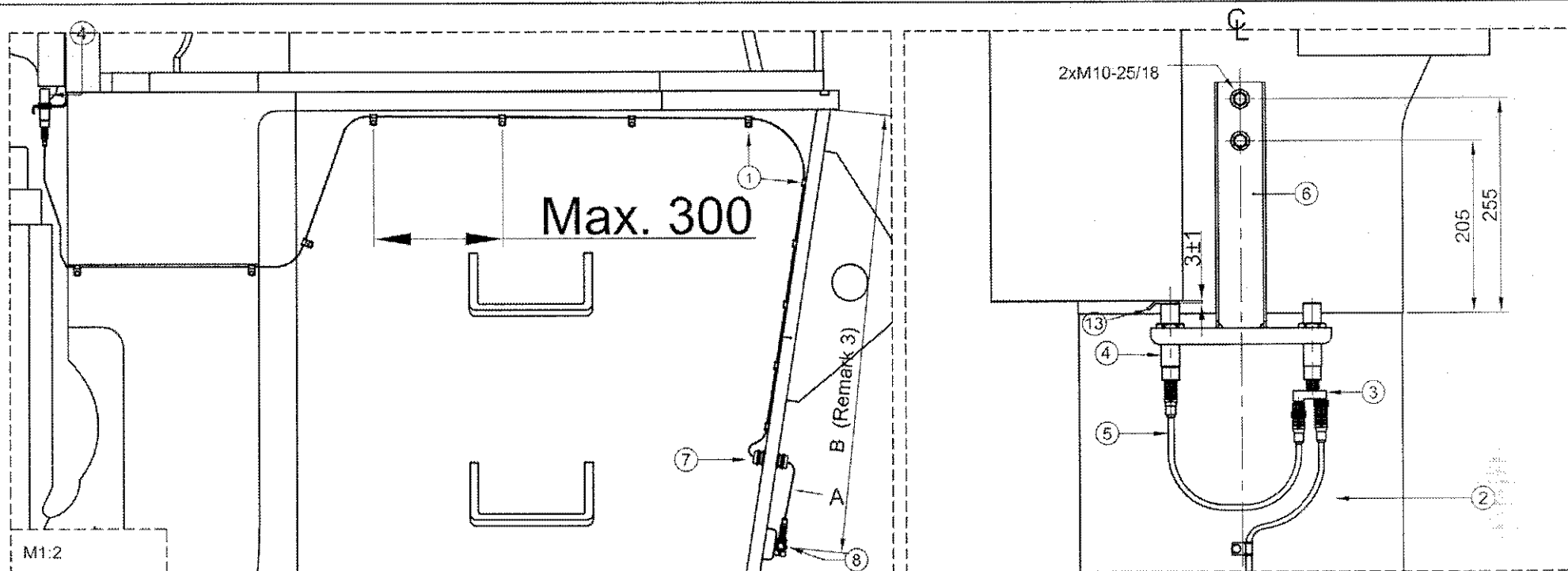


Cylinder no.	6	7	8	9				
Qty.	7	8	9	11	13	Bracket	338439	
	1	1	1	1	12	Connection box	UG-890	
	12	14	16	18	11	Bearing Wear sensor kit PS-11	329419	Sensor, magnet and nut's
	1	1	1	1	10	CANopen Trunk 1,0m 7/8" - 7/8"	313756	See drawing UX-808
	1	1	1	2	9	CANopen Trunk 2,0m 7/8" - 7/8"	313760	See drawing UX-808
	5	6	7	7	8	CANopen Trunk 3,0m 7/8" - 7/8"	316423	See drawing UX-808
	-	-	-	1	7	CANopen Trunk 4,0m 7/8" - 7/8"	316427	See drawing UX-808
	2	2	2	2	6	CANopen Male Term. Resistor 7/8"	313750	120 ohm, see drawing UX-808
	7	8	9	11	5	CANopen T-piece 7/8" - M12 - 7/8"	313749	see drawing UX-808
	14	16	18	22	4	CABLE GLAND M20x1,5 WITH SPLIT	314947	For M12 connector
	5	6	7	7	3	CANopen cable 0,5m M12 - M12	310826	see drawing UX-788
	5	6	7	7	2	CANopen Y-piece M12	312029	see drawing UX-788
7	8	9	11	1	CANopen cable 5,0m M12 - M12	313748	see drawing UX-788	

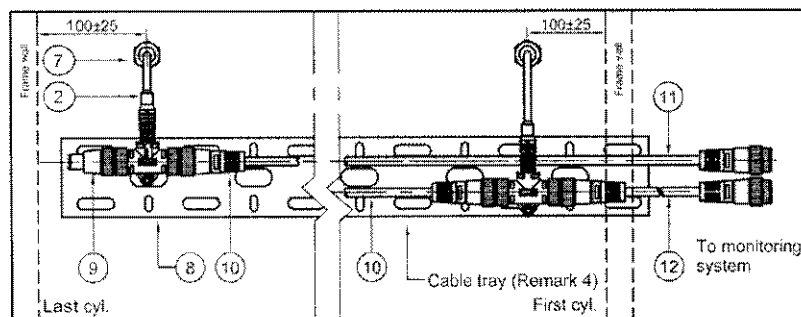
Remarks:

1. Optimal for connection box: CANopen cable 7/8"-open ended 20 - 35 [m] see UX-808
2. Brackets and fastening equipment: see engine specific drawings
3. Distribution of sensors on CAN segments:
A: 1FORE, 2AFT, 3FORE, 4AFT, 5FORE, 6AFT, 7FORE, 8AFT, 9FORE
B: 1AFT, 2FORE, 3AFT, 4FORE, 5AFT, 6FORE, 7AFT, 8FORE, 9AFT
4. CAN bus / Power
Cable type: CANopen bus cable - Individually and collectively screened.
5. VOLTAGE TO EACH 24VDC CONSUMER MUST BE BETWEEN 18-32V DC.
MAX ±5% RIPPLE.
SEE DOC. AO-18211E POWER CONSUMPTION.
6. Cable list SEE DOC. cablesens ce.

Pos.	Name, Type, Dim	Article no., spec.	Remarks
A	02.11.2009		RH TG MaV
REV.	DATE	DESCRIPTION	Designed by Checked by Approved by
Yard Hull No.			
 Kongsberg Maritime AS Merchant Automation Trondheim		Title: Bearing Wear Monitoring MAN B&W S90MC-C/ME-C	Sheet: 1/1 Size: A3 Scale:
Project / Product name: Bearing Wear Monitoring		Project number:	Drawing type: System Layout
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View A



Remarks

1. Use installation tool 338445 to get the right distance between guide shoe and PS-11.
2. See dwg 338638 for machining details.
3. When using a standard cable [pos 2], B must be maximum 2 m
4. Project specific equipment, to be delivered by builder/shipowner
5. See drawings by MAN for details of cable protection inside crank case. Optional installation on exhaust side of engine is shown in this drawing.
6. The sensor and brackets can be mounted on manouver- or exhaust side
7. See dwg. 338640 for correct scope of supply.

13	Offset gauge tool	338445	One per engine
12	CANopen Trunk 1,0m 7/8" - 7/8"	313756	See drawing UX-808
11	CANopen Trunk 1,5m 7/8" - 7/8"	313759	See drawing UX-808
10	CANopen Trunk 2,0m 7/8" - 7/8"	313760	See drawing UX-808
9	CANopen Male Term. Resistor 7/8"	313750	120 ohm, see dwg UX-808
8	CANopen T-piece 7/8"-M12-7/8"	313749	See drawing UX-808
7	CABLE GLAND M20x1,5 WITH SPLIT	314947	For M12 connector
6	Bracket	338439	
5	CANopen cable 0,3m M12 - M12	313733	See drawing UX-788
4	Bearing wear sensor kit PS-11	329419	
3	CANopen Y-piece M12	312029	See drawing UX-788
2	CANopen cable 5,0m M12 - M12	313748	See dwg UX-788
1	Fastening equipment	UT-283	OPTION, see rem. 5

Qty.	Pos.	Name, Type, Dim	Article no., spec.	Remarks		
A	02.11.2009	First issue		RH	TG	MaV
REV.	DATE	DESCRIPTION		Designed by	Checked by	Approved by

Yard HUS No.



Kongsberg Maritime AS

Merchant Automation
TrondheimProject / Product name
Bearing Wear Monitoring

Project number

Title

Installation of
Bearing Wear Monitoring Type PS-11
Man B&W S90MC-C/ME-CDrawing type
SYSTEM LAY-OUT

Document ID

338641

Sheet

1/1

Size

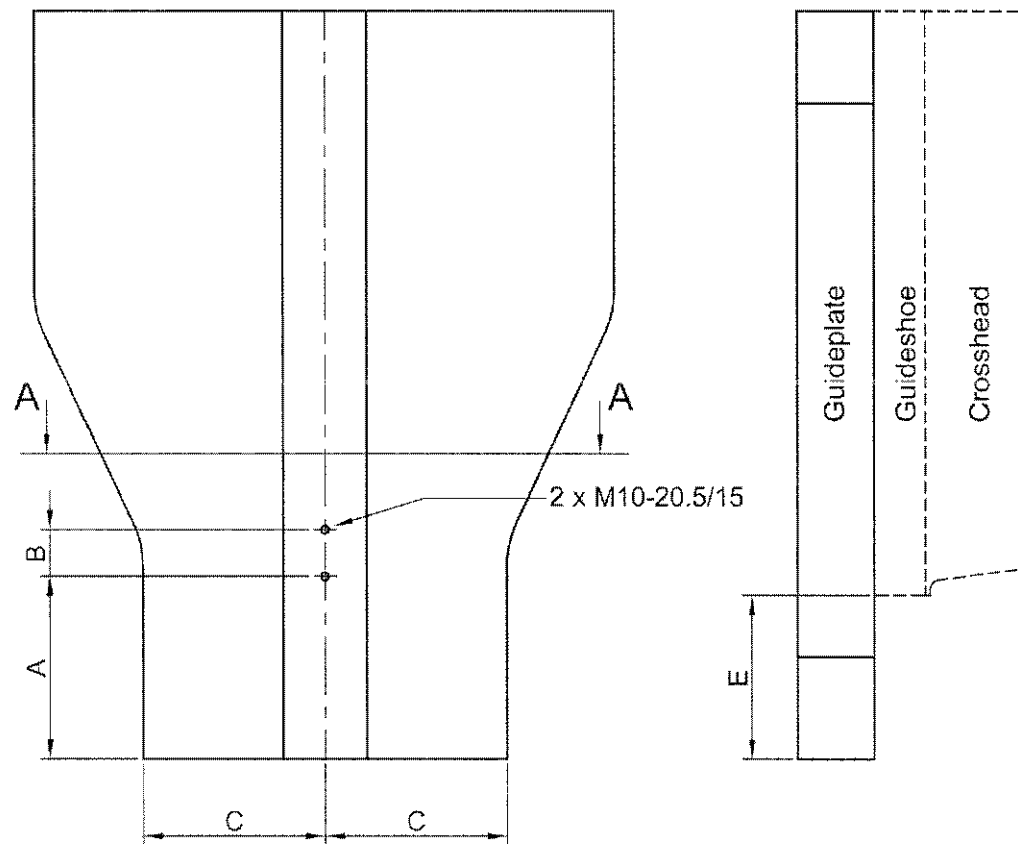
A3

Scale

Revision/Version

A

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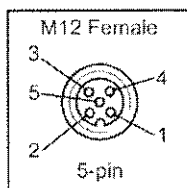
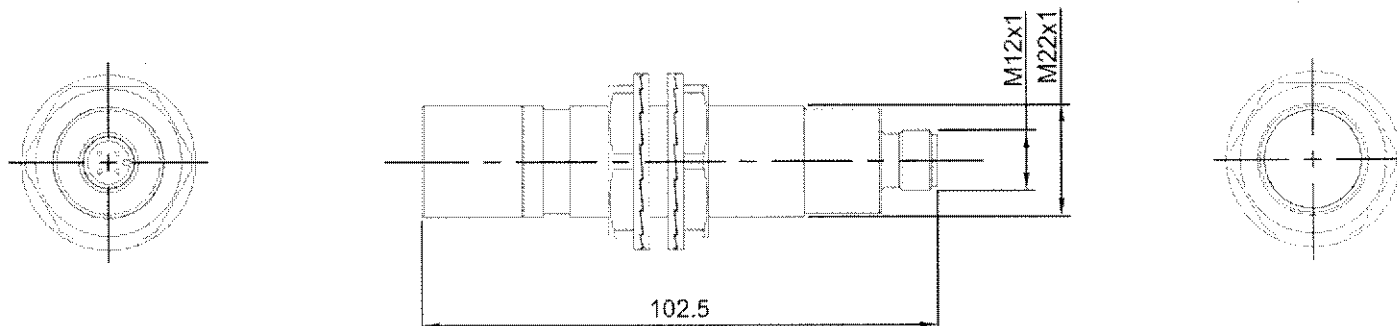
Engine	A	B	C	D	E	F	Inst. dwg
S80MC-C	390	50	150	1	210	90	338637
K80ME-C9	389	40	145	1	375	90	340135
S80ME-C9	374	40	145	1	360	90	340125
S90MC-C/ME-C	206	50	180	1	26	80	338641
K98MC/ME/ MC-C/ME-C	195	50	195	1	15	90	338645

Based on MAN B&W no: 5068368-7

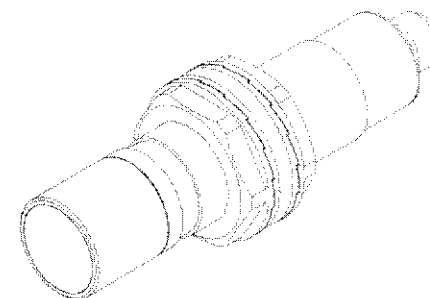
Note:

Customer always has to use current MAN B&W original drawing as sufficient underlay

A	09.11.2009	First issue	RH	TG	MaV
REV.	DATE	DESCRIPTION	Designed by	Checked by	Approved by
Yard/ Pull No.					
 KONGSBERG		Kongsberg Maritime AS Merchant Automation Trondheim	Title Machining instructions Bearing Wear Monitoring MAN B&W		Sheet 1/1 Size A3 Scale
Project / Product name Bearing Wear Monitoring		Project number	Drawing type DETAIL DRAWING	Revision/Version  A	
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			Document ID 338638		



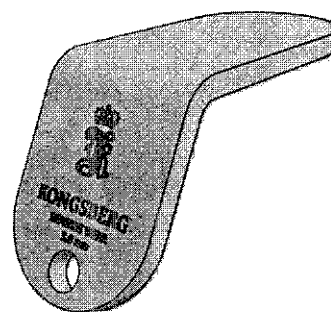
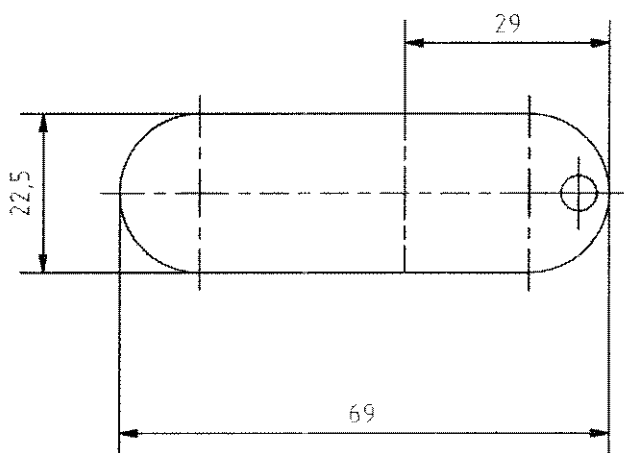
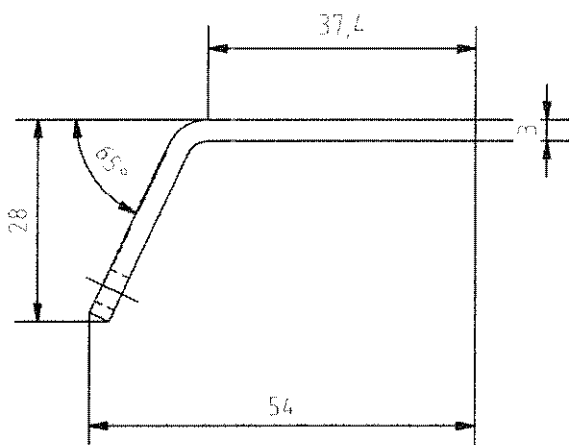
- 1 Shield
2 Power +24V, Red
3 Power 0V, Black
4 CAN High, White
5 CAN Low, Blue



Remarks:

1. Power : 24VDC
2. Output : CANOpen
3. Max. working temperature : 85°C.
4. Protection: IP67
5. Material, sensor body: AISI 304, nickel plated brass
6. Weight: 160 g
7. Connection cable: see dwg UX-788
8. Measuring range: 0-6 mm
9. Mounting distance from reference point: 3±1 mm

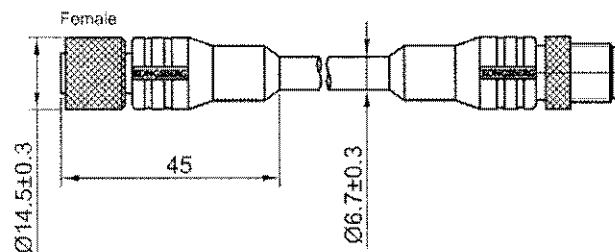
A	13.11.2009	Released	RH	TGJ	MaV
REV.	DATE	DESCRIPTION	Designed by	Checked by	Approved by
Yard/HR No.					
 Kongsberg Merchant Automation Trondheim			Title		Sheet
			Bearing Wear Monitoring Sensor type PS-11		1/1
Project / Product name			Item no: 329419	Size	A3
			Drawing type	Scale	
			Dimensional sketch		
			Document ID		
			340912		
				Revision/Version	A



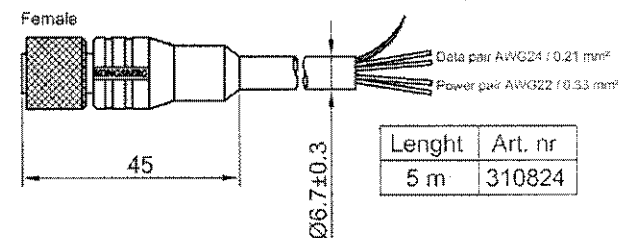
A	02.10.09	Prod.Issue	RH		MaV
REV.	DATE	DESCRIPTION	Designed by	Checked by	Approved by
Material: AISI 304			Tolerances unless otherwise stated: ISO2768-mK		
Surface treatment:			Broken edges: 0,1 - 0,5 x 45°		
			Surface: Ra 3,2		Threads: 6g/6H
 Kongsberg Maritime AS Merchant Marine Division Trondheim			Title Bearing Wear Monitoring Offset gauge tool for PSS11		Sheet
					1 / 1
					Size
					A4
Project / Product name Bearing Wear Monitoring			Project number Item no: 338445		Scale
					1:1
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					A
			Document ID 339261		

Lenght	Art. nr
0.3 m	313733
0.5 m	310826
1.0 m	310827
2.0 m	314948
3.0 m	316429
4.0 m	320595
5.0 m	313748

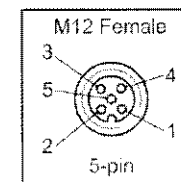
CANopen cable M12 - M12



CANopen Cable M12- open ended

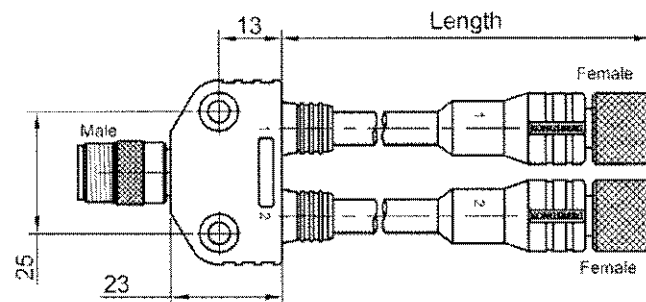


Lenght	Art. nr
5 m	310824

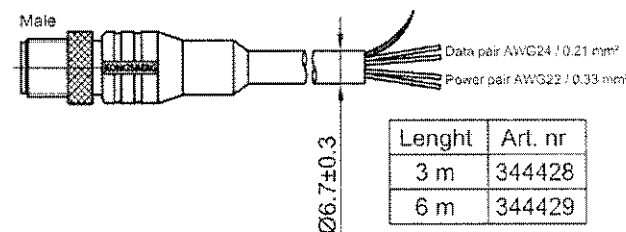


- 1 Shield
2 Power +24V, Red
3 Power 0V, Black
4 CAN High, White
5 CAN Low, Blue

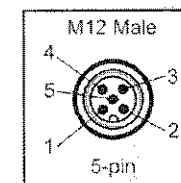
CANopen Y-piece M12 w. cables



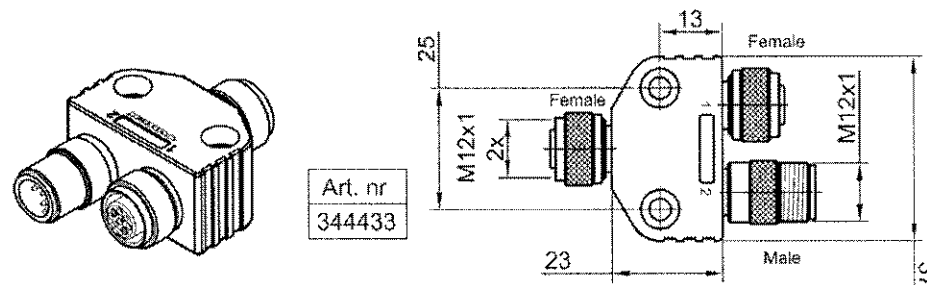
Lenght	Art. nr
0.3 m	344424



Lenght	Art. nr
3 m	344428
6 m	344429

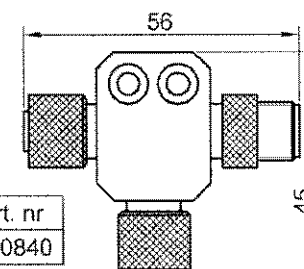


CANopen Y-piece M12



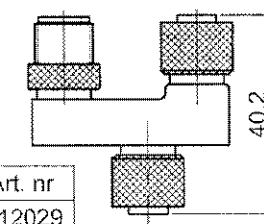
Art. nr
344433

CANopen T-piece M12



Art. nr
310840

CANopen Y-piece M12



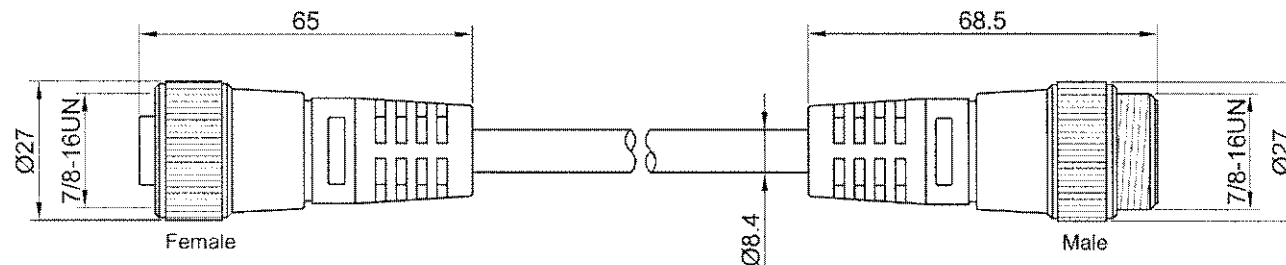
Art. nr
312029

REMARKS:

- Operating temperature: -25 - 80°C
- Material cable: PUR
- Material con./cap nut: CuZn, nickel plated
- Material moulded body: TPU and PUR
- Protection grade: IP 67 in locked position
- Cable impedance: 120 ohm
- See connection dwg PS-008

Drop line		
Data rate	Max	Cumulative
125 kb	6 m	156 m

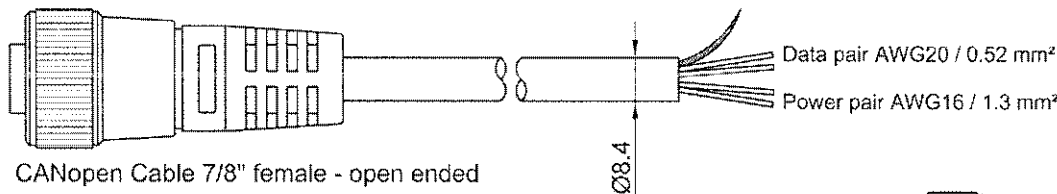
D	2010-02-17	New items in	MaV	TGJ	MaV
A	2006-03-02	-	VRa	MaV	AJa
REV.	DATE	DESCRIPTION	Designed by	Checked by	Approved by
Material: -			Tolerances unless otherwise stated: ISO 2768-mS		
Surface treatment: -			Broken edges: 0.1-0.5 x 45°		
Kongsberg Maritime AS			Title		
Merchant Marine Division			M12 Cordset and T- and Y-pieces		
Trondheim			for CANopen - Drop lines and		
			Bearing Wear Sensors		
Project / Product name			Drawing type		
			DIMENSIONAL SKETCH		
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			UX-788		
			Rev. no.		
			D		



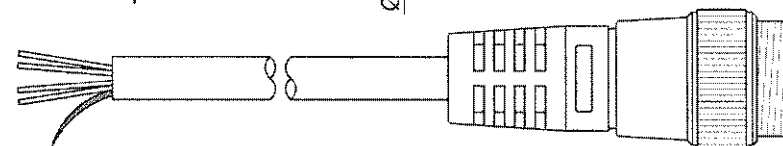
CANopen Cable 7/8" - 7/8"

Lenght	Art. nr
1.0 m	313756
1.5 m	313759
2.0 m	313760
3.0 m	316423
4.0 m	316427
5.0 m	319834

Lenght	Art. nr
20 m	313761
25 m	313762
30 m	313763
35 m	313765

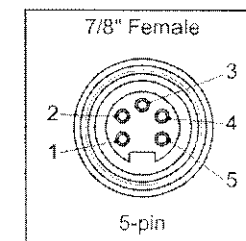
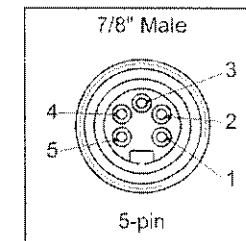


CANopen Cable 7/8" female - open ended

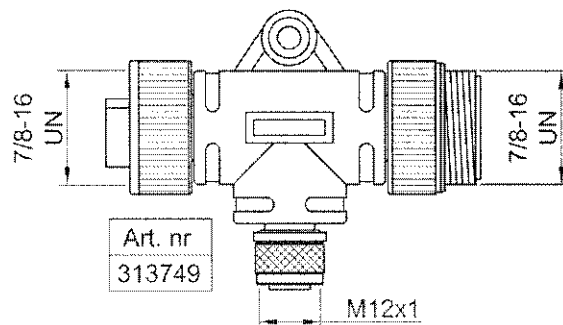


CANopen Cable 7/8" male - open ended

Lenght	Art. nr
30 m	329600

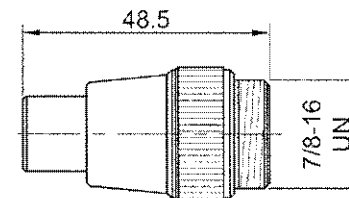


- 1 Shield
- 2 Power +24V, Red
- 3 Power 0V, Black
- 4 CAN High, White
- 5 CAN Low, Blue



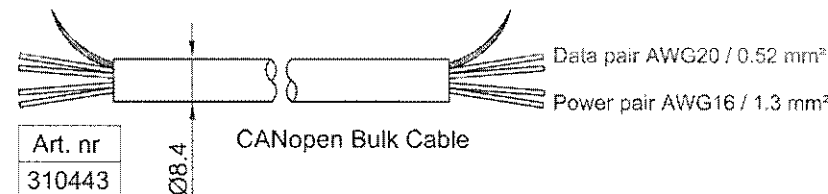
CANopen T-piece 7/8" - M12 - 7/8"

Art. nr
313749



CANopen Male Terminating Resistor 7/8" 120 ohm

Art. nr
313750



CANopen Bulk Cable

Art. nr
310443

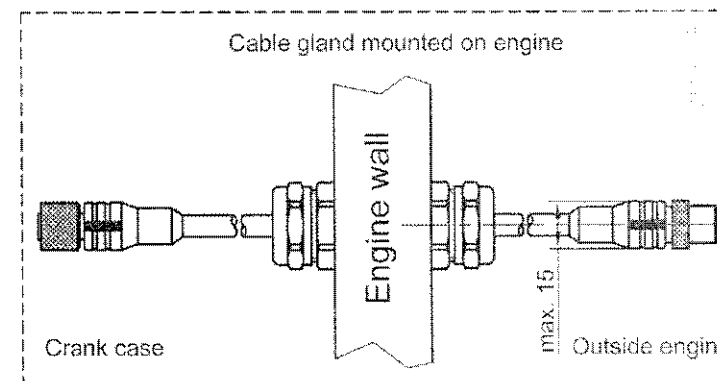
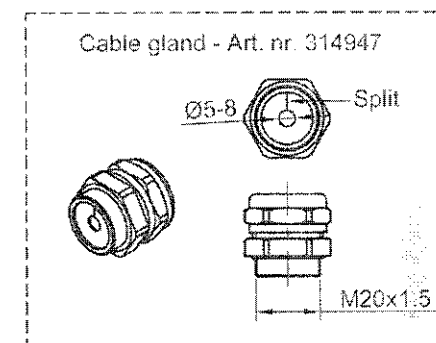
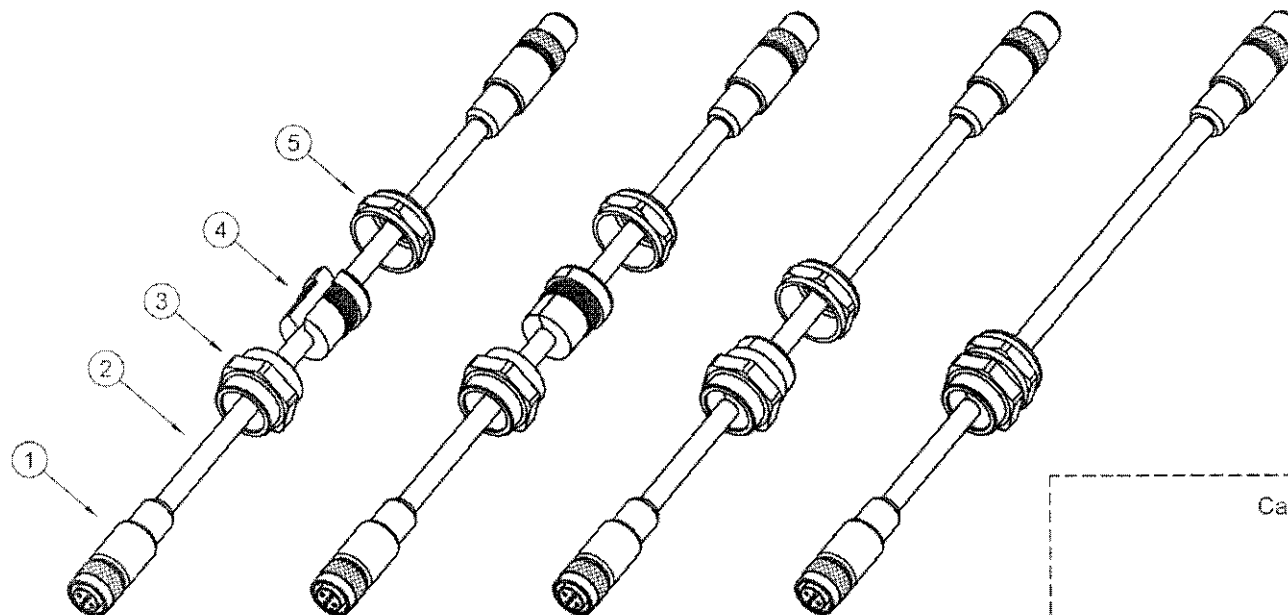
REMARKS:

- Operating temperature: -25 - 80°C
- Material cable: Oilresistant PVC
- Material con./cap nut: CuZn, nickel plated
- Material moulded body: TPU and PUR
- Protection grade: IP 67 in locked position
- Cable impedance: 120 ohm
- See connection dwg PS-008

Data rate	Maximum lenght
125 kb	300 m

C	15.12.09	C008984	RH	MaV	MaV
REV.	DATE	DESCRIPTION	Designed by	Checked by	Approved by
Vard Hull No.					
Kongsberg Maritime AS Merchant Automation Trondheim		Title Cordset, Can Open, 7/8 connector And t-pieces for CAN open - trunk line			Sheet 1/1
		Project / Product name Item no 329600			Size A3
Drawing type Dimensional sketch		Scale			
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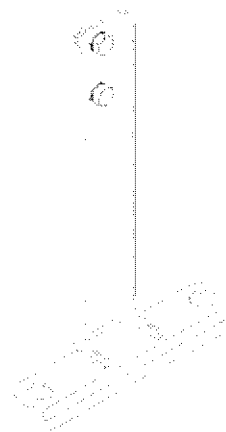
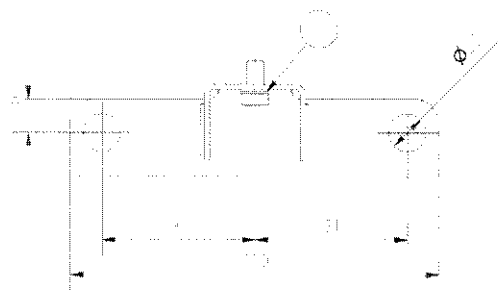
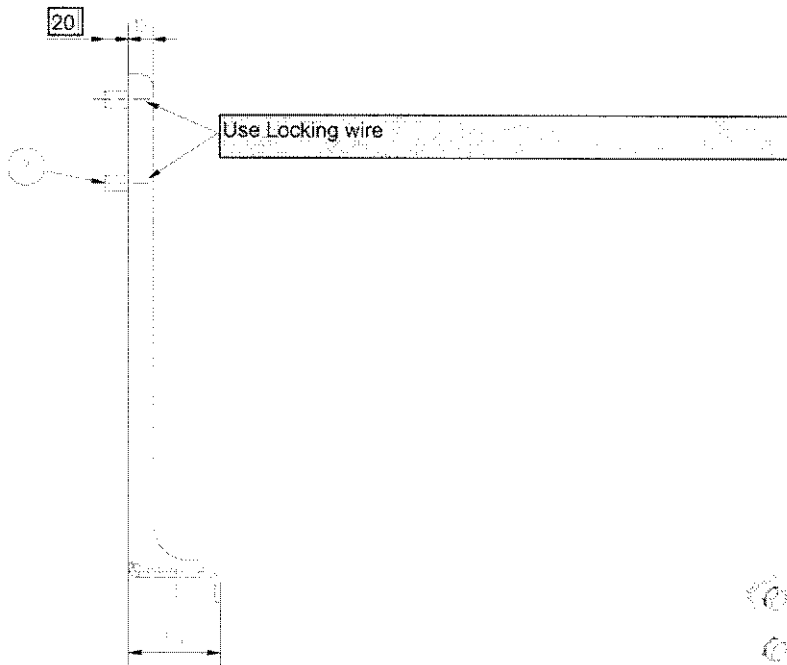
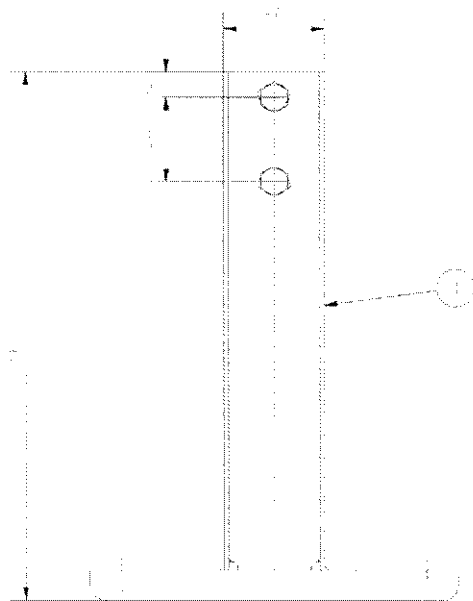
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Installation of cable gland for M12 cordset

1. The cable gland consist of 3 parts; double nipple [3], sealing insert [4] and pressure screw [5]. Disassemble the cable gland.
2. Install the cable gland as shown on the drawing; split the sealing insert to get it on the cable [2] on the M12 cordset [1]
3. Fasten the double nipple [3] on the engine frame, insert the sealing insert [4] and tighten the pressure screw [5]. Finito!

Date 2007-11-26	Dsgn/Dwn VRa	Trac	Scale/Format -	 Kongsberg Maritime AS Automation Trondheim	Repl. for	Repl. by	Next sheet
Checked ABL	Spec Ctr.	Approved MaV			Dwg. no. PS-045	Sh. no. A	Rev. Lang.
Mounting of cable gland for M12 cordset					SYSTEM LAY-OUT		



Kongsberg Maritime AS	
Merchant Marine Division	
Trondheim	
Project / Product name	2010-2011
Project number	2010-2011
Drawing type	2010-2011
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REV.	DATE	DESCRIPTION	Designed by	Checked by	Approved by
Yardplot No.					
 Kongsberg Maritime AS Merchant Marine Division Trondheim			Title		
Project / Product name			Project number	Drawing type	Sheet
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Kongsberg Maritime 2008			Revision		

VIEW WITH COVER REMOVED

Fixing holes Ø6

Power in segment B

CAN segment B

Power in segment A

CAN segment A

CAN/Power
Segment ACAN/Power
Segment B

Terminal blocks to system

(Colors in accordance with CANopen standard)

A segment:

1. Shield
2. +24, Red
3. 0V, Black
4. CAN High, White
5. CAN Low, Blue

B segment:

6. Shield
7. +24, Red
8. 0V, Black
9. CAN High, White
10. CAN Low, Blue

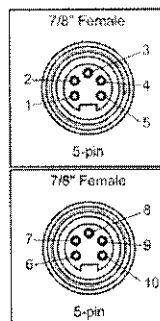
7/8" CAN connector to terminal blocks

A segment:

1. Shield, White
2. +24, Red
3. 0V, Green
4. CAN High, Orange
5. CAN Low, Black

B segment:

6. Shield, White
7. +24, Red
8. 0V, Green
9. CAN High, Orange
10. CAN Low, Black



Remarks:

1. Material, box: Silumin
2. Cable glands: Nickel plated brass
3. Paint: Silver gray
4. Weight: 1.04 kg
5. Protection grade: IP56
6. Terminal blocks (ZDUB 2.5-2); 0.5 - 2.5 mm²,
All terminal blocks to be marked 1 - 10
7. 4 x M20 Cable glands for cable Ø8 to Ø15
8. 2 x RKF 56-0.3M/M20 CAN connector

FIXING HOLES

M6-15/12

M6-15/12

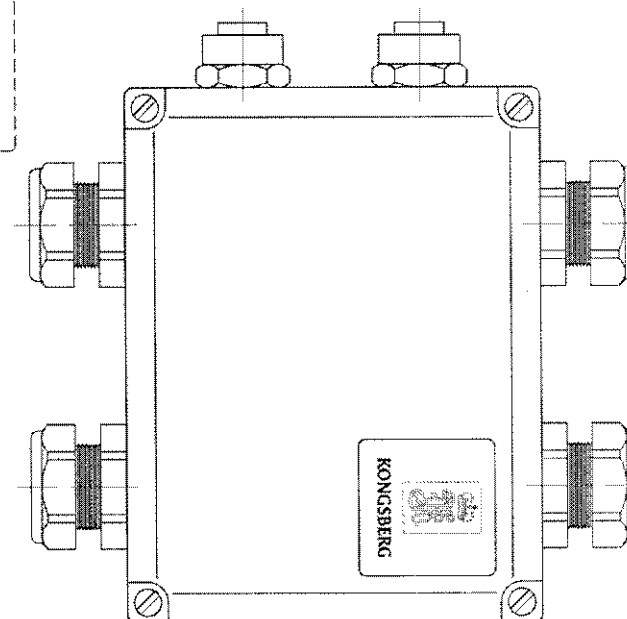
143

122

69

Ø6

Ø10.5



A	2010-11-19	First issue	RH	MaV	MaV
REV.	DATE	DESCRIPTION	Designed by	Checked by	Approved by
Yard/ Hull No.					
 Kongsberg Maritime AS Merchant Automation Trondheim		Title Bearing Wear Monitoring Engine connection box			Sheet 1/1
		Project / Product name Item no. 353392			Scale 1:1.5
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Chapter.5

Cable Specification

CABLE	FROM		TO		CABLES		FIND IN	SIGNALS	
NAME	UNIT NAME	TERM	UNIT NAME	TERM	LENGHT	DRAWING	CHAPTER	TYPE	REMARKS / RECOMMENDATIONS
W1-2	NOT IN USE / SPARE								
W3	MOS	PLUG	Terminal X10	SCREW	2,5M	HA458722	2	POWER	
W4	MOS	PLUG	Terminal X1	SCREW	2,5M	HA458722	2	SIGNAL	
W5	MOS	PLUG	Terminal X8/X9	SCREW	2,5M	HA458722	2	DATA	
W6	INPUT CRP PANEL, USB OS, X3	PLUG	BU/AUT PANEL, X3	PLUG	1M	HA464339	1,2	SIGNAL	K-CHIEF 710
W6	INPUT CRP PANEL, USB OS, X4	PLUG	ALC PANEL, X3	PLUG	1M	HA464339	1,2	SIGNAL	
W6	INPUT CRP PANEL, USB OS, X5	PLUG	TCP PANEL, X3	PLUG	1M	HA464339	1,2	SIGNAL	
W7	INPUT CRP PANEL, X2	SCREW	TCP PANEL, X2	SCREW	1M	HA464339	1,2	SIGNAL	
W8	EATON 9130-M, Battery Connector	PLUG	EATON Battery Pack, Battery Connector	PLUG	0,5M/1M	334394	10,4	POWER	
W9	NOT IN USE / SPARE								
W10	SOCKET WALL - MALE	PLUG	SOCKET CONSUMER - FEMALE	PLUG	MISC.	MISC.	N/A	POWER	ENEC STD 230VAC
W10	PSU	---	PSU CONNECTION BOX, X101	SCREW	2,5M	318586	1	POWER	
W11	UPS	PLUG	UPS CONNECTION BOX, X102	SCREW	1,2M	318586		POWER	FIXED TO UPS
W12	UPS	PLUG	UPS CONNECTION BOX, X102	SCREW	1,2M	318586		POWER	FIXED TO UPS CONNECTION BOX
W13	UPS	PLUG	UPS CONNECTION BOX, X102	SCREW	1,2M	318586		SIGNAL	FIXED TO UPS CONNECTION BOX
W14	DCU-12, X100/230VAC	SCREW	POWERSUPPLY 230/24VDC	SCREW	2M			POWER	MBB
W15	MOUSE EXT. CABLE	PLUG		PLUG	2M	None	N/A	DATA	
W16	KEYBOARD EXT. CABLE	PLUG		PLUG	2M	None	N/A	DATA	
W17	PC, TCP	PLUG	LCD TOUCHPANEL	PLUG	1,75M	HA464571	6,1	DATA	For MP7900 see dwg. 327997
W18	PC, PRINTER	PLUG	PRINTER	PLUG	5M	HA442122	6,3	DATA	PARALLEL
W19	ACP, P6	PLUG	OPU, P1	PLUG	2,5M	HA462755	6	DATA	SERIE
W20	PC, NET C	PLUG	TERMINAL, U20 (X20)	PLUG	3M/6M/12M	HA454205	6,5	DATA	K-CHIEF 500, STRAIGHT CABLE
W21/22	PC1 NET A/B	PLUG	PC2 NET A/B	PLUG	3M/6M/12M	HA451670	6,5	DATA	CROSSED CABLE
W21/22	RCU 501, P10/P11	PLUG	RCU 501, P10/P11	PLUG	3M/6M/12M	HA451670	6,5	DATA	CROSSED CABLE
W23	NOT IN USE / SPARE								
W24	PC, NET C	PLUG	TERMINAL, U20 (X20)	PLUG	3M/6M/12M	HA451913	6,5	DATA	STRAIGHT CABLE
W24	PC, CAN NET	PLUG	TERMINAL, U40 (X40)	PLUG	3M/6M/12M	HA451913	6,5	DATA	STRAIGHT CABLE
W24	RCU 501 P21-28	PLUG	RSER200-4, P1-P3	PLUG	3M/6M/12M	HA451913	6,5	DATA	STRAIGHT CABLE
W24	PSU		PSU CONNECTION BOX, X101	SCREW	3M	318586		DATA	STRAIGHT CABLE
W24/25	PC NET A/B	PLUG	PC NET A/B	PLUG	3M/6M/12M	HA451670	6,5	DATA	CROSSED CABLE
W24/25	PC NET A/B	PLUG	SWITCH, A/B	PLUG	3M/6M/12M	HA451913	6,5	DATA	STRAIGHT CABLE
W26-27	NOT IN USE / SPARE								
W28	PC, Display Port to DVI cable conversion	PLUG	DISPLAY, DVI	PLUG	0,20M	327997	6,1	DATA	
W29	PC, DVI	PLUG	DISPLAY, DVI	PLUG	1,75M	HA464571	6,1	DATA	For MP7900 see dwg. 327997
W30	PC, CRP	PLUG	CRP, INPUT	PLUG	2M/3M	HA464571	6,1	DATA	For MP7900 see dwg. 327997
W31-33	NOT IN USE / SPARE								
W34	OPERATOR PANEL	-	TERMINAL - / MSI-12	SCREW	2,5M	319690	2	SIGNAL	12 x 0,5 SQUARE
W35-39	NOT IN USE / SPARE								
W40	PC, CAN NET	PLUG	TERMINAL, U40 (X40)	PLUG	3M/6M/12M	HA451913	6,5	DATA	K-CHIEF 500, STRAIGHT CABLE
W41-49	NOT IN USE / SPARE								
W50	PC, MSI / ARI / USB	PLUG	MSI-12/ARI-12, X9 TERM./LASERJET	PLUG	3M/5M	HA464571	6,1 & 6,4	DATA	USB 2.0 cable A-B, for MP7900 see dwg. 327997
W51-59	NOT IN USE / SPARE								
W60	LTU, X1	PLUG	DPU - ESS, X4	SCREW	2,5M	HA462270	7	DATA	MAX 0,3M BETWEEN ESS/X1-K1
W61	DPU - ESS, X4	SCREW	ESS, P4	PLUG	2,0M	HA462534	3	SIGNAL	
W62	LTU	PLUG	ACP	SCREW	0,5M			SIGNAL	3x0,5mm² CABLE
W63-70	NOT IN USE / SPARE								

K-CHIEF CABLE LIST
W00-99 KONGSBERG SUPPLY
W100-> YARD SUPPLY

CABLE	FROM		TO		CABLES		FIND IN	SIGNALS	
NAME	UNIT NAME	TERM	UNIT NAME	TERM	LENGHT	DRAWING	CHAPTER	TYPE	REMARKS / REQOMMENDATIONS
W71	MANUAL LEVER, J1	PLUG	TERMINAL SHH, X1	SCREW	3.0M	HA462401	3	SIGNAL	
W72	MANUAL LEVER, J2	PLUG	TERMINAL SHH, X2	SCREW	3.0M	HA462401	3	SIGNAL	
W73-80	NOT IN USE / SPARE								
W81/83	RPMD BOX, DPU X1	PLUG	RPM DETECTORS	SCREW	10M	SeaMate	14	SIGNAL	MECH. PROT. NEEDED(BY ENG.MAKER)
W82/84	RPMD BOX, DPU X1	PLUG	RPM DETECTORS	SCREW	10M	SeaMate	14	SIGNAL	MECH. PROT. NEEDED(BY ENG.MAKER)
W85	ACTUATOR-J32	PLUG	CABINET - DSU, X32	PLUG	3/5/10/15M	HA464134	4	POWER	
W86	ACTUATOR-J33	PLUG	CABINET - DSU, X33	PLUG	3/5/10/15M	HA464134	4	SIGNAL	
W87	ACTUATOR-J31	PLUG	CABINET - DSU, X31	PLUG	3/5/10/15M	HA464134	4	SIGNAL	
W88-99	NOT IN USE / SPARE								
W100	DCU-12, X100	SCREW	PSU CONNECTION BOX, X101	SCREW		318586	3	POWER	2 x 2.5
W101	PC, X20	SCREW	WBU / WCU, X10	SCREW		HA464552	2	DATA	1 TWIST PAIR WITH BRAIDED SCREEN
W102	UPS CONNECTION BOX, X102	SCREW	DCU-12, X100	SCREW		318586		POWER	
W103	UPS CONNECTION BOX, X102	SCREW	DCU-12, X100	SCREW		318586		POWER	
W104	WBU/WCU, X10	SCREW	WCU, X10	SCREW		HA464552	1,2	DATA	1 TWIST PAIR WITH BRAIDED SCREEN
W105	UPS CONNECTION BOX, X102	SCREW	DCU-12, MSI X1	SCREW		318586		SIGNAL	
W106	EMG. SHIPS SUPPLY 230VAC	SCREW	DCU-12, F1	SCREW		318586		POWER	2 x 2.5mm ²
W107	UPS, 220VAC	SCREW	OPERATOR STATIONS	SCREW		331466	10-4	POWER	2 x 2.5mm ²
W108	UPS POWER / YARD POWER	SCREW	WBU, X10	SCREW		HA464552	1,2	POWER	Power#2 from another source, galvanic isolated
W109	UPS POWER / YARD POWER	SCREW	WBU, X10	SCREW		HA464552	1,2	POWER	Power#1 from C20 UPS
W110	WCU, X1-U7	SCREW	FIRE SENTRAL	SCREW		HA464552	1,2	SIGNAL	1 PAIR
W111	UPS 1, F8	SCREW	UPS 2 F8	SCREW		HA349974	1.1	POWER	2x2.5mm ² or calc. By yard if long dist.
W112-121	NOT IN USE / SPARE								
W122	TERMINAL X20, OS1	SCREW	TERMINAL X20, OS2	TENS./CLAMP		HA464552	1,2	DATA	1 TWIST PAIR WITH BRAIDED SCREEN
W123	NOT IN USE / SPARE								
W124/125	TERMINAL X24/25, LAN A, B	SCREW	TERMINAL X24/25, LAN A, B	SCREW		HA464553	6	DATA	2 PAIR, CAT 5 STP, MAX 100 M.
W124	DCU-12, X24	SCREW	PSU CONNECTION BOX, X101	SCREW		318586		DATA	4 PAIR, CAT 5 STP, MAX 100 M.
W125	DCU-12, X25/26	SCREW	K-SINT (K-BRIDGE, K-CHIEF, K-POS etc.	SCREW		318586		DATA	4 PAIR, CAT 5 STP, MAX 100 M.
W126	TERMINAL X26, LAN C	SCREW	TERMINAL X26, LAN C	SCREW		HA464553	6	DATA	CONNECTION TO OTHER LAN NETWORK
W127	NOT IN USE / SPARE								
W128	DCU-12, X28	BNC PLUG	3RD PARTY ARPA SUPPLIER	-----		318586		VIDEO	Cable RG, 75ohm
W129	NOT IN USE / SPARE								
W130	BUZZER, X1	SCREW	WBU/WCU - X10	SCREW		HA464552	1,2	SIGNAL	1 PAIR
W131	BUZZER, X1	SCREW	ACP, X1	SCREW		SeaMate	14	SIGNAL	1 PAIR
W132	BUZZER, X1	SCREW	ESS-X4	SCREW		HA462355	3	SIGNAL	1 PAIR
W133	TERMINAL CONVERTER, X30	SCREW	Terminal / AIS	SCREW		318586	N/A	DATA	2 x 2 x 0.5 TWIST PAIR WITH BRAIDED SCREEN
W134	TERMINAL X200	SCREW	MSI-12	SCREW		319690	2	SIGNAL	12 x 1 SQUARE
W135	BW INDICATOR, X1	SCREW	DIMMER BOX	SCREW		SeaMate	11	SIGNAL	3x0.5
W136	ACP, X1	SCREW	REV COUNTER	SCREW				SIGNAL	1 PAIR
W137	ACP, X1	SCREW	HOUR RUN COUNTER	SCREW				SIGNAL	1 PAIR
W138	DPU-MEI	SCREW	CHANGE OVER SWITCH	SCREW				SIGNAL	1 PAIR
W139	DPU-MEI	SCREW	MANUAL RPM HANDLE	SCREW				SIGNAL	11x0.5mm ²
W140-149	NOT IN USE / SPARE								
W150	DPU - RDI-32/C2(DI), X1	SCREW	START/STOP/RESET/WH UNIT	SCREW		HA460743	4	SIGNAL	Min 0.5, ENGINEER SAFETY SYSTEM
W151	DPU - RDI-32/C2(DI), X1	SCREW	START/STOP/RESET/WH UNIT	SCREW		HA460743	4	SIGNAL	Min 0.5, ENGINEER SAFETY SYSTEM
W152	DPU - RDI-32/C2(DI), X1	SCREW	START/STOP/RESET/WH UNIT	SCREW		HA460743	4	SIGNAL	Min 0.5, ENGINEER SAFETY SYSTEM
W153	DPU - C2(RDI/RDO), X1	SCREW	DEADMAN SAFETY, ROT. LIGHT	SCREW		HA460743	4	POWER	Min 1.5, ENGINEER SAFETY SYSTEM
W154-159	NOT IN USE / SPARE								
W160	WECS 9520 -MCP, X10	SCREW	E90	SCREW		HA349117	4	POWER	2 PAIR
W161	NOT IN USE / SPARE								

K-CHIEF CABLE LIST
W00-99 KONGSBERG SUPPLY
W100-> YARD SUPPLY

CABLE	FROM		TO		CABLES		FIND IN	SIGNALS	
NAME	UNIT NAME	TERM	UNIT NAME	TERM	LENGHT	DRAWING	CHAPTER	TYPE	REMARKS / RECOMMENDATIONS
W162/164	BWU, X1	SCREW	TERMINAL ESS-X4 (W/H)	SCREW		HA462357	4	SIGNAL	1 PAIR
W163	ESS-X4 (W/H, ECR)	SCREW	ESS X10	SCREW		HA462355	3	POWER	
W165	TERMINAL ESS-X4 (W/H)	SCREW	TERMINAL ESS-X4 (ECR)	SCREW		HA462357	4	SIGNAL	3 PAIR
W166	SSH, X1/X2	SCREW	DPU - MEI	SCREW		SeaMate	14	SIGNAL	2x3 PAIR, MANUAL LEVER
W167	TERMINAL ESS-X4 (ECR)	SCREW	DPU - ESU (CABINET E10)	SCREW		SeaMate	14	SIGNAL	4 PAIR
W168	EMCY, STOP SWITCH (ER)	SCREW	DPU - ESU (CABINET E10)	SCREW		SeaMate	14	SIGNAL	1 PAIR
W169	CPP EMCY BRIDGE/ECR, X1	SCREW	CPP TERMINAL, CPP-X18 TENS /	SCREW / CLAMP		HA348221	4	SIGNAL	4 PAIR
W170	CPP TERMINAL, CPP-X18	SCREW	CPP Control unit	SCREW		HA348221	4	SIGNAL	4 PAIR
W171	CPP TERMINAL, CPP-X18	SCREW	CPP DPU - MEI, X1	SCREW		SeaMate	14	SIGNAL	2-4 TWIST PAIR WITH BRAIDED SCREEN
W172	RPM HANDLE, X1	SCREW	DPU-MEI, X1	SCREW		SeaMate	14	SIGNAL	2-4 TWIST PAIR WITH BRAIDED SCREEN
W173	DPU - MEI, X1	SCREW	CPP CONTROL SYSTEM, X1	SCREW		SeaMate	14	SIGNAL	2-4 TWIST PAIR WITH BRAIDED SCREEN
W174	SWITCH AUTO/MANUEL	SCREW	DPU - MEI, X1	SCREW		SeaMate	14	SIGNAL	1 PAIR
W175	TERMINAL AUX BLOWER, X1	SCREW	CABINET ECU, X1	SCREW		HA463656	4	SIGNAL	1x1.5
W176	TERMINAL AUX BLOWER, X1	SCREW	CONTROL UNIT AUX, BLOWER	SCREW		HA463656	4	SIGNAL	7x1.5
W177	TERMINAL AUX BLOWER, X1	SCREW	IPU PANEL, X1	SCREW		HA463656	4	SIGNAL	27x1.0
W178	SPP, X1	SCREW	TERMINAL TBX	SCREW		HA461556	4	SIGNAL	10 PAIR WITH BRAIDED SCREEN
W179	TERMINAL TBX	SCREW	DPU - ESS-X2	SCREW		HA461556	4	SIGNAL	5 PAIR WITH BRAIDED SCREEN
W180	LCP E25	SCREW	AUX BLOWER CONTROL	SCREW		HA338221	4	SIGNAL	
W181	DPU - RPME, X1	SCREW	DPU - ESU, X1	SCREW		SeaMate	14	SIGNAL	2 pair, 0.5
W182	DPU - RPME, X1	SCREW	CABINET E10, XE10	SCREW		SeaMate	14	SIGNAL	2 pair, 0.5
W183-187	NOT IN USE / SPARE								
W188	ARI-12, X1	SCREW	MICROPHONES	SCREW		318586	8	SIGNAL	2 x 2 x 0.75 TWIST PAIR W/BRAIDED SCREEN
W189	ARI-12, X1	SCREW	VHF	SCREW		318586	8	SIGNAL	2 x 2 x 0.75 TWIST PAIR W/BRAIDED SCREEN
W201	TERM, X40/X8 GLOBAL CAN A	SCREW	TERM, X8, GLOBAL CAN A	SCREW		HA464551	8	DATA	1 TWIST PAIR WITH BRAIDED SCREEN
W202	TERM, X40/X41/X9 GLOBAL CAN B	SCREW	TERM, X9, GLOBAL CAN B	SCREW		HA464551	8	DATA	1 TWIST PAIR WITH BRAIDED SCREEN
W203	TERM, X8, LOCAL CAN A	SCREW	TERM, X8, LOCAL CAN A	SCREW		HA461797	8	DATA	1 TWIST PAIR WITH BRAIDED SCREEN
W203	RCU X4 / DPU X8 LOCAL CAN A	SCREW	RCU X4 / DPU X8 LOCAL CAN A	SCREW		HA461797	8	DATA	1 TWIST PAIR WITH BRAIDED SCREEN
W204	TERM, X9, LOCAL CAN B	SCREW	TERM, X9, LOCAL CAN B	SCREW		HA461797	8	DATA	1 TWIST PAIR WITH BRAIDED SCREEN
W204	RCU X5 / DPU X9 LOCAL CAN B	SCREW	RCU X5 / DPU X9 / MOS LOCAL CAN B	SCREW		HA461797	8	DATA	1 TWIST PAIR WITH BRAIDED SCREEN
W205	DC C20 SYSTEM	SCREW	AUTOCHIEF (AC4/7), X16	SCREW		HA453535	8	DATA	2 TWIST PAIR WITH BRAIDED SCREEN
W206	WECS 9520 -MCP, X8	SCREW	E90 WEC59520	SCREW		HA349117	4	DATA	1 TWIST PAIR WITH BRAIDED SCREEN
W207	CABINET E25, X8/X9	SCREW	E90	SCREW		None	N/A	SIGNAL	1 TWIST PAIR WITH BRAIDED SCREEN, SULZER
W208	CABINET E25, X8/X9	SCREW	E90	SCREW		None	N/A	SIGNAL	1 TWIST PAIR WITH BRAIDED SCREEN, SULZER
W210	DPU - RD0-16/C2, X1	SCREW	ROT. LIGHT, KLAXON	SCREW		SeaMate	14	SIGNAL	4 x 1.5
W211	WECS 9520 -MCP SERVICE PLUG, JX1	SCREW	E90	SCREW		HA349117	4	SIGNAL	
W212	WECS 9520 -MCP, X1	SCREW	AUX BLOWER CABINET	SCREW		HA349117	4	SIGNAL	2 PAIR
W213	RCU-500, X6-15	SCREW	RCU 500, X6-15	SCREW			8		2 x 0.5 TWIST PAIR WITH BRAIDED SCREEN
W214-221	NOT IN USE / SPARE								
W222	MSI-12, X1 / DPU, X7 / RSER200-4	SCREW	INTERFACE	SCREW		HA462422	8	DATA	2 x 0.5 TWIST PAIR WITH BRAIDED SCREEN
W222	SENSORS		DCU-12, MSI X1	SCREW		318586		DATA	2 x 2 x 0.75 TWIST PAIR W/BRAIDED SCREEN
W223-228	NOT IN USE / SPARE								
W229	POWER SUPPLY UPS 24 VDC	SCREW	PSO, 1X10	SCREW		HA461629	8	POWER	2 x 6.0
W230	POWER SUPPLY UPS 24 VDC	SCREW	PSO, 2X10	SCREW		HA461629	8		
W231	POWER SUPPLY UPS/PSO/PSO-P	SCREW	DPU X10 / TERMINAL X10 / OPU	SCREW		HA461629	8	POWER	2x2.5mm²
W232	POWER SUPPLY CABINET 1	SCREW	PSO-P1, 1X10	SCREW		HA461629	8	POWER	2x2x2.5mm²
W233	POWER SUPPLY CABINET 1	SCREW	PSO-P2, 1X10	SCREW		HA461629	8	POWER	2x2x2.5mm²
W234	POWER SUPPLY CABINET 3	SCREW	PSO-P1, 2X10	SCREW		HA461629	8	POWER	2x2x2.5mm²
W235	POWER SUPPLY CABINET 3	SCREW	PSO-P2, 2X10	SCREW		HA461629	8	POWER	2x2x2.5mm²

K-CHIEF CABLE LIST
W00-99 KONGSBERG SUPPLY
W100-> YARD SUPPLY

CABLE	FROM		TO		CABLES		FIND IN	SIGNALS	
NAME	UNIT NAME	TERM	UNIT NAME	TERM	LENGHT	DRAWING	CHAPTER	TYPE	REMARKS / REQOMMENDATIONS
W236	POWER SUPPLY CABINET 1	SCREW	PSO-P3, 1X10	SCREW		HA461629	8	POWER	2x2x2.5mm²
W237	POWER SUPPLY CABINET 3	SCREW	PSO-P3, 2X10	SCREW		HA461629	8	POWER	2x2x2.5mm²
W238	SWITCH BOARD (MSB/MSB 1)	SCREW	POWER SUPPLY CABINET 1	SCREW		HA461629		POWER	2x2x2.5mm²
W239	SWITCH BOARD (ESB/MSB 2)	SCREW	POWER SUPPLY CABINET 3	SCREW		HA461629		POWER	2x2x2.5mm²
W240-299	NOT IN USE / SPARE								
W300	TBX TERMINAL	SCREW	DPU - ESU/C2, ECU, SENSOR	SCREW	--	HA464124	4	SIGNALS	13 x 1.0 (ECU006-15)
W301	NOT IN USE / SPARE								
W302	SS-X40	SCREW	RPM INDICATOR, X1	SCREW	--	HA463834	11	SIGNALS	2 X 0.5, DIMMER FUNCTION
W303	TBX TERMINAL	SCREW	DPU - ESU/C2, ECU, SENSOR	SCREW	--	HA464209	4	SIGNALS	17 x 1.0 (ECU005)
W304	DPU RA6-8, X1 (BRIDGE)	SCREW	INSTRUMENTS - BRIDGE W & C	SCREW	--	SEAMATE	14	SIGNALS	CONNENTION ARRANGEMENT REPORT
W305	DPU RA6-8, X1 (ECR)	SCREW	INSTRUMENTS - ECR	SCREW	--	SEAMATE	14	SIGNALS	CONNENTION ARRANGEMENT REPORT
W306	DPU MEI, X1	SCREW	M.E. CONN. BOX/SENSORS	SCREW	--	SEAMATE	14	SIGNALS	CONNENTION ARRANGEMENT REPORT
W307	DPU RAI, X1	SCREW	M.E. SLD SENSORS	SCREW	--	SEAMATE	14	SIGNALS	CONNENTION ARRANGEMENT REPORT
W308	DPU ESU, X1	SCREW	M.E. SHD SENSORS	SCREW	--	SEAMATE	14	SIGNALS	CONNENTION ARRANGEMENT REPORT
W309	DPU C2, X1	SCREW	REV./ HOUR COUNTER	SCREW	--	SEAMATE	14	SIGNALS	CONNENTION ARRANGEMENT REPORT
W320	Backup panel ECR, BP-X1	SCREW	DPU MEI, X1	SCREW	--	SEAMATE	1	SIGNALS	MULTICABLE, TWIST PAIR min. 11x0.5mm² w/ IND. SCREEN
W321	Backup panel Eng. room	SCREW	DPU C2#1	SCREW	--	SEAMATE	1	SIGNALS	MULTICABLE, TWIST PAIR min. 5x0.5mm² w/ IND. SCREEN
W322	Backup panel Eng. room	SCREW	DPU ESU, X1	SCREW	--	SEAMATE	1	SIGNALS	MULTICABLE, TWIST PAIR min. 5x0.5mm² w/ IND. SCREEN
W323	MEI	SCREW	CLU-3	SCREW	--	SEAMATE	1	SIGNALS	MULTICABLE, TWIST PAIR min. 2x0.5mm² w/ IND. SCREEN
W324	MEI	SCREW	E10	SCREW	--	SEAMATE	1	SIGNALS	MULTICABLE, TWIST PAIR min. 21x0.5mm² w/ IND. SCREEN
W325	C2#1	SCREW	Aux.bl 1 cab.	SCREW	--	SEAMATE	1	SIGNALS	MULTICABLE, TWIST PAIR min. 2x0.5mm² w/ IND. SCREEN
W326	C2#1	SCREW	Aux.bl 2 cab.	SCREW	--	SEAMATE	1	SIGNALS	MULTICABLE, TWIST PAIR min. 2x0.5mm² w/ IND. SCREEN
W327	C2#1	SCREW	E10	SCREW	--	SEAMATE	1	SIGNALS	MULTICABLE, TWIST PAIR min. 2x0.5mm² w/ IND. SCREEN
W328	ESU	SCREW	E10	SCREW	--	SEAMATE	1	SIGNALS	MULTICABLE, TWIST PAIR min. 15x0.5mm² w/ IND. SCREEN
W329	Rai 16	SCREW	E28	SCREW	--	SEAMATE	1	SIGNALS	MULTICABLE, TWIST PAIR min. 7x0.5mm² w/ IND. SCREEN
W329	SENSORS		Rai-16	SCREW		318586		SIGNAL	2 x 0.5 TWIST PAIR W/BRAIDED SCREEN
W331	Backup panel Eng. room	SCREW	DPU C2#2	SCREW	--	SEAMATE	1	SIGNALS	MULTICABLE, TWIST PAIR min. 1x0.5mm² w/ IND. SCREEN
W333	C2#2	SCREW	E10	SCREW	--	SEAMATE	1	SIGNALS	MULTICABLE, TWIST PAIR min. 2x0.5mm² w/ IND. SCREEN
W334-339	NOT IN USE / SPARE								
W340	DPU-CPP, C2 module, back-up, ECR	SCREW	CPP, back-up, BU-X1, Bridge	SCREW	--			SIGNALS	4 x 0.5 SQUARE
W341	DPU-CPP, C2 module, back-up, ECR	SCREW	CPP, back-up, BU-X1, Bridge	SCREW	--			SIGNALS	4 x 0.5 SQUARE
W342	DPU-CPP, C2 module, back-up, ECR	SCREW	CPP, back-up, ECR-X1, ECR	SCREW	--			SIGNALS	4 x 0.5 SQUARE
W343	DPU-CPP, C2 module, back-up, ECR	SCREW	CPP, back-up, ECR-X1, ECR	SCREW	--			SIGNALS	4 x 0.5 SQUARE
W344	DPU-CPP, C2 module, back-up, ECR	SCREW	CPP, Servo unit ASP12, J2	SCREW	--			SIGNALS	4 x 0.5 SQUARE
W345	DPU-CPP, C2 module, back-up, ECR	SCREW	CPP, Servo unit ASP12, J3	SCREW	--			SIGNALS	4 x 0.5 SQUARE
W346	DPU-CPP, C2 module, back-up, ECR	SCREW	CPP, back-up, BU-X1, Bridge	SCREW	--			SIGNALS	6 x 0.5 SQUARE
W347	DPU-CPP, C2 module, back-up, ECR	SCREW	CPP, back-up, ECR-X1, ECR	SCREW	--			SIGNALS	6 x 0.5 SQUARE
W348	DPU-CPP, C2 module, back-up, ECR	SCREW	CPP, Servo / Control unit	SCREW	--			SIGNALS	8 x 1.5 SQUARE
W400	DPU-DGU, X8L + X10	SCREW	UG-890	SCREW	--	UX-808		SIGNAL+POWER	CANopen Bulk Cable, AWG20, AWG16 w/ IND. SCREEN
W401	Bearing wear, end of Can Bus A	PLUG	WaterInOil, MMT330-8BAC	SCREW		UX-808		SIGNAL+POWER	CanOpen Cable 7/8" male - open ended
T1, T2	DPU - TERMINAL, X8, X9	SCREW	None			None	N/A	120ohm	RESISTOR TERMINATOR
T3, T4	DPU - TERMINAL, X8, X9	SCREW	None			None	N/A	120ohm	RESISTOR TERMINATOR
Issue:	Change:	Issue:	Change:	Checked: 01.03.2010 BSM Approved: 01.03.2010 SDA					
N	CO08161	H	AOE-016646						
O	CO09263	I	CO06106						
P	CO09476	J	CO06604						
E	AOE-015675	K	CO07151						
F	AOE-016043	L	CO07743						
G	AOE-015675	M	CO07966						



KONGSBERG

Quick Installation Manual

Bearing Wear System

Guide for installation of Bearing Wear System in 2-stroke diesel engine

Figure 29. Exploded view of sensors and bracket

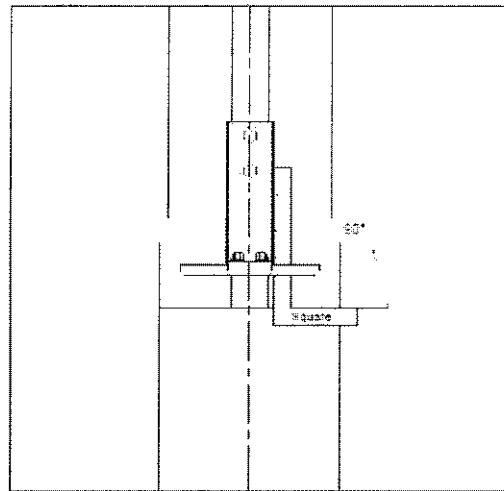


Figure 30. Adjustment of bracket

The bracket is easily adjusted inline with the guide plane with a square; one side of the square lying to the bracket side and the other side against the underside of the frame.

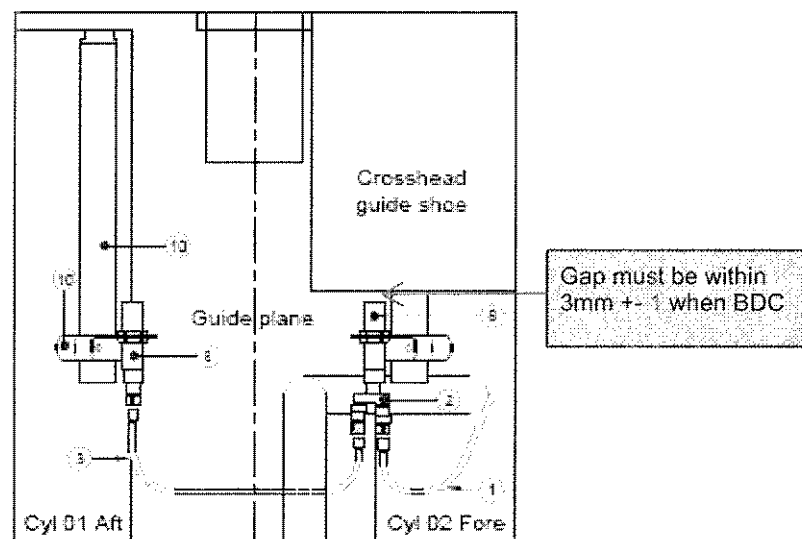
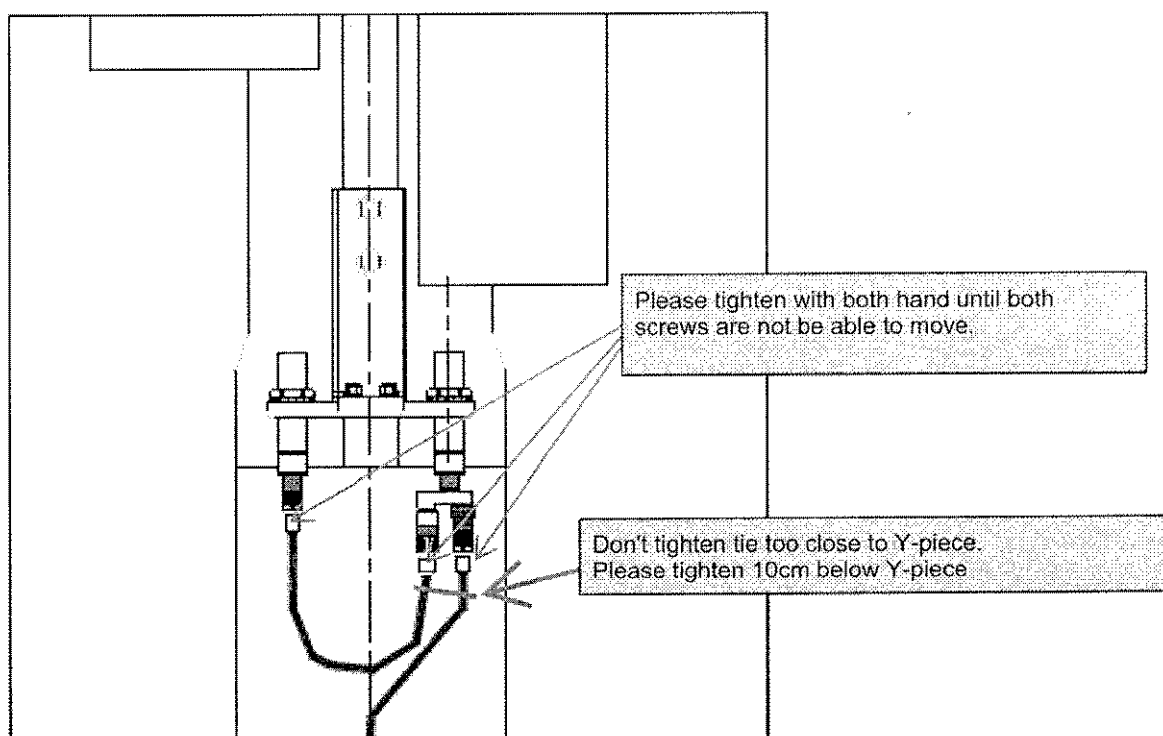


Figure 27. Bracket mounted below the guide plane

Tightening torque bracket bolts

Thread	Nm
M6	9.50
M10	45.0

Cabling inside engine



C o n f i r m a t i o n f o r m E n g i n e B u i l d e r

	Cyl. 1		Cyl. 2		Cyl. 3		Cyl. 4		Cyl. 5		Cyl. 6		Cyl. 7	
	Fore	After	Fore	After	Fore	After	Fore	After	Fore	After	Fore	After	Fore	After
Gap														
Serial NO.														
	Cyl. 8		Cyl. 9		Cyl. 10		Cyl. 11		Cyl. 12		Cyl. 13		Cyl. 14	
	Fore	After	Fore	After	Fore	After	Fore	After	Fore	After	Fore	After	Fore	After
Gap														
Serial NO.														

Note *Please check the standard gap. 3±1mm*

ENGINE BUILDER

Person in charge of installation	
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KONGSBERG MARITIME

Person in charge of confirmation.	
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Serial numbers are defined before delivery. Please install as defined.
 When installing after over-haul after sea-trial, Sensors must be installed the same position.