KONGSBERG
SIMRAD

QUOTATION NO. 1452-7

R&B Falcon

Project RBS8D

KONGSBERG SIMRAD
Integrated Alarm & Control System

EXHIBIT # 996
WIT:

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INTRODUCTION

The proposed Integrated Automation System is a modern distributed monitoring and control system covering all important automation functions on board the vessel:

- Vessel Control
  - Power Management
  - Auxiliary machinery control
  - Ballast/bunker monitoring and control
  - Cargo monitoring and control
- Thruster control
  - Individual/Group lever Control
  - Joystick Control
  - Local thruster Control
- Dynamic positioning
  - Automatic positioning
  - Applicable system function and operational modes.
- Safety System
  - Fire and Gas
  - Emergency Shut Down

To meet today's requirement for flexibility and modularization, the Integrated Automation System is built from a number of modular hardware components and application software modules, communicating on the same data communication network.

By integrating the automation function, the overall need for hardware and software functions and interfacing requirement are reduced, which again leads to less demand for special software, cabling and testing. Furthermore, integrated systems offer a far greater degree of redundancy and therefor increased system availability and operational performance.

The benefits of system integration are fully realised only when all the components of the system are based on the same technology, both in hardware and software:

- Cost effectiveness
  - Only one totally integrated system instead of several independent ones
  - Reduced number of interfaces
  - One supplier is responsible for the complete system
  - Reduced engineering and cabling costs
- Utilisation of large amounts of available data for optimisation of the vessel's prime functions
- A uniform man-machine interface which:
  - Reduces learning time for operators
  - Eases the decision-making process, especially in critical situations
- Easier maintenance
  - Only one system to learn
  - Common spare parts from a single supplier
- Flexibility for later expansion.

COMMENTS TO SPECIFICATION/QUOTATION

Revision 1452-7

The quotation has been revised to replace sensors and peripheral equipment with corresponding R&B F free- issue items.
KS assumes that the items provided by R&B F to replace corresponding items specified by KS meets R&B F specifications and are covered by R&B F warranties.
KS also assumes that these items will be available to KS in Kongsberg, Norway or at the yard at KS's decision.

General Requirements

This quotation is based on INQUIRY NO. 087-00001 and RBS8D cable layout drawing #799622 revision P9 (7 pages).
The quotation in general have incorporated the agreed solutions for RBS8M.The RBS8M solution with consoles for printers and the Current Profiler Controller integrated into the Metocean System cabinet, control stations for the mud rooms and station for the Drilling Cabin have been incorporated.

Number of I/O Included

The total number I/O's quoted is:

Vessel Control System:	according to I/O list, incl. 25% unused:	5200
	I/O for additional engines and Thrusters:	1100
ESD, Fire/gas and Safety system, incl. 25% unused:		1200 *
Gross total number of I/O included in quotation:		7500

* see item 9.2 below

Year 2000 Compliance

The system quoted fully complies with Y2K requirements. Please see section 8.

Item 6 Type Test

All Kongsberg Simrad equipment included in the quotation has been type tested and approved by Det Norske Veritas (DnV). Certificates in section 8.

Item 7.4 Other Regulations and Standards

NMD or NPD certification is not included. The quoted SDP systems comply with NMD class 3, but NMD certification based on total vessel design has to be obtained by the Buyer.

Item 8.2 Overall IACS Architecture

Fiberoptic converters included in all consoles and cabinets thus providing a total fiberoptical net solution. (Identical to RBS8M).

As indicated on the system layout drawing all operator stations (Cos 200 computers) might be connected to third (administrative) network with access to network printers. Alarm printers however have to be dedicated to the sub-systems.

We have included a 2 GB Jaz drive for the Historical Station as specified, but we recommend a HP T20 tape storage due to it's larger capacity, 20 GB compressed, or a mutual agreed removable storage device.

Item 8.4 Panel Construction

In the case the bridge equipment will be supplied by Kongsberg Norcontrol, we offer to deliver relevant operator stations in Kongsberg Norcontrol's consoles to obtain an uniform bridge installation.

Item 8.5 Power Supply Requirements

Powering of field loops of maximum 50A x 120V = 6000VA included.
Revision #7:
UPS configuration changed to a distributed system including 5 ea. 6KVA UPS as free-issue items, 8 ea. 3 KVA UPS , 2 ea. 2 KVA UPS and 14 internal UPS in process stations. The added power requirements include UPS powering of ABB and KAMEWA equipment in the thruster compartments.

Item 9 IACS Modules

The system quoted is prepared for input of mooring lines tension and length. The quoted system can be expanded to incorporate Position Mooring Mode without installation of additional consoles.

Item 9.2 Safety System

The quotation is based on the I/O count per date for RBS8M, plus 25% unused I/Os. FMEA for the Safety System is included.
Revision #7:
The Fire and Gas system is based on using the free-issue Thorn and Crowcon sensors from the P6 project with additional supply of same make detectors.

Item 9.3 Thruster Control Module

The system can handle input from a towing vessel, but the system to provide differential position (DARPS or other) has not been included.

Item 9.4 Dynamic Positioning System

A Gyro Compass selector for switching the repeaters from one compass to an other is included.

Item 9.6 Bulk Materials Module

Bulk materials local operator control stations identical to those supplied for RBS8M are included.

Item 9.7 Ballast Control Module

Ocean Motion load and stability calculator software installed on Kongsberg Simrad Operator Station computer has been included.

Item 9.11 Drilling Control System Interface Module

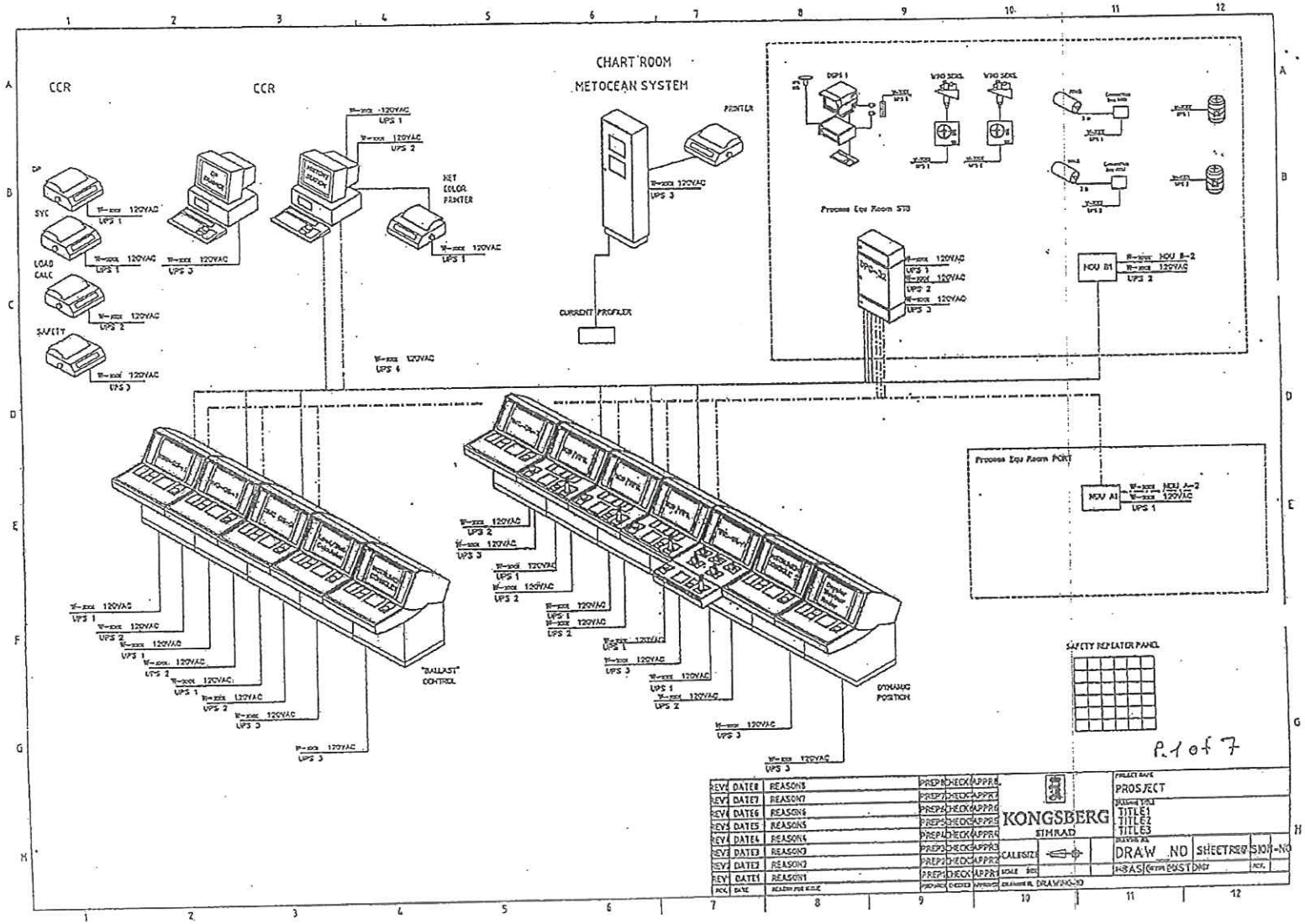
Interface identical to RBS8M is included.

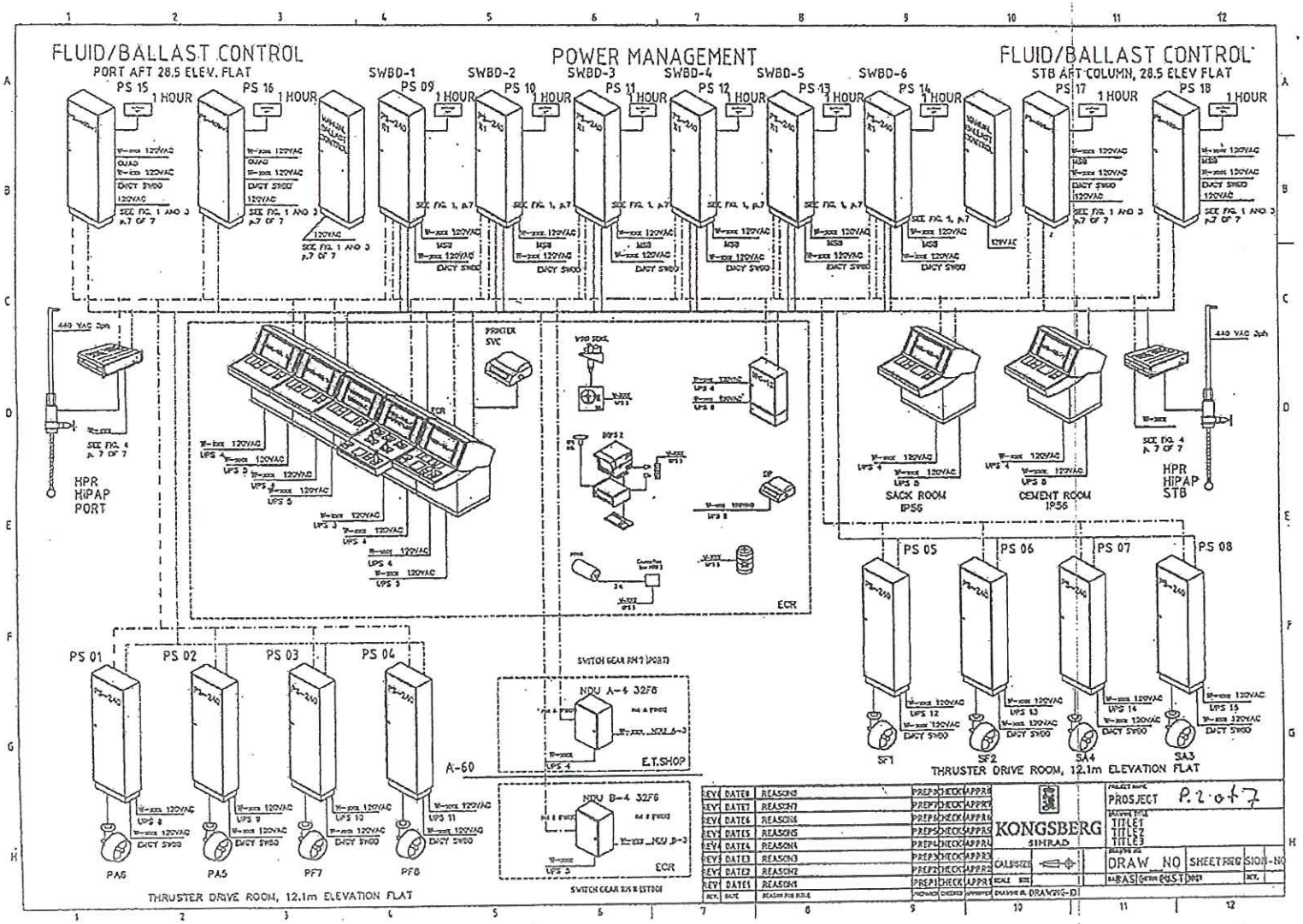
Item 14 Field Service

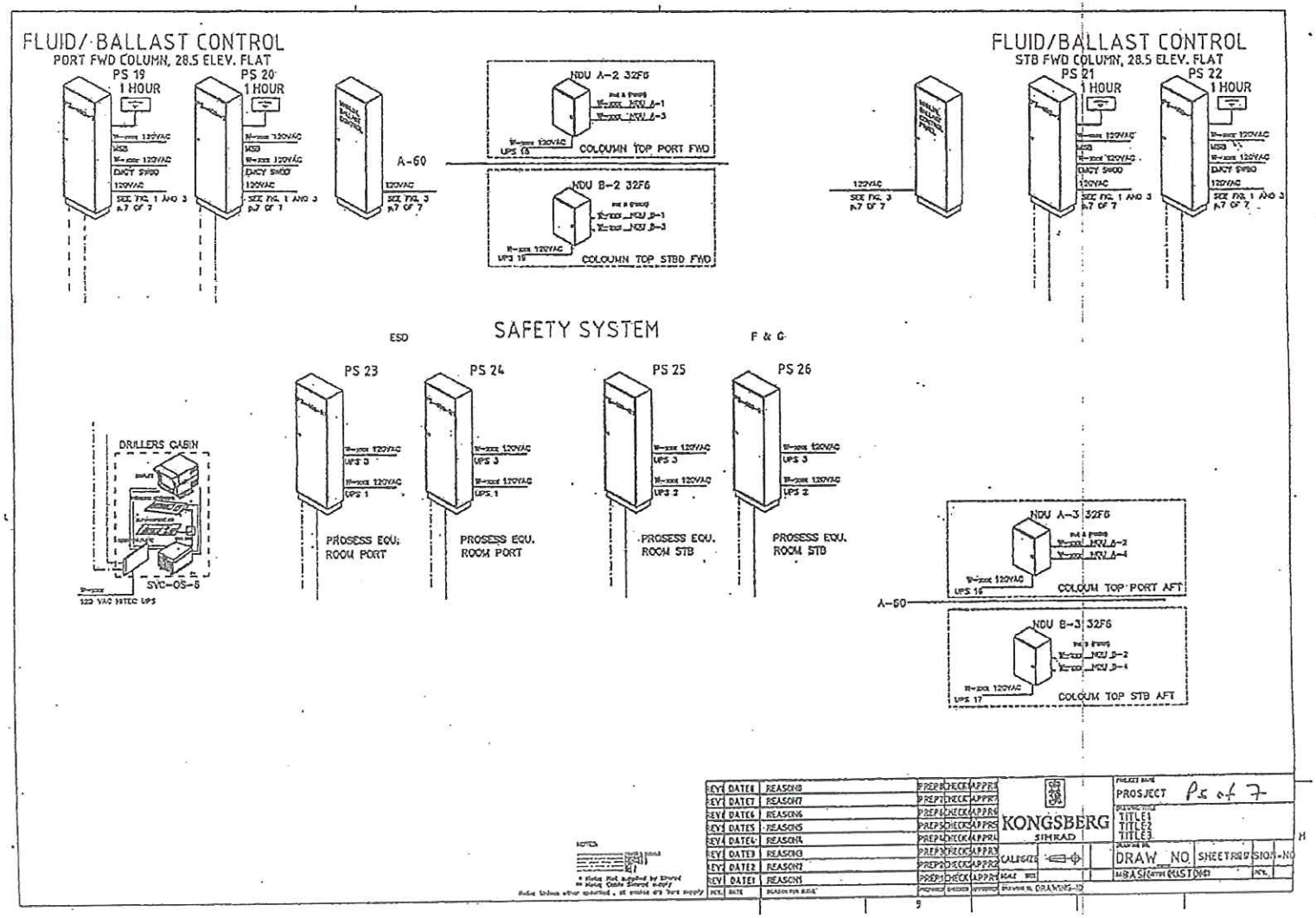
The specification calls for 180 man-days commissioning service which we have included. We think a realistic figure for the commissioning should be 290 mandays.

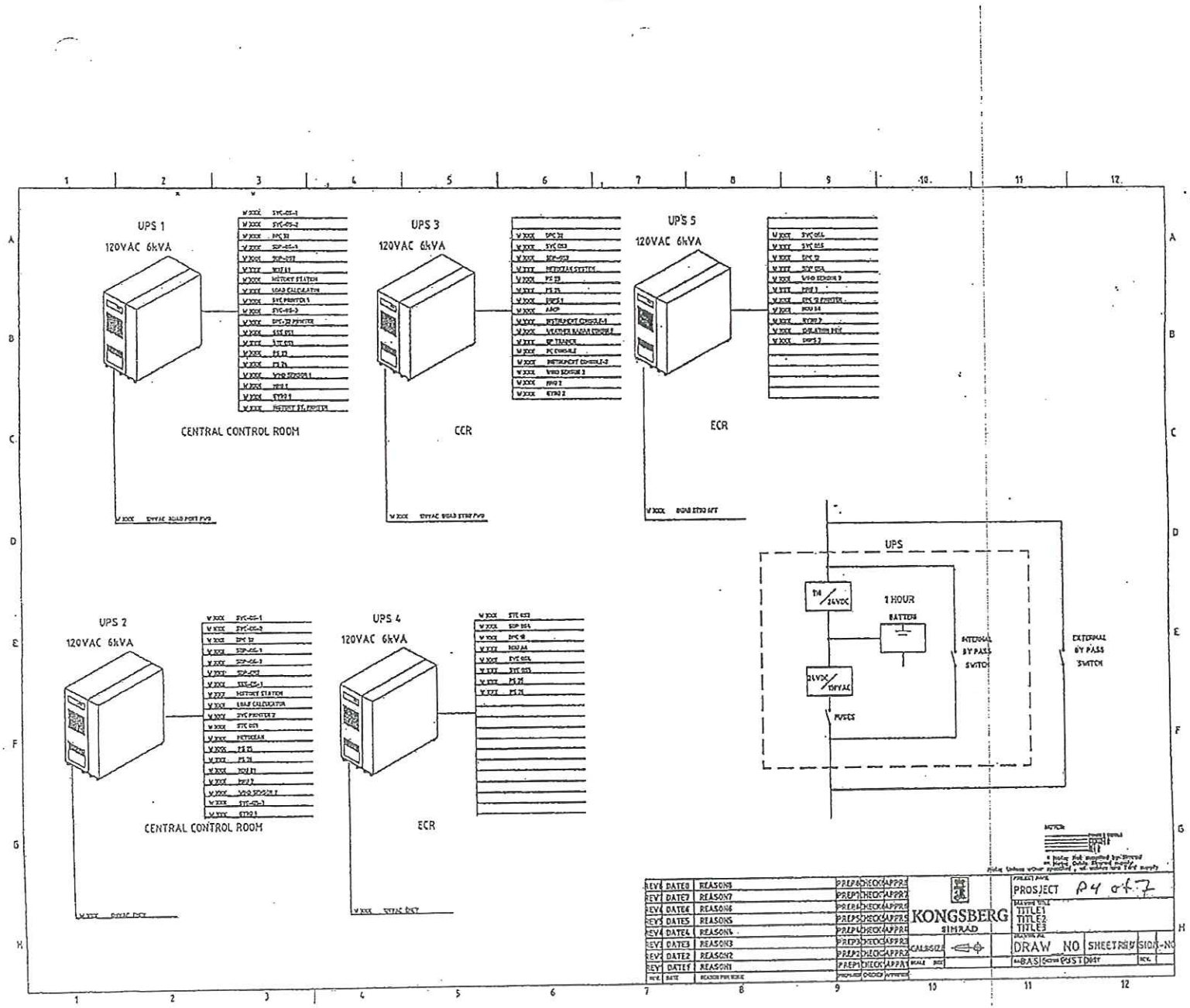
LAYOUT DRAWING

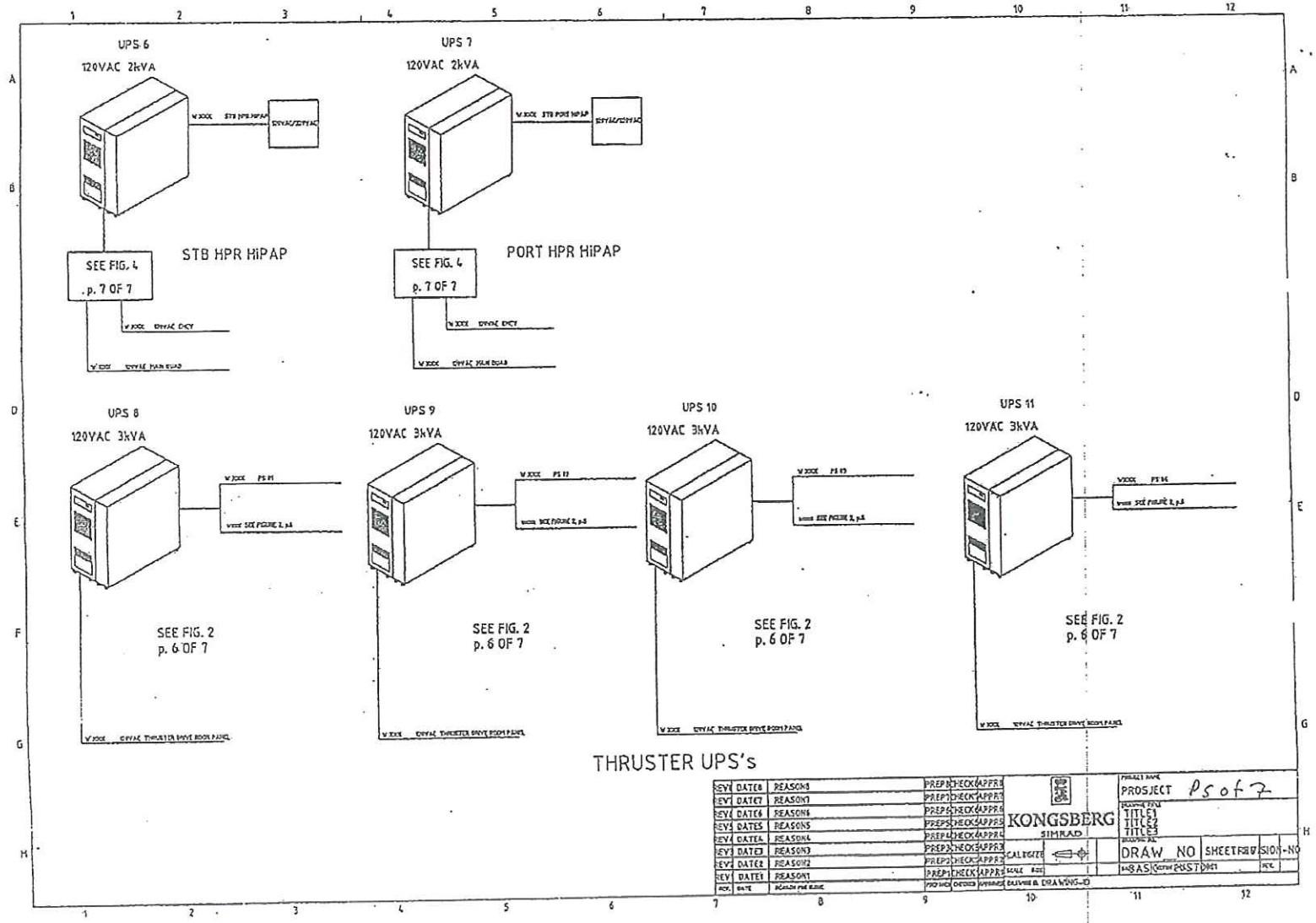
See enclosed drawings #799622,version P9, 7 pages.











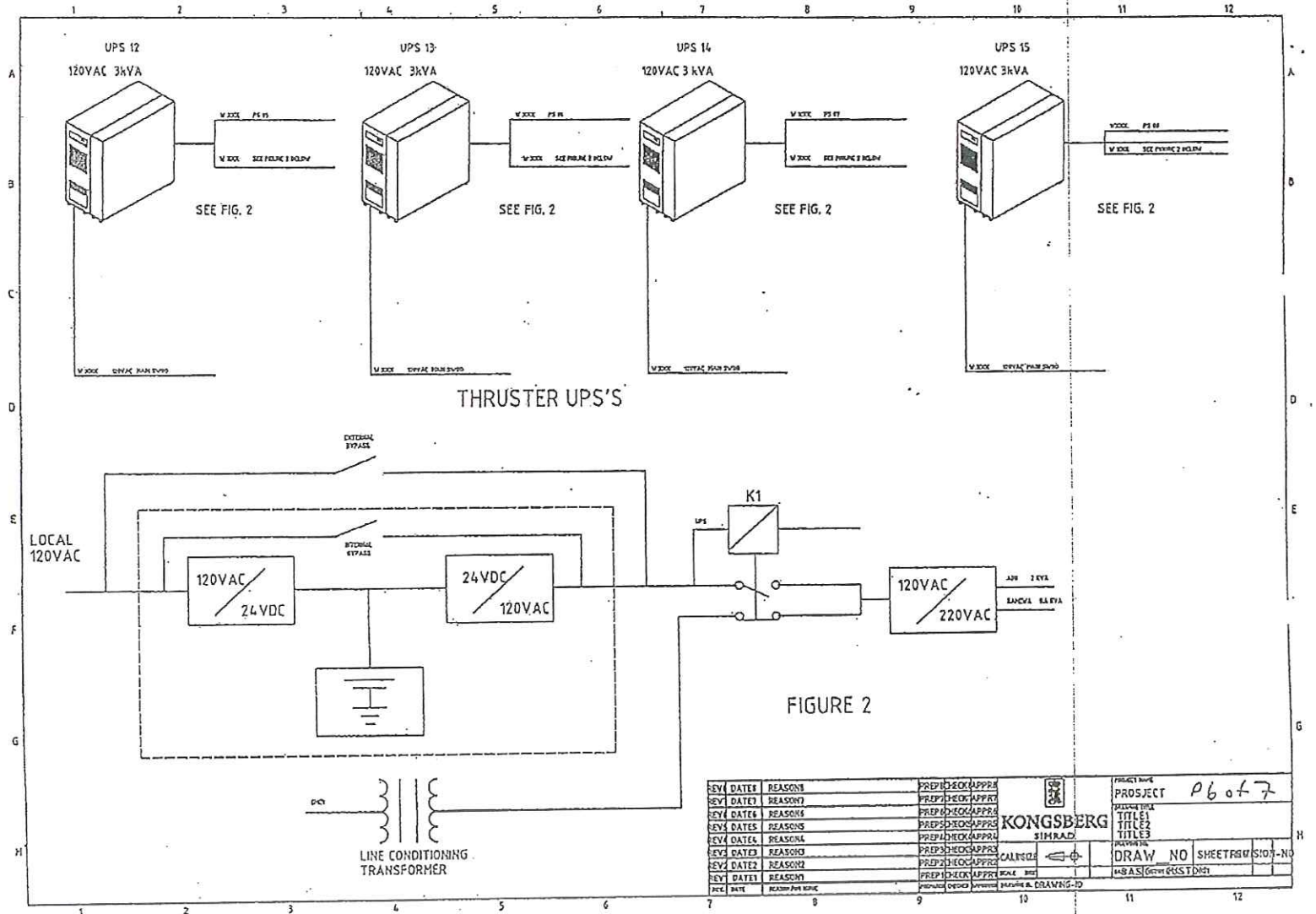

UPS 12
120VAC 3kVA
SEE FIG. 2
UPS 13
120VAC 3kVA
SEE FIG. 2
UPS 14
120VAC 3 kVA
SEE FIG. 2
UPS 15
120VAC 3kVA
SEE FIG. 2
THRUSTER UPS'S
LOCAL
120VAC
120VAC
24VDC
24VDC
120VAC
K1
120VAC
220VAC
LINE CONDITIONING
TRANSFORMER
KONGSBERG
SIMRAD
PROSJECT
TITLE1
TITLE2
TITLE3
DRAW NO
SHEET
REVISION-NO

FIGURE 2

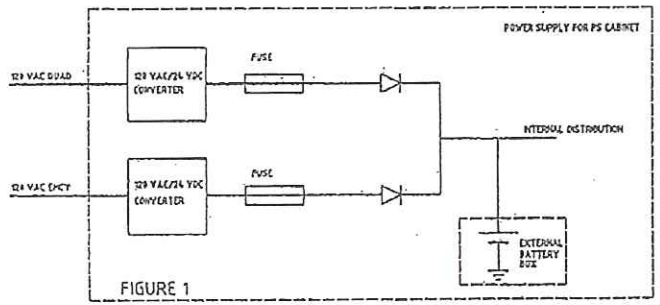


FIGURE 1

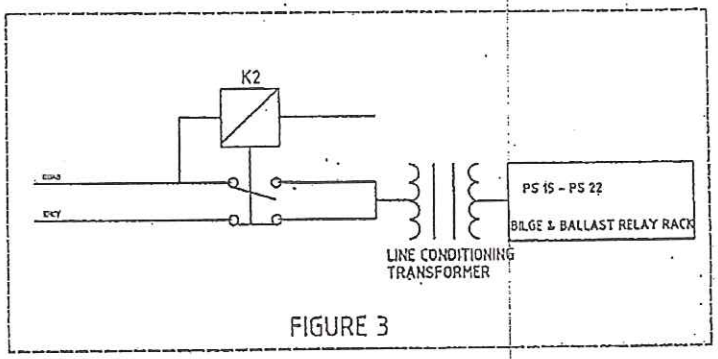


FIGURE 3

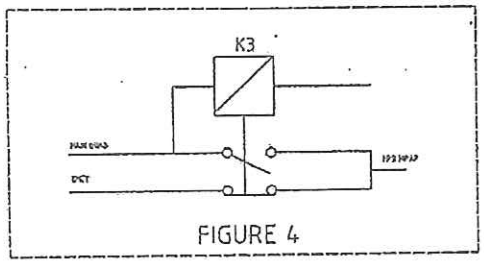


FIGURE 4

REV	DATE	REASON	PREP	CHECK	APPR
REV8	DATE8	REASON8	PREP8	CHECK8	APPR8
REV7	DATE7	REASON7	PREP7	CHECK7	APPR7
REV6	DATE6	REASON6	PREP6	CHECK6	APPR6
REV5	DATE5	REASON5	PREP5	CHECK5	APPR5
REV4	DATE4	REASON4	PREP4	CHECK4	APPR4
REV3	DATE3	REASON3	PREP3	CHECK3	APPR3
REV2	DATE2	REASON2	PREP2	CHECK2	APPR2
REV1	DATE1	REASON1	PREP1	CHECK1	APPR1

KONGSBERG SIMRAD

PROJECT P2 of 7

TITLE1
TITLE2
TITLE3

DRAW NO

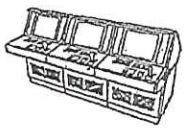
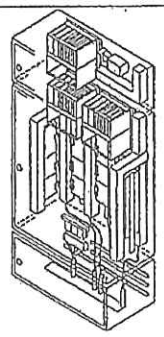
SHEET SIZE A3

SCALE

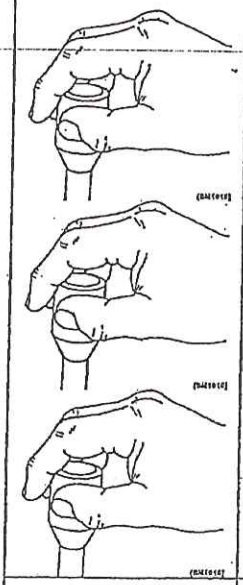
DRAWING ID

SCOPE OF SUPPLY SDP32

The KONGSBERG SIMRAD SDP32 System is a triple redundant dynamic positioning system designed for all DP applications with the full range of functionality. It's modularity and use of common building blocks allows for high flexibility and various upgrade paths. The system is designed to satisfy notations equivalent to Dynamic Positioning Class 2 with voting facilities.
It consists of a triple redundant controller unit (DPC-32) and three operator stations (SDP-OS).
The controller unit contains three powerful control computers the necessary I/O units to provide an interface to reference systems, sensors and dual Net Interface for various types of propellers, thrusters and rudders via local process stations. The operator stations contain high performance graphic controllers running the Windows-NT 32 bit operating system with high resolution 21" colour displays.

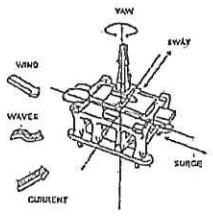
BASIC SYSTEM HARDWARE		
One (1)		**Three-sections SDP/HiPAP-OS Operator Station** Three identical operator consoles, each incorporating: • Joystick (3-axis) control • Heading control • Trackball • Buttons and status lamps • Colour Display (21") • Windows-NT graphic controller with dual net interface • Hard disk (1Gbyte) • Redundant power supply
One (1)		**DPC-32 Triple Voting Redundant Controller unit** • Triple Real Time Processor • Triple Flash PROM • Triple Analogue Input • Triple Digital Input • Triple Analogue Output • Triple Power Supplies • Triple Serial Input • Field Termination • Dual Net Interface • Redundant power supply

BASIC PRINCIPLES



Redundancy
- No single point failure
- Fault isolation
- Fault detection
- Automatic switch-over (TMR)
- On-line repair

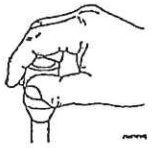
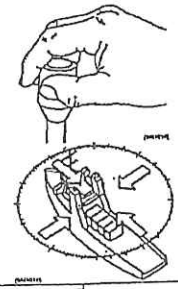
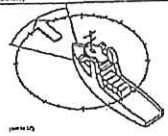
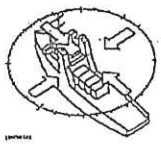
Sensor Redundancy
- First level voting
- Second level voting

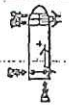
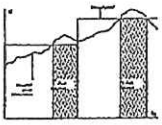
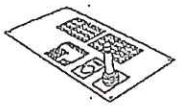
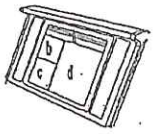


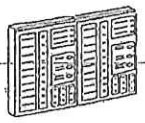
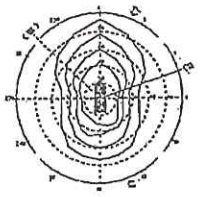
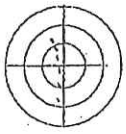
Mathematical Model
The vessel's mathematical model and the Kalman filtering technique provide the following advantages:
- Optimum noise filtering of heading and position measurements.
- Optimum combination of data from different reference systems.
- In the absence of position or heading measurements, the model provides an accurate "dead reckoning" mode.

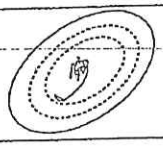
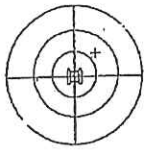
Optimum Controller
- Excursion Feedback
- Wind Feed Forward
- Current Feedback

Position Reference Systems and Sensor Data Processing
- Prediction Test (Short term accuracy assessment)
- Variance Test (Long term accuracy assessment)
- Median Test

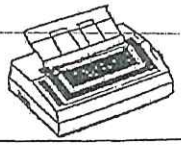
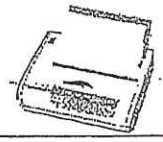
OPERATIONAL MODES	
	Standby Mode The Standby Mode is the waiting and reset mode. No control of the vessel
	**Manual/Joystick Mode** Manual positioning using the joystick and rotate controller. • Joystick Gain Selection, Normal, High and non-linear • Alternative Rotation Centre
	**Mixed Manual and Auto Mode** Enabling the operator to select any of the three degrees of vessel movements, (Surge, Sway and Yaw) as manual and/or auto control. This means that the operator can select automatic control of Sway and Yaw and manual control of Surge, or any other combination
	**Auto Heading Mode** Accurate control of selected vessel heading. • Present Heading • Set Heading • Heading • Set Rotate Speed • Heading Alarm
	**Auto Position Mode** Accurate control of selected vessel position. • Present Position • Marked Position • Set Position • Previous Position • Set Vessel Speed • Position Alarm

SYSTEM FUNCTIONS	
	**Thruster Allocation/Control** • Position Priority • Alternative rpm • Emergency Thrust • Thruster Run-in • Fixed Thruster Azimuth mode • Variable Thruster Azimuth mode • Rudder/Nozzle Control
	**Power Load Monitoring and Blackout Prevention** Dynamic reduction of pitch/RPM of thrusters/propellers. Require interface to: • Generator power and breaker status • Bus tie-breaker status • Thruster breaker status
 	**Man Machine Interface (MMI)** The MMI consist of the Operator Panel and the Colour Display. **Operator Panel** Dedicated pushbuttons for activation of main modes, reference systems, sensors, thrusters and functions important to the operation assessment. Heading selector, trackball and 3-axis joystick as well as numeric input buttons and alarm indicators are incorporated. **Colour Display** The Windows-NT interface provides high degree of flexibility in the presentation of information. In addition to familiar windows features such as Menu, Tool and Dialogue Bar, the display is organised with four views simultaneously shown on the screen, a) Alarm View b) Performance View c) Monitoring View d) Working View displaying information about: Position & Heading, Thrusters, Power, DP-Conning Display, Reference Systems, Sensors, Trends and Alarms.

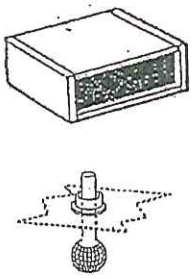
	Alarm System • On-line Diagnosis • Message Reporting • Alarm Advisory Function • Message Printout
	Built-In Trainer • Position and Heading Change • Thruster Operation • Environmental Conditions • Simulated Vessel Mode
	Miscellaneous Function • Controller Gain Selection • Selectable Rotation Point • Selection of Datum • Selection of UTM Zone/Hemisphere • Meridian Convergence • Selection of Display Presentation • Draught compensation
	On-line DP-Capability Analysis Predicting the maximum weather conditions for continuos DP operation based on various situations: • All systems fully operational • "Present" condition regarding thrusters and generators • Loss of one or more thruster unit(s) • Loss of one or more power generator(s)
	Motion Prediction Motion Prediction for drilling and well intervention. To simulate the motion pattern of the vessel: - in a drift-off situation and - in normal conditions to find the expected motion amplitudes induced by wind and waves The predictions are calculated based on user-specified environmental condition and for the following system status: - All thrusters and generators running - Present number of thrusters and generators running - Failure in a user-specified set of thrusters, generators and busbars The drift-off simulation are using domain methods, whereas the motion amplitude estimation are utilising frequency domain calculation.

	Consequence Analysis NMD Class III
	Auto-Area-Position Mode • Position Control • Heading Control
	Electric Riser Angle (ERA) Functions • Riser angle monitoring • Position advisory • Joystick advisory • Emergency position reference

SYSTEM INTERFACES	
Three (3)	Gyro Compass Serial line (Kongsberg Simrad Standard)
Three (3)	Motion Reference Unit Serial line (Kongsberg Simrad Standard)
Three (3)	Wind Sensor Serial line (Kongsberg Simrad Standard)
Four (4)	DGPS (providing NMEA-0183 interf.) Serial line (Kongsberg Simrad Standard)
Two (2)	Hydroacoustic Position Reference system HiPAP Via net
Four (4)	Draught SVC via net
One (1)	ECDIS (providing NMEA-0183 interface.) Serial line (Kongsberg Simrad Standard)
Three (3)	Electrical Riser Angle Serial line (Kongsberg Simrad Standard)
One (1)	Acoustic Riser Angle via HiPAP telegram
One (1)	Metocean System Serial line Number of signals: 250
	All Power Management via net
Eight (8)	Thruster via net

PERIPHERAL EQUIPMENT		
One (1)		R&B F free-issue item Printer Matrix printer. RS232-C interface.
One (1)		R&B F free-issue item Printer Colour printer for hard copy printing of VDU mimic, etc. Network connection.
Two (2)		Console for Printers Same design as made for RBS8M

SENSORS		
Three (3)		R&B F free-issue items Wind Sensor Wind Speed and Direction Sensor
Two (2)		R&B F free-issue items Motion Reference Unit MRU-5 • Pitch , Roll and heave sensor • Mounting Bracket • Serial and Analogue output • Junction Box incl. Cable
One (1)		R&B F free-issue items Watson Vertical Reference Unit • Pitch and Roll sensor
Three (3)		R&B F free-issue items Gyro Compass Anschutz Standard 20 • Master compass The compass is fully compliant with IMO resolution A424 (XI).

POSITION REFERENCE SYSTEMS (separately priced):		
Two (2)		Kongsberg Simrad Integrated HiPAP® system • HiPAP® operator software • HiPAP® Transceiver in cabinet • HiPAP® Hull Unit with Sphere Transducer with 5 meters stem • Hoist Control and • Remote Control Unit, for raising and lowering the Hull Unit • Gate Valve, light-opening Ø=500 mm, DnV certified • Mounting Flange, Ø=500 mm, DnV certified • Interface to Gyro and MRU • Integration to DP System • Documentation HiPAP®
Two (2)		Transponders Type SPT 331/DI SSBL,(10000 feet rated) including: -Lithium battery pack. -Depth sensors. -Inclinometer (x/y)
Two (2)		Transponders Type SPT 331/D SSBL,(10000 feet rated) including: -Lithium battery pack. - Depth sensor

POSITION REFERENCE SYSTEMS		
Two (2)		R&B F free-issue item Trimble 4000 Differential Global Position System • 2 ea. Trimble 4000 GPS Receiver units • 2 ea. Demodulators • 2 ea. Computers • 1 ea. Inmarsat antenna and radome • 2 ea. Racal multi-fix software packages • Cabinets and cabling

OPTION:

MARINE RISER MANAGEMENT SYSTEM

The Marine Riser Management System (MRMS) is an advisory tool for positioning the vessel and monitoring the riser performance when connected to the well. Based on measured inclinations of the BOP stack, lower and upper riser joints and the vessel motions, MRMS will calculate the most optimal position of the vessel with respect to minimum lower and upper flex-joint angles. The system will also report when there is a certain probability to exceed predefined limits for the flex-joint angles. Optionally, based on stroke measurements the system will also report when there is a certain probability of bottom-out of the riser tensioners. Optionally, available time to safe disconnect in case of a blackout event can be estimated based on simplified assumptions for the drift-off scenario.

The primary objectives of the MRMS are as follows:

- Increase the service life of the riser (by controlling flexjoint angles)
- Maximise operability (system availability) by monitoring critical parameters
- Optimise disconnect operations (ensure a vertical lift-off)
- Control safety margins for possible drift-off events (estimate available time to perform safe disconnect). (Optional)

The information typically collected and presented to the operator by the MRMS :

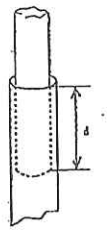
- Angle of upper flex-joint
- Angle of lower flex-joint
- Telescopic slip-joint stroke vs. operational limits (option)
- Optimum vessel position for drilling and non-drilling operations
- Optimum vessel position for disconnect operations

The MRMS will issue warnings when riser tension, flex-joint angles or slip-joint stroke are outside set limits.

SYSTEM HARDWARE		
1 (one)		MRMS Operator Station • Single Operator Keyboard • Single Colour Display (21") • Single Windows-NT graphic controller • Net I/F to DPC-32 cabinet

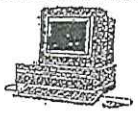
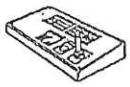
SYSTEM INTERFACES	
Set	Riser Angles (ERA) -BOP/Stack inclination -Lower riser joint inclination -Upper riser slip-joint inclination (Analogue or Serial line, NMEA 0183)
One (1)	Stroke Length (Optional) Analogue 4-20mA
One (1)	Vessel heave, roll and pitch From DP system via Net.
One (1)	Vessel heading From DP system via Net
One (1)	Current speed and direction* From DP system via Net
One (1)	Vessel global position * From DP system via Net

* Relevant for the optional "Time to go" prediction module.

SENSOR (OPTIONAL)		
One (1)		Stroke Length System for measuring slip-joint stroke distance Stroke length maximum 30 meter Eex-1 zone classified

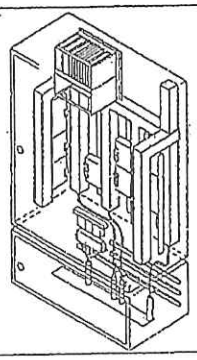
SYSTEM MODES	
	SETUP In this mode the operator enters all required data to define the riser stack-up data including alarm limits for the operation of the riser for the actual well. The SETUP will be designed to facilitate the riser stack-up definition and include default values for most of the parameters. It will also be possible to save the SETUP parameters in a file for later use or modification.
	NORMAL DRILLING In this mode the optimum position of the vessel relative to the current position is displayed by use of allowable vessel position circles for the upper and the lower flex-joint angles together with markers indicating the vessel position and the estimated optimum position. The optimum position is based on equal utilisation of the limits of the upper and lower flex-joint angles given in SETUP mode.
	NON-DRILLING In this mode the same type of information as for normal drilling is given but the operator may choose a different set of allowable flex-joint angles in order to optimise the vessel position.
	DISCONNECT In this mode the optimum vessel position is where the lowest riser joint is vertical, in order to reduce the horizontal forces to a minimum during a planned disconnect operation.

OFFLINE SDP BASIC TRAINER		
		SDP Basic Trainer Station

One (1)	 	SDP Basic Trainer Station consisting of:
		• One standard Pentium PC, 233 MHz , 128Mb memory, 2Gb harddisk. CD-ROM drive, Windows-NT 4.0 operating system, 17 inch colour display unit
		• One Desktop Operator Panel identical to the SDP console panel
		• Training software for simulation of:
		  ◦ position change
		  ◦ heading change
		  ◦ vessel mode
		  ◦ thruster operation
		  ◦ environmental conditions

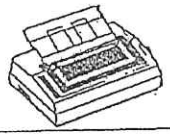
SCOPE OF SUPPLY SDP12 - BACKUP

The KONGSBERG SIMRAD SDP12 is a backup dynamic positioning system designed for all DP applications with the full range of functionality. It's modularity and use of common building blocks allows for high flexibility and various upgrade paths. The backup system is designed to satisfy notations equivalent to Dynamic Positioning Class 3.
It consists of a single controller unit (DPC-12) and an operator station (SDP-OS).
The controller unit contains a powerful control computer and the necessary I/O units to provide an interface to reference systems, sensors, dual Net Interface for various types of propellers, thrusters and rudders via local process stations and dual Net Interface to the main DP-System. The operator station contains a high performance graphic controller running the Windows-NT 32 bit operating system with a high resolution 21" colour display.

BASIC SYSTEM HARDWARE		
One (1)		**SDP/HiPAP-OS Operator Station** • Joystick (3-axis) control • Trackball • Buttons and status lamps • Colour Display (21") • Windows-NT graphic controller • Hard disk (1Gbyte) • Dual power supply
One (1)		**DPC-12 Single Controller unit** • Single Real-Time Processor • Single Flash PROM • Single Analogue Input • Single Digital Input • Single Power Supply • Single Serial Input • Field Termination • Dual Net Interface • Dual power supply

Operational Modes and System Functions as for the main SDP-System.

SYSTEM INTERFACES	
One (1)	Gyro Compass Serial-line (Kongsberg Simrad Standard)
One (1)	Motion Reference Unit Serial line (Kongsberg Simrad Standard)
One (1)	Wind Sensor Serial line (Kongsberg Simrad Standard)
Four (4)	DGPS (providing NMEA-0183 interf.) Serial line (Kongsberg Simrad Standard)
Two (2)	Hydroacoustic position reference system HiPAP via net
Four (4)	Draft Sensors SVC via net
One (1)	ECDIS (providing NMEA-0183 interf.) Serial line (Kongsberg Simrad Standard)
Three (3)	Electrical Riser Angle Serial line (Kongsberg Simrad Standard)
One (1)	Acoustic Riser Angle via HiPAP telegram
	All Power Management via net
Eight (8)	Thruster via net

PERIPHERAL EQUIPMENT		
One (1)		R&B F free-issue item Printer Matrix printer complete with cable and serial RS232-C interface.

SCOPE OF SUPPLY STC40:

The Kongsberg Simrad Thruster Control system - STC is an independent propulsion control system integrated with the Dynamic Positioning System via the DPC Controller Unit. The STC system consists of a standard operator station STC-OS with individual levers for each vessel thruster. There is also Analog 0-10volts option to install levers for main propeller and rudder in the STC-OS.
The interface to the thrusters/propellers/rudders is either via the I/O cards in the DPC controller or via local process stations as part of an integrated Kongsberg Simrad Vessel Control system - SVC.

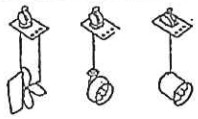
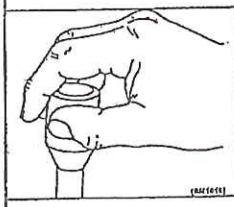
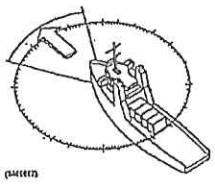
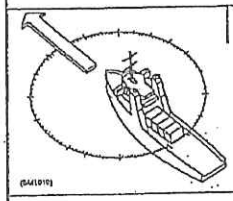
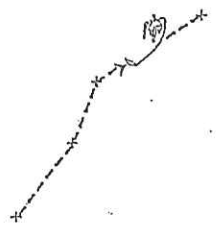
BASIC SYSTEM HARDWARE

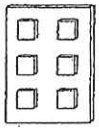
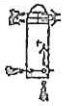
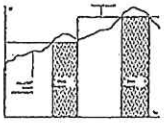
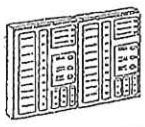
Two (2)

STC-OS Operator Station
- Individual lever control
- Common Joystick and Rotate controller
- Buttons and status lamps
- Colour Display (21")
- Windows-NT graphic controller
- Dual power supply

Sixteen (16)

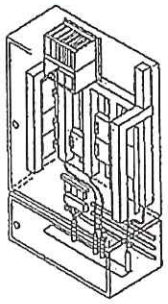
Azimuth Lever
- Lever in Operator Stations

OPERATIONAL MODES	
	Standby Mode The Standby Mode is the waiting and reset mode. No control of the vessel
	**Individual Lever Control** Individual control of any operator selected thruster, propeller and/or rudder
	**Manual/Joystick Mode** Manual positioning using the joystick and rotate controller. • Joystick Gain Selection, Normal, High and Non-linear • Environmental Force Compensation • Free Run
	**Auto Heading Mode** Accurate control of selected vessel heading. • Present Heading • Set Heading • System Selected Heading • Set Rotate Speed • Heading Alarm
	**Auto Pilot Mode** • Rudder/Thruster Azimuth Limit Setting • Port/Starboard Incremental Change of Heading • Off-Course Alarm • Free Run Speed
	**Auto Track (high-speed) Mode** • Stop • Reverse Track • Sideways Track Compensation • Off Track Alarm • Set Vessel Speed • Set Cross Track Speed • Set Turn Radius • Rudder/Azimuth Limit • Heading • Waypoints from external Computer

SYSTEM FUNCTIONS	
 	**Thruster Start/Stop** • Pushbuttons for individual start and stop of any Thruster/Propeller. • Thruster/Propeller status indicators
	**Thruster Allocation** • Fixed Thruster Azimuth mode • Variable Thruster Azimuth mode • Rudder/Nozzle Control • Alternative rpm • Emergency Thrust • Thruster Run-in
	**Power Load Monitoring and Blackout Prevention** Dynamic reduction of pitch/RPM of thrusters/propellers. Requires interface to: • Generator power and breaker status • Bus tie-breaker status • Thruster breaker status
	**Alarm System** • Message Reporting • Alarm Advisory Function • Message Printout
	**Miscellaneous Function** • Controller Gain Selection • Selectable Rotation Point • Selection of Display Presentation • Draught compensation

LOCAL THRUSTER CONTROL

The control of each thruster/propulsion unit is performed within local process stations which may be located close to the thruster unit. The local controllers receive command signals from the thruster control panels or dynamic positioning system, whichever is in command, and act on the actuators accordingly.
The local process stations may include monitoring and control of other process elements in addition to the thruster/propulsion units. Redundant controller units may be supplied depending on class/customer requirements.
Detailed process views including all alarms and status signals are shown on SVC operator stations. Basic SVC functions such as alarm reporting, storage of events and alarms for historic search, trending, reporting, self-diagnostic system and on-line configuration are applicable tools for the STC thruster control system.

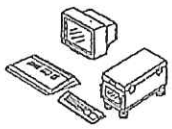
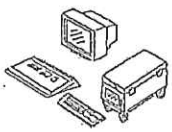
LOCAL PROCESS STATIONS		
Eight (8)		PS-240 Process Station (max 240 I/O) • Single Real Time Processor • Analogue Input • Digital Input • Analogue Output • Digital Output • Serial Input • Field Termination • Dual power supply

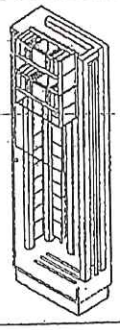
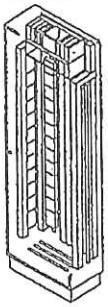
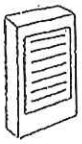
SYSTEM INTERFACES	
	Input/output : Included in SVC system.
Eight (8)	Frequency Controller Interface

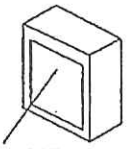
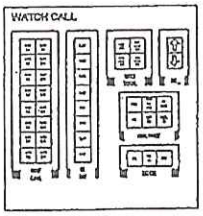
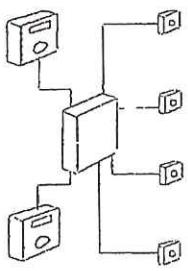
APPLICATIONS		
		Azimuth Thruster Control • Alarm monitoring • Remote start and stop and standby pump control of hydraulic/lubrication pumps • Remote start and stop of main thruster motor including sequential start-up of auxiliaries, zero pitch verification and start of standby electric generator, if required • Thruster pitch (rpm) and azimuth order (output signal 4-20 mA or 0-10VDC) • Thruster pitch (rpm) and azimuth feedback signals • Zero pitch function (controls pitch to zero during thruster stopped condition at sea or quay) • Safety protection • Thruster electric motor overload prevention (motor current limitation) • *Service mode* providing the operator with downgraded control/troubleshooting facilities from any SVC Operator Station • Servo loop control of thruster rotation (output signal 4-20 mA or 0-10VDC) • Generator overload prevention (if applicable)

SCOPE OF SUPPLY SVC

The KONGSBERG SIMRAD Vessel Control System (SVC) is a marine automation system designed for all applications with the full range of functionality. The modularity of the system and use of common building blocks allows for highly flexible expansion possibilities.
It consists of processing stations (SVC-PS) and operator stations (SVC-OS). The processing stations provides an interface to field sensors, whilst the man-machine communication, based on windows-NT runs from the operator station.
The processing stations and operator stations are connected to a communication network in a dual configuration, each network being a standard single segment industrial LAN.
For further details please refer to the SVC Design Manual and SVC Product Description.

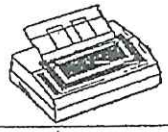
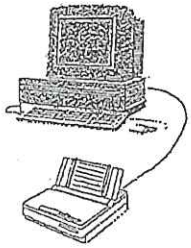
BASIC SYSTEM HARDWARE		
Five (5)		**SVC-OS Operator Station** • Operator panel with buttons and status lamps • Alphanumeric keyboard • Single Colour Display (21") • Single Windows-NT graphic controller • Dual power supplies
One (1)		**SVC-OS Operator Station Drilling Control** • Operator panel with buttons and status lamps • Alphanumeric keyboard • Single Colour Display (21") • Single Windows-NT graphic controller • Input Power: 120VAC from external UPS
Two (2)		**SVC-OS Operator Station for harsh environment (IP56)** • Mouse Keys • Single Colour Display (21") • Single Windows-NT graphic controller • Input Power: 120VAC from external UPS
One (1)		**History Station** • Database for long term storage of user defined process variables, for presentation on trend views and reports • Input Power: 120VAC from external UPS • 2 Gb Jaz Drive included • Modem interface (2ea.)for remote access

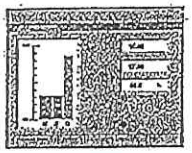
Eight (8)		PS-400 Process Station (max. 400 I/O) • Single Real Time Processor • Analogue Input • Digital Input • Analogue Output • Digital Output • Serial Input • Field Termination Boards (option IS) • Input Power: 2 x 120 VAC from external UPS • Dual Net Interface • Cable penetration through MCT
Six (6)		PS-240RI Process Station (max. 240 I/O) • Dual Real Time Processor • Analogue Input • Digital Input • Analogue Output • Digital Output • Serial Input • Field Termination Boards (option IS) • Input Power: 2 x 120 VAC from external UPS • Dual Net interface • Cable penetration through MCT
Four (4)		Ballast Control Panel • Local panel installed in each column controlling the ballast system in respective quadrant.

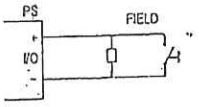
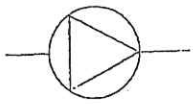
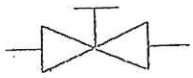
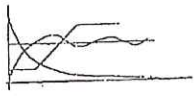
Six (6) Eighty (80)	NDU - NETWORK DISTRIBUTION UNIT  MULTIPORT REPEATER	Net Distribution Units (NDU) The NDU is the star point of the data network. Separate NDUs are installed for the A- and B-networks. Shielded twisted pair (STP) cables fibre optic cables connect each SVC-OS and -PS to the NDU. Several NDUs may be connected by fibre optic cables. Max. length STP cable: 100 m. Ref. SVC Design Manual for further information. NDU 16 Cabinet Multiport repeater NRP 100 Fibre optic transceiver. Note: Network cable is not included.
Four (4)		Watch Call System Panels • Alarm Extension System for UMS/E0 notation • Up to three main control panels in addition to ECR including command transfer. No panel required in ECR (control from SVC-OS) • Up to eight engineer panels including selection and indication of duty engineer • Up to five slave panels for mess/dayroom • 16 group alarms • Repeat alarm • Built-in Engineer Call function • Serial connection between panels and SVC-PS
One (1)		Dead Man System in E.R Six (6) activation panels Six (6) reset panels

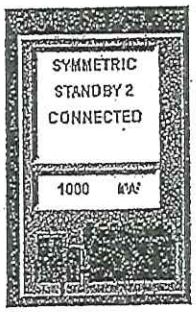
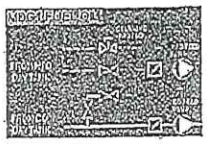
ADDITIONAL HARDWARE		
Three (3)		Instrument Console Empty console for mounting other equipment. (No engineering, cut out or mounting of equipment included.)
One (1)		Display Console for Weather Radar Instrument console with 21 inch color display fitted.

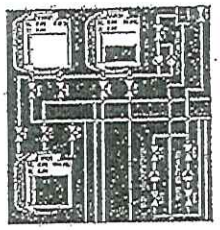
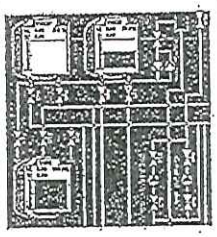
SYSTEM INTERFACES	
6300	Input/output signals (SVC and STC)inclusive 25% spares: Total Hardwired : approx. 5800 I/O Additional I/O on serial line : approx. 500 I/O
One (1)	Watch call system Serial line (Kongsberg Simrad standard)
One (1)	Load and Stability Calculator Serial lines (2). (Kongsberg Simrad standard).
One (1)	Drilling System Serial line (Kongsberg Simrad standard)
Two (2)	PBX Telemetry Modem interface for connection to telephone PBX

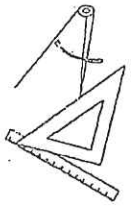
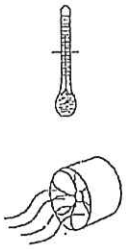
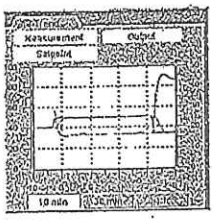
PERIPHERAL EQUIPMENT		
Two (2)		R&B F free-issue item Printer Matrix printer complete with cable and serial RS232-C interface.
One (1)		R&B F free-issue item Load and Stability Computer • Serial connection to SVC

BASIC SYSTEM FUNCTIONS	
	Man Machine Interface • Process Views using latest technology • Single Point Displays containing valuable information for troubleshooting and setpoint adjustment • Custom built keyboard with trackball operation
	Alarm and Event System • Reporting of alarms and process events • Storage of alarm and events for historic search • Filter functions for reporting and historic search • Alarm and event printing (continuously/on request)
	Access Control System • Password protection • Command transfer system
	Self-Diagnostic System • Monitoring of process controller • I/O card self-test function • Network failure monitoring • Monitoring of UPS system and internal power units
	On-line Configuration System All application software may be on-line edited, i.e. the control system may easily be adjusted to fit new requirements which can occur during installation and operation. On-line configuration and storage of updated application software is performed by means of the standard operator stations; no additional workstation required. • Parameter adjustment (set point, delay, gain, etc.) • Alarm configuration (new alarms/edit existing alarms) • New function modules (measurements, pumps, motors, etc.) • Control logic modification Process view modification (VDU displays)

BASIC MEASURING/CONTROL ELEMENTS	
	**Field Instruments** Analogue input 4-20 mA, 0-10 VDC, 2,3- or 4-wire Pt100 Alarm levels: H, L, HH, LL, open loop, short circuit Alarm delay/low pass filtering Digital input Alarm delay Pulsed input Real time value Accumulation Analogue output 4-20 mA, 0-10 VDC +/- 10 VDC (option) Digital output 24 VDC/300 mA powered outputs (standard) Relay contacts 120 VAC/300 VDC/5 A (option)
	**Electric Motor Control** • Remote start and stop • Automatic control mode • Standby start functionality • Restart after blackout • Local control indication, start interlocks • Two speed logic • Alarms
	**Valve Control** • Remote open and close • Automatic control mode • Single acting/double acting/throttle valves • Control valves (via I/P converter or motor driven) • Alarms
	**PID Control** PID-controllers for temperature in fuel, lubrication, cooling water systems. Special controllers e.g. : • Viscosity control of heavy fuel oil with temperature backup • Jacket cooling temperature control • rpm control of cooling pumps • Cascade, feed forward and split range functions

APPLICATIONS	
	Power Management Diesel Generator Control • Alarm monitoring • Remote start and stop • Safety protection • Exhaust gas temperature deviation monitoring incl. static or dynamic deviation alarm limits • Synchronising (via external sync. unit) • Standbystart in case of alarm on running generator Switchboard Control • Net frequency control • Generator loadsharing (balanced, unbalanced, fixed) • Load-dependent start and stop • Blackout restart Consumer Control • Start prevention of heavy consumers • Advance load reservation for consumers with variable load • Bus-tie/transformer breaker synchronising (via external sync. unit) • Interlock of bus-tie/transformer breaker operation • Automatic reconnection of bus-tie/transformer breakers after blackout • Load reduction of consumers
	Auxiliary Machinery Systems • Alarm monitoring • Remote start and stop of electric motors, single- or two-speed • Standby pump control • Air compressor lead/lag control • PID-control with pneumatic or motor driven control valve • Fuel oil viscosity control with backup temperature control • Jacket cooling temperature control Options: • Group start/stop of pumps • Automatic bilge control

	**Ballast and Storage Monitoring and Control** • Tank level monitoring (presentation in sounding or ullage) • Remote start and stop of electric driven pumps, single- or two-speed • Remote start and stop of hydraulic driven ballast pumps • Remote control of valves (single acting, double acting, throttle) • Remote start and stop of hydraulic power pack for valve control • Draught, trim and list measurements • Local emergency quadrant control • Tank volume presentation Option: • Colour change of pipeline
	**Bulk Monitoring and Control** • Tank level monitoring (presentation in sounding or ullage) • Tank temperature and inert gas pressure monitoring • Remote start and stop of electric driven pumps, single- or two-speed • Remote start and stop of hydraulic driven cargo pumps and hydraulic power system • Remote control of valves (single acting, double acting, throttle) • Bulk material control from local control consoles • Tank volume presentation Options : • Colour change of pipeline

	**Load and Stability Calculation** Make: Ocean Motion • Off-line (planning) and on-line (monitoring) modes of operation • Stability Analysis incl. KG, GM solid, GM fluid, righting level curvature, list of roll angles • Comparison of stability/stress conditions vs. max. values • Displacement, dead weight, drafts • On-line tank level gauging via SVC, presentation in sounding (or ullage), volume, volume percent, weight • Trim correction of on-line tank level data • Display of main calculation results and warnings on SVC process views for ballast/cargo operation • Classification society approval of calculations
	**Heating, Ventilation & Air Conditioning** Control of air handling units for cabins, duty rooms, offices : • Start/stop of supply, exhaust and re-circulation fans • Preheating, cooling and re-heating temperature control • Humidity control (if applicable) • Heat recovery wheel control (if applicable) • Cold and hot air duct for cabins, duty rooms, etc. • Sequence start-up of air handling unit Control of heating water system : • Circulation pump control • Temperature control
	**Trend System** The SVC trend system enables the operator to observe the development of process variables and component states over time. It is an excellent tool for machinery troubleshooting and process optimisation. The operator may easily define trend pictures or the smaller *trend views* from any process variable. Option: Data storage of process variables in order to present historical information in trend curves (requires History Station).

	Report System • Watch report • Daily report • Average/total values available • Hour counter report
	Miscellaneous Hospital Call System Elevator Monitoring and Alarm system (4 elevators) Watertight Doors and Hatches monitoring and control
	Redundancy and Criticality Assessment /Mode control On-line analysis system for monitoring of thruster units and electric power plant as well as auxiliary systems including control systems, to verify that the status of all units comply to vessel operational mode requirements. Operator warnings in case of malfunction or incorrect operational condition on any required equipment will be displayed on DP-console and navigation stand (STC).

SCOPE OF SUPPLY: SSS40

The KONGSBERG SIMRAD Safety Systems comprise Emergency Shut Down (ESD) and Fire & Gas Detection and Protection (F&G). The systems include;

- Extensive safety management functions
- Comprehensive fault diagnostics and self checking features
- Controlled flexibility concerning maintenance and modifications
- Unified HW and SW with vessel control systems

The systems are fault tolerant, reliable computer based systems and ensure a high availability without reducing the demand for safe operation. ESD and F&G functions are implemented on computers that are independent of other systems and are functionally stand-alone systems, meaning they are not dependent of signals, features or operator actions related to other systems. They are however capable of transferring alarms and data to other systems on the dual redundant network, thus a dedicated serial line is not necessary to integrate the systems. The safety functions are not dependant of the network.

The safety system uses standard function blocks developed for safety functions. The programming of these blocks may to a great extent be done automatically from the definition of Cause & Effect (C&E) diagrams and Fire Protection Data Sheets (FPDS) produced by the Simrad Safety Tool (SST) engineering SW package.
The safety systems include for a total of 1167 signals; hardwired and analogue addressable. The scope of I/O is based on the number of I/O on the sister vessel RBS8M as per engineering status per January 1999, plus 25 % spare for each type of I/O. I/O also includes interface to the matrixes/repeater panels.

The spare is installed and may be utilised during engineering of RBS8D. In addition, cabinets and equipment is prepared for an additional 10% increase of I/O (space/capacity).

The number of detectors is based on the engineering of RBS8M. See the following table.

F&G I/O:
45 HC Gas Detector
45 H2S Gas Detector

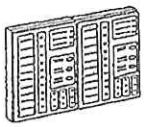
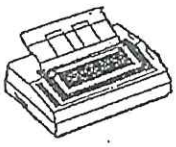
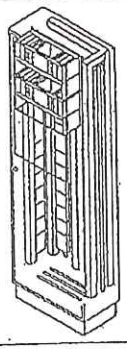
The detector I/O is counted below.

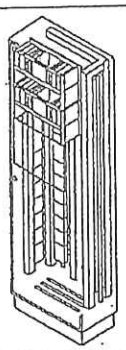
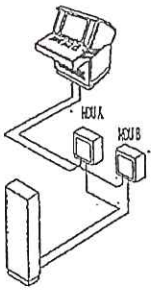
8 Manual Call point	
13 Smoke Detector	
9 Heat Detector, grade 1	
34 Flame detector IR3	
50 Manual Call point	
47 Manual Call point	
309 Smoke Detector	
47 Heat Detector	
153 Analogue/Digital Inputs (Line monitoring), non-IS	
10 Analogue/Digital Inputs (Line monitoring), IS	
19 Digital Inputs non-IS	
40 Digital Inputs IS	
79 Digital Outputs NE	
9 Digital Outputs NDE with monitoring	
103 Digital Outputs NDE without monitoring	
930 Sum Detectors, Field and Repeater I/O	Including 25% spare

ESD I/O:

44 Analogue/Digital Inputs with monitoring	
20 Digital Inputs IS	
19 Digital Outputs NE	
93 Digital Outputs NE without monitoring	
23 Digital Outputs NDE with monitoring	
38 Digital Outputs NDE without monitoring	
237 Sum Field and Repeater I/O	Including 25% spare

The system is expandable by addition of hardware modules and / or cabinets if necessary.

SYSTEM HARDWARE		
One (1)		Operator Station (Single) • Single Operator Keyboard • Single Colour Display (21") • Single Windows-NT graphic controller
Three (3)		Matrixes for ESD and F&G Simple matrixes showing only the most critical information. One ESD and F&G for CCR, and one F&G repeater panel for driller's cabin.
One (1)		R&B F free-issue item System Printer (event and alarm)
Two (2)		ESD Station • Redundant 1 out of 2 system (1oo2R) • Analogue/digital inputs • Digital Outputs NDE without mon. • Digital Outputs NDE with mon. • Power Supply
Three (3)		ESD Push buttons Locations: Helideck and the two Lifeboat stations

Two (2)		F&G Station • Redundant processor • Analogue Inputs • Digital Inputs • Digital Outputs NE • Digital Outputs NDE without mon. • Digital Output NDE with mon. • Addressable detectors • Serial line to Fire Central • Power Supply
One (1) LOT		**R&B F free-issue items:** **Fire & Gas Equipment** Fire Central and detectors according to above list
Two (2) Two (2)		Net Equipment - Communication network consists of dual redundant LAN connecting operator and process stations. - Network Distribution Unit (NDU); multiport repeaters with connection to fibre optic via bridges. - Net bridges

MAIN SYSTEM FUNCTIONS	
ESD	System features; • Dual redundancy (1oo2R) • Fault tolerant, no spurious shutdown on single failure • Autonomous of other systems • Extensive system tests and monitoring • Functional testing without output switching • Compatible with other Simrad systems
F&G	System features; • Redundant computer • Self-contained • Extensive self-checking • Functional testing without output switching • Compatible with other Simrad systems

SCOPE OF SUPPLY: UNINTERRUPTIBLE POWER SUPPLY SYSTEM

SYSTEM HARDWARE		
Five (5)		R&B F free-issue items: 6 KVA UPS with 1 Hour Battery Backup • 120 V 60 Hz input • 120 V 60 Hz output
Eight (8)		3 KVA UPS with 1 Hour Battery Backup • 120 V 60 Hz input • 120 V 60 Hz output
Two (2)		2 KVA UPS with 1 Hour Battery Backup • 120 V 60 Hz input • 120 V 60 Hz output
Eight (8)		Step-up Transformer 120 V / 220V / 60 Hz / 2.5 KVA • Two outputs with breakers • Housing
Eighteen (18)		Line Conditioner 120 V / 60 Hz / 2.5 KVA
Fourteen (14)		Battery Box • 1 Hour Battery Backup for internal UPS in PS's

SCOPE OF SUPPLY: METOCEAN SYSTEM
Standard Make: Nautic Systems

The Metocean system is based on a separate Windows-NT PC system communicating with the Historic Station database on serial communication line. The Metocean system will utilize the DP sensors for wind, roll, pitch, heave, heading, draft, depth and position. In addition sensors for air temperature, air humidity, air pressure, sea temperature, sea current speed and direction are interfaced to the Metocean computer.

BASIC SYSTEM HARDWARE	
One (1)	Data Acquisition System mounted in cabinet, containing: • one (1) Pentium PC • one (1) Keyboard • one (1) mouse • one (1) 17" colour monitor • one (1) printer • one (1) interface rack
	Sensors
One (1)	• Combined air temperature and air humidity sensor with Gill radiation shield
One (1)	• Barometric pressure sensor including air inlet unit
One (1)	• Acoustic Doppler Current Profiler, ADCP, vessel mounted. Maximum operating depth: 500 meters. Computer and keyboard mounted in the Metocean system cabinet.
One (1)	• Sea Temperature sensor, Pt 100 sensor, complete with termowell.
One (1)	Interface to Vessel Control system. Net interface
One (1)	DADAS-NT Windows-NT, software package for data aquisition, storage, graphical presentation and reporting.

SPARE PARTS

INTEGRATED CONTROL SYSTEM			
ITEM	PART.NO.	DESCRIPTION	QTY
1	47730080	POWER SUPPLY SBC400 ESD-C314W/AS	1
2	47730156	DC/DC 24/+15-15 15W *553 SN96	1
3	37946373	SBC400 8MB DRAM	1
4	44489755	FUSE CER. 5X20MM 5A 10-061	2
5	44489706	FUSE CER. 5X20MM 1A 10-061	2
6	43505841	FUSE 20* 5 1.0A 250V T I-042	2
7	43505833	FUSE 20* 5 2.0A 250V T I-042	2
8	44489698	FUSE CER. 5X20 125mA KVIKK E10-	2
9	47703384	FUSE 19303K 1.6A 125V TR3-F *038	2
10		DI-400	1
11		DO-400	1
12		AOV 400	1
13		AI-400	1
14		AI-400 Pt-100	1
15	37960309	TBSS	1
16	37767532	TBSL MOTHER BOARD	1
17	37767605	TBSL CURRENT LOOP ADAPTER	1
18	37767563	TBSL RS422 ISOLATED ADAPTER	1
19	37767522	TBSL RS232 ISOL. ADAPTER	1
20	37767449	TBSL POWER	1
21	47736046	HARDDISK FOR COS COMPUTER	1
22	37960259	PMC 100	1

HiPAP® SYSTEM:			
ITEM	PART.NO.	DESCRIPTION	QTY
1	382-111836	TRB Transmitter Receiver Board	1
2	290-087025	Power Supply	1
3	719-087082	PC Pentium	1
4	982-112009	TNC Transceiver Memory Control	1
5	719-087122	Digi PC/4e-RS422	1

PROJECT SERVICES

Project Management
Kongsberg Simrad' project team will through close co-operation with the R&BF assist and support R&BF's engineering group to take advantage of the engineering done for the RBS8M project which is also relevant for RBS8D. Local competent technical support is available from Kongsberg Simrad's Houston office.
When the contract is signed, Kongsberg Simrad (KS) will assign a project manager who will be responsible for administration and day-to-day communication with the customer until completed installation of the system specified in the quotation. The project manager and project engineers will attend 4 project meetings at the yard or at customer's site. Kongsberg Simrad will for limited periods of the engineering phase locate an engineer in Houston.

Embedded Engineering
- Engineering activities which are the normal work of KS are :
- Technical discussions with the customer to design the structure of the supply, e.g. dimensioning of process cabinets, number and type of I/O to each cabinet, network arrangement and power supply.
- Clarification of system performance/operation, installation requirements, and documentation requirements
- Production of installation drawings and cable plan
- Production of VDU mimic layout for approval
- Production of field cable termination diagrams

Establishing drawings and / or specifications required for HW and SW production

Additional engineering (Functional requirements definitions)
Kongsberg Simrad will provide additional engineering services to assist the customer in design of the control system, i.e. establish the functional requirements for the control of the various machinery. This will typically include :
- participate in interface meetings/discussions with yard or other suppliers
- checking control requirements/interface diagrams for machinery, switchboards, motor control centres, solenoid valve cabinets, etc.
- checking system response time requirements for each control loop
- detection of possible failure modes and the required response to the identified faults
- defining distribution of process segments and I/O signals to the different process cabinets based on requirements of system performance, limitation of field cables, authority requirements, etc.
- serial interface specifications
- write Function and Design Specification (FDS) for the control system

If these engineering services are not included, KS will require complete functional requirements from the customer as part of the information schedule.
Under all circumstances, the customer has the overall responsibility for the definitions of the control system functionality.

Re-programming Service
200 man hours software configuration post acceptance service by experienced engineer(s) included.

Documentation Requirements
The information required in order to produce the control system is specified in the SVC Design Manual. It is the responsibility of the customer to provide the information, including all required information from his sub-suppliers.

Documentation from Kongsberg Simrad
Based on the contracted scope of supply KS will issue a project specific installation manual which includes the following documentation:

- System block diagram
- System cable list (excl. field instrument cables)
- Power consumption of each unit
- Dimensional drawings of all units
- Installation requirements/drawings of all units

Upon receipt of preliminary data KS will design VDU mimic. Preliminary specification of hardware units and internal arrangements will be made.
Upon receipt of final documentation from the customer the production of hardware and software will start. Field cable termination information will be produced.

Schedule
The data listed under Documentation Requirements will normally be received as a preliminary version used for system dimensioning, and later as final documentation. A delivery schedule shall be established once the project is established, stating the deadlines for delivery of documentation from both parties. This schedule shall be binding for both parties and any additional cost due to late/incomplete or incorrect documentation shall be compensated. If the information required for system production is delayed this shall delay the shipment date accordingly. Acceptable deviations between preliminary and final data shall be defined by the project. Any modifications which are notified after receipt of final data shall be compensated.

Standards
All control functions and interface requirements are based upon the standards described in SVC Design Manual and Product Description unless specified in writing.

Factory Acceptance Test (FAT)
The project manager is responsible for preparing an FAT procedure in accordance with the Kongsberg Simrad Quality Assurance program. The test procedure will be sent to the customer in due time before the actual test. The FAT is included in the quotation. Travelling expenses and any other costs for the yard's/owner's and classification's representatives are not included.

Customer Acceptance Test (CAT)
The project manager is responsible for preparing a CAT procedure for the delivered system in accordance with the Kongsberg Simrad Quality Assurance program. The test procedure will be sent the customer in due time before the actual test.

Client Acceptance Trials in GOM
The project manager is responsible for preparing a Client Acceptance Trials procedure for the trials prior to first drilling in the GOM.

Anticipated amount of Installation Supervision, Commissioning and Sea Trial Time
SDP, STC and SVC system:
Installation supervision and commissioning: 220 mandays

Seatrial: 24 mandays

Travel and living expenses are not included.
Waiting time is not included.

Installation and Commissioning of Safety field equipment.
Commissioning: 60 man-days

Installation, Commissioning and Sea Trial of Metocean System
Commissioning and sea trial: 10 man-days

Quoted according to RFQ: 232 man-days commissioning excl. travel and living costs.

Documentation
The following documentation is included:

- 10 sets of the Operator Manual
- 10 sets of the Technical Manual
- 10 sets of the Installation Manual

In addition to the written handbooks supplied, all proprietary documentation will also be supplied in electronic format. Ref. Attachment 1.

Certification
The following certification cost is included:

- ABS DPS-3 and ABS ACCU
  Certification for the delivered systems and witnessing of Factory Acceptance Test by ABS representative is included. Kongsberg Simrad is responsible for obtaining ABS approval of necessary documents issued by Kongsberg Simrad. ABS onboard survey and any travel expenses are not included.
- NMD / NPD Compliance

The quoted system complies fully with NMD and NPD requirements.

Cause & Effect Matrix
Kongsberg Simrad will supply the Kongsberg Simrad Safety Tool (SST) programme and corporate with the customer to make Cause &Effect diagrams, reports and safety documentation.

FMEA
Kongsberg Simrad will supply FMEA analysis for the system according to certification requirements.

Training (Included)
The following training courses are available at the Kongsberg Simrad training Centre in Kongsberg, Norway or Houston, Texas:

- SDP Operator Course
  One (1) 5 days operator courses for maximum 8 persons at each course.
- SVC Operator Course
  One (1) 2 days operator course for maximum 8 persons.
- Maintenance Course
  Two (2) 5 days technical training for total 4 persons on the Integrated Vessel Control system.

Included are:
Instruction
Training material, (written documentation)
Daily lunch

Travel and living expenses are not included.

COMMERCIAL SECTION

1. Prices

Base price	US $	3,000,800. -
Integrated dual HiPAP system	US $	400,000. -
Installation supervision, commissioning and sea trial	US $	286,000. –
82 mandays additional commissioning, Normal Price is $ 110,000.-. Special Price to RBF	US$	55,000. -
DP Spare Parts package	US $	18,940. -
HiPAP Spare Parts package	US $	26,832. -
Total	US $	3,787,572.-

Free-issued Equipment:

1 ea. Dot Matrix Printer	US $	600. -
1 ea. Color Printer	US $	2,000. -
3 ea. Wind Sensor	US $	10,000. -
2 ea. MRU	US $	66,000. -
1 ea. VRU	US $	14,500. -
3 ea. Gyro Compass	US $	57,900. -
2 ea. DGPS	US $	76,000. -
1 ea. Dot Matrix Printer	US $	600. -
2 ea. Dot Matrix Printer	US $	1,200. -
1 ea. L & S Computer	US $	10,000. -
1 ea. Printer	US $	600. -
1 Lot Fire & Gas Equipment	US $	232,226. -
5 ea. UPS	US $	53,000. -
Total	US $	524.626.-

Options:

If RBF declines to free-issue items above, add	US $	524,626. -
Marine Riser Management	US $	345,000. -
Second History Station	US $	41,600. -
Color change of pipelines	US $	13,000. -
CIF Ulsan Korea, sea freight	US $	6,500. –
Delete RBF's specified I/O Isolation TBs (Credit)	US $	(12,900.-)
Removed Attachment 3:		
Extended Warranty from November 2000 -		
- To the end of January 2002	US $	70,000. –
Engineering Service Rate (Pr Hour)	US $	80. –
Addition/Deletion for DI I/O Points (per 32 channels)	US $	6,400. -
Addition/Deletion for DO I/O Points (per 32 channels)	US $	6,265. -
Addition/Deletion for AI I/O Points (per 32 channels)	US $	6,478. -
Addition/Deletion for AO I/O Points (per 32 channels)	US $	4,285. -

2. Payment Terms

Base Bid:
10% of contract value at receipt of order, due 30 days after invoice
40% of contract value on December 1, 1999, due 30 days after invoice
50% of contract value on January 31, 2001; due 30 days after invoice

3. Delivery Time

Delivery time from Kongsberg, Norway, 8 months from order pending no delays in engineering

4. Terms and Conditions

R&B Falcon's Conditions shall apply.

5. Customs and Taxes

The purchaser is responsible for all charges such as
Import duties and taxes levied on the equipment in
his country.
Hydroacoustic Transponders (4) for 3000 meters water depth requires export license.
Export to Korean yard requires End User Certificate.

6. Terms of Delivery

The equipment is supplied FCA Kongsberg (Incoterms 1990).
CIF Ulsan, Korea quoted as option.

7. Validity

This quotation is valid until May 20th 1999.

The prices given in this quotation are valid for delivery before July 1st 2000.

TERMS & CONDITIONS

Reading & Bates Falcon's Terms & Conditions will apply.

ATTACHMENT 1

RBS8D INTEGRATED ALARM AND CONTROL SYSTEM DOCUMENTATION / DATA REQUIREMENTS SHEET

ITEM	DATA DESCRIPTION / DEFINITION	WHEN REQ'D.				QTY. / TYPE REQ'D.					COMMENTS
		Quotation	Approval	Certified (AFC)	Record	Original	Reproducible	Copies	Laminated	Electronic	
1	Block Diagram Detailed block diagram of the IACS as proposed for the RBS8D program.	X	X	X	X	1	9			1	COMPLY
2	Cause & Effects Diagram Complete Cause & Effects diagram in spreadsheet format, listing each input and each output to the IACS. Each I/O point shall be identified by tag number and IACS register identification.		X	X	X	1	9			1	COMPLY
3	Emergency Shutdown Logic Diagram Complete logic diagram indicating manual and automatic shutdown logic.		X	X	X	1	9			1	COMPLY
4	General Outline Dwgs. Dimensioned drawings showing: the general appearance and arrangement of the major cabinets and consoles of the IACS.	X	X	X	X	1	9			1	COMPLY
5	Equipment Outline Dwgs. Dimensioned drawings showing: equipment mounting details; required clearances for maintenance; power, control, and utility connection provisions.		X	X	X	1	9			1	COMPLY
6	Utility Requirements Detailed analysis of all utility requirements for the IACS indicating the location and size of each required feeder.		X	X	X	1	9			1	COMPLY
7	Bill of Materials Detailed Bill of Materials for each console or cabinet, listing quantity, manufacturer, description and rating, manufacturer's part number.		X	X	X	1	9			1	COMPLY
8	Control Screens Full color screen captures of all monitor, alarm, and control screens to be used in the IACS		X	X	X	1	9			1	COMPLY
9	Control Panel Layouts Drawings detailing the planned layout of all main consoles and remote panels.	X	X	X	X	1	9			1	COMPLY

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ATTACHMENT 1

RBS8D INTEGRATED ALARM AND CONTROL SYSTEM DOCUMENTATION / DATA REQUIREMENTS SHEET

ITEM	DATA DESCRIPTION / DEFINITION	WHEN REQ'D.				QTY. / TYPE REQ'D.					COMMENTS
		Quotation	Approval	Certified (AFC)	Record	Original	Reproducible	Copies	Laminated	Electronic	
10	Interconnection Cable Plan Detailed cabling diagram showing all cables required to interconnect the IACS		X	X	X	1	9			1	COMPLY
11	Schematics Schematic diagrams of all monitoring, alarm, shutdown, and control equipment, identifying manufacturer's wiring and shipyard wiring, including details and identification of terminals for equipment connections.		X	X	X	1	9			1	COMPLY
12	Wiring Diagrams Detailed wiring diagrams, lists, or schedules listing all wiring within each piece of equipment. All wires are to be identified with the actual wire tag number. The source and destination of each conductor is to be clearly identified by component ID and terminal ID.		X	X	X	1	9			1	COMPLY
13	FAT Procedure Detailed Factory Acceptance Test procedure, complete with copies of forms to be used to record the progress and results of the FAT.		X		X	1	9			1	COMPLY
14	Commissioning Procedure Detailed procedure for the final commissioning procedure aboard the rig in the shipyard, complete with copies of forms to be used to record the progress and results of the commissioning process.		X		X	1	9			1	COMPLY
15	Operations and Maintenance Manuals Detailed Operations and Maintenance manuals developed specifically for the equipment supplied for the RBS8D. Manuals shall include system-specific start-up, operations, trouble-shooting, and repair procedures. Component vendor data may be used where applicable, but the Bidder shall accumulate a comprehensive manual specific to this project.			X	X	1 0				4	Photocopied Vendor Manuals NOT acceptable. All documents to be originals. COMPLY Four (4) copies of manuals to be provided on CD-ROM in Adobe Acrobat form or Company-approved equivalent.

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ITEM	DATA DESCRIPTION / DEFINITION	WHEN REQ'D.				QTY. / TYPE REQ'D.					COMMENTS
		Quotation	Approval	Certified (AFC)	Record	Original	Reproducible	Copies	Laminated	Electronic	
16	FMEA Vendor shall prepare and submit a complete Failure Modes and Effects Analysis (FMEA) plus any other reliability analyses required by the Regulatory Bodies covering the hardware and software of the IACS, with a particular focus on the DP systems. These documents will be used in the overall FMEA of the vessel.		X	X	X	1				1	COMPLY
17	Bound Drawing Set Complete set of all calculations, drawings, bills of material, etc. as required to support the Operations and Maintenance Manuals.				X	3			X		COMPLY
18	Archive Copies of Software Vendor shall provide electronic copies of all control programs, MMI software, developed MMI modules, and full developmental tool set, including any licenses or hardware keys required.				X	2				2	SW BACKUP CONDITIONALLY AVAILABLE
19	Class Society Approval Certificates				X	3					COMPLY
20	Certified FAT Test Reports				X	3					COMPLY
21	Certified Commissioning Test Reports				X	3					COMPLY
22	Spare Parts List – Installation and Commissioning – Detailed List, Single Price, Special Tools Included	X	X	X	X	1			X	X	INCL.
23	Spare Parts List – First Year of Operation in GOM – Detailed List, Single Price	X	X	X	X	1			X	X	COMPLY