



MV TRINITY SURVEYOR

MULTI PURPOSE GEOPHYSICAL, GEOTECHNICAL AND ENVIRONMENTAL VESSEL

MV Trinity Surveyor is a Multi Purpose Geophysical, Geotechnical and Environmental Vessel.

The Vessel is equipped with a 4-point mooring system whilst offering a range of drilling, in situ testing and sampling services operated through a central moon-pool at the midship of the vessel, enabling stability and verticality during drilling and testing operations.

MV Trinity Surveyor is fitted with geotechnical rig supported by a Dando 500, capable of performing soil boring for hydraulic push sampling, downhole cone penetration (CPT) and in-situ vane shear testing, and with offshore soil laboratory and office facilities for field engineering for foundation design and jack-up leg penetration analysis.

Apart from her operational capability, MV Trinity Surveyor has sufficient accommodation onboard including office facilities for data processing.

NOTICE: All the information in this document is provided in good faith without any guarantee.



MV TRINITY SURVEYOR

TECHNICAL SPECIFICATIONS

Suited for various offshore Geotechnical Investigation Operations

- Soil Samples Acquisition for exploration and development wells
- Shallow water geotechnical investigation for terminal plant and pipeline shore approach construction
- Debris clearance Survey
- Coring Services & CPT Operations

VESSEL SPECIFICATION

Year Built	2008
Flag	Kiribati
Classification	IRS

PRINCIPLE DIMENSIONS

Length Overall	57m
Beam	13.8m
Maximum Draft	5.5m
GRT / NRT (MT)	1092 / 327

PROPULSION

Main Propulsion	2
Propulsion Type	Niigata 6MG 25HX
Total BHP	3600
Propellers	2 x 4 Blade Fixed Pitch
Bow Thrusters	1 x Schottel STT 330T
Lateral Thrust	5 Tons

MOORING SYSTEM

System	4 point mooring
Mooring Winches	3 x 25T (32mm x 1200mm wire)
Mooring Anchors	4 x 3 ton HP Delta Flipper

NAVIGATION EQUIPMENT

Radar no.1	Furuno FR 1505 MK3
Radar no.2	Furuno GPS 150
Echo Sounder	Skipper ED-165
Weather fax receiver	DEBEG 2095
AIS	Furuno FA 150
Auto Pilot	Raytheon NP 60
Gyro Compass	Anschutz STD 22

CARGO CAPABILITIES

Fresh Water	550m ³
Fuel	550m ³
Dead Weight	1100 tons @ 4.76m max draft
Clear Deck Area	350m ²

ACCOMMODATION

Crew	12 men
Passengers	30 men
Total	42 berths

AUXILIARY MACHINERY

Auxiliary Generators	2 x Volvo DX-12-AUX
Compressors	1 x Sphere HL2/77, 1 x Sphere HLF2/77

DECK MACHINERY

Vertical Capstans	2 x 5 Tons (15m/min)
Tugger Winches	10 tons @ 15m/min
Anchor Winches	1 double-drum unit

MOON POOL

2.5m x 2.5m at centerline located at frame 28 to 32

*Particulars given herein are without warranty as to accuracy and interest parties must satisfy themselves by inspection or other means of details of the vessel.



MV TRINITY SURVEYOR

TECHNICAL SPECIFICATIONS

COMMUNICATIONS EQUIPMENT

HF Radio	1 x Sailor HC4500
VHF with DCS	1 x Sailor RT5022
EPIRB	1 x McMurdo E3
SART	2 x McMurdo S3
Navtex Receiver	1 x McMurdo ICS Nav 5plus
2 way VHF Radio	3 x McMurdo 84001
PA System / Talk Back system	1 x Vinto ETB100
Immarsat System	Sailor TT 3000C

PERFORMANCE

Service Speed	Max - 11 Knots Economical - 9 knots
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LIFE SAVING APPARATUS

Life Rafts	As per SOLAS
Rescue boats	1 x Rigid Type

GEOTECHNICAL CAPABILITIES

DRILLING SYSTEMS

Derrick	17m height
Derrick Rating	35 tons
Draw works	Braden CH210A-36120-01-1
Top drive	Dando 1000/ 0-100rpm
Heave compensation	3m stroke
Mud Pump	GASO Duplex System
Mud tanks	5000 gallons
Drill string	5" API with 4.5"ID
Drill pipes	350m depth using 5" drill pipes
Seabed frame	12 tons

GEOTECHNICAL LABORATORY

Munsell Soil Colour Chart	Pocket penetrometers
Moisture Test	Torvane Shear Device
Triple beam balance	Laboratory Vane
Laboratory oven	UU Triaxial
Horizontal Extruder	gINT Professional Software
Shelby Sampling Tube	

UNDISTURBED SAMPLING

Piston Corer	Available Upon Request
Vibro corer	Available Upon Request
Seabed CPT	Available Upon Request

DOWNHOLE SAMPLING AND TESTING

Wireline PCPT	1m/3m WISON APB Real Time 50/100KN CPT Umbilical Hydraulic power pack 1m Shelby sampler
Wireline logging	PS logger
Vane Shear	APvdBerg Vane Shear System

REPORTING

Offshore field reporting and real-time engineering analyses (e.g. jack-up penetration analysis and preliminary pile capacity analysis).

GEOPHYSICAL CAPABILITIES

GEOPHYSICAL CAPABILITIES (UPON REQUEST)

Navigation system	Fugro or Veripos
Side Scan Sonar	Edgetech FS 4200 or 4205
Sub Bottom Profiler	Applied Acoustics Boomer / Sparker / Chirp
Single Beam Echo Sounder	ODOM Echotrac
Multi Beam Echo Sounder	Reson 7101 or R2Sonic 2024 or Teledyne T20
USBL	Sonardyne Mini Ranger 2 or Scout System
2HDR/UHRS	Streamer, Leveller, Compressor, Source, Air Bank



MARINE DRILLING RIG (ENV30) SPECIFICATION

ENV30 drilling rig, built to meet the driller's needs, assembled on a main independent base frame. This drilling rig fully hydraulically operated offer highly advanced technical solutions which extremely economical, easy maneuverability and reliability.

DRILLING MAST

Drill centerline in plane of front chords. Ladder is sited so as to allow safe and convenient access to the rooster box (sampling platform) at any position in the derrick. The derrick is divided into three (3) sections;

- Main Derrick
- Crow Block
- Sub Derrick for CPTU

SPECIFICATIONS

Overall height : 17m

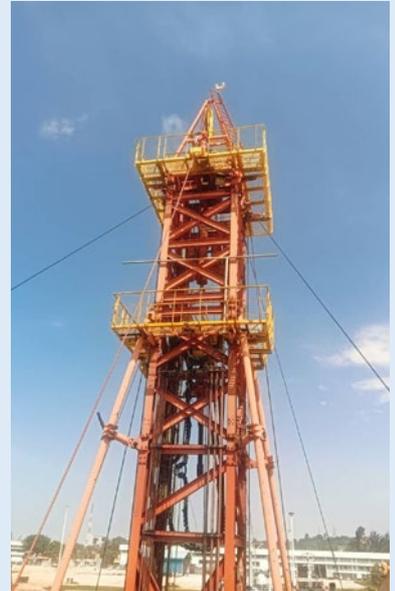
Main Derrick Size : 2.4mLx2.4mWx12mH

Crown Block Size : 2.4mLx2.4mWx2mH

Sub Derrick Size : 1.5mLx1.5mWx5mH

Travel : 10m

Capacity : 30 tons



ROOSTER BOX (SAMPLING PLATFORM)

The rooster box is suspended from the four falls of the drilling line in the derrick. It is composed essentially of two ram housings each incorporating a 24" sheaves through which the drilling line is routed. These housings are connected to box section and the complete assembly is guided to run between the front chords of the derrick.

SPECIFICATIONS

Dimension : 2.0m x 3.0m

Fall of wire : 6 nos

Sampling Winch : can be mounted



DRILLING CONSOLE

Equipped with 4 spool valve bank to supply draw work (from two banks for max speed), pipe clamp, template winch, tong rams, sample winch and etc. Also fitted with compensator change / blow down control, relevant gauges, mud flow controls, load cell indicator, emergency shut down device (air control) and power swivel servo controls. It also equipped with Wison APV CPTU data acquisition system.



MAIN POWER PACK

2 X 200HP air cool GM engine driving a four stage gear pump, come with relief valve block filters. The engine is enclosed and access is afforded by 6 soundproofed doors. The engine is fitted with an air starter, and exhaust spark arrestor and an Amot protection system which shuts down on overspeed, high water temperature, low water pressure and low oil pressure. Engine RPM, oil pressure and water temperature are monitored by gauge mounted on the exterior of the rear bulkhead. Pressure gauge is mounted at this same location to monitor the hydraulic pressure of each output, return line pressure and suction vacuum.



MARINE DRILLING RIG (ENV30) SPECIFICATION

SEABED TEMPLATE, SEABED CLAMP, SHEAR RAM AND BIT GUIDE

The seabed template has two functions namely to provide a seabed reaction for the hydraulic action of the down hole testing equipment as it penetrates the soil and to provide a re-entry template for the drill string, should it be necessary to withdraw the string from the borehole at any time (e.g. to change the drill bit). The seabed template weighs approximately 10 tones and this weight is concentrated in the base which is built up of 12" hole to allow for the passage of the drill string. A seabed clamp is bolted on top of the plates which is identical in construction to the clamp and is used to grip the pipe to transmit the reaction from seabed template to the drill string and hence to the down hole equipment. To provide the re-entry facility the seabed template is used in conjunction with the Bit Guide. This fabrication is essentially a box section connection two guides which enclose and run on the SBF Deployment wires. The guide has a central adjustable opening which loosely encloses the drill string above the bit such that the bit will not pass through it. A shear ram is bolted on top of the plates which is identical in construction to the shear ram and used to shear the drill pipe on the emergency of uncontrolled of shallow gas.



POWER SWIVEL

The function of the Power Swivel is to suspend and rotate the drill string and allow for the introduction of drilling fluids and sampling tools when required. The swivel itself consists of a gear case carrying a vertical hollow spindle mounted on taper roller bearings. A worm wheel pinion is fitted around the spindle within the case and is driven by two horizontal worm shafts which are powered by externally mounted Commercial gear motors. The gear case is oil filled and provision is made greasing the main bearings. The complete Power Swivel assembly is gimbal mounted into the Sampling Platform. Provision is made for greasing the gimbal bushings. The Power Swivel is connected to the drill string by means of a drive sub which is flagged to the hollow spindle and has a 4 1/2" IF Pin on its lower end to suit the drill string.



SPECIFICATIONS

Model : Dando 500
Rotary head torque : 21,000nm
Rotary Head Speed : 150 RPM
Lifting Capacity : 20 ton

DRAW WORKS WINCH

The draw works winch is a Braden CH210A-36120-01-1 with high speed reverse. The winch is powered by a high efficiency gear motor designed specifically for winch applications to provide smooth operation. The motor torque is then transmitted and multiplied by the highly efficient computer-aided designed gear train to the winch drum. All rotating components are supported by an anti-friction bearing and run in oil minimize any frictional losses. Load control when lowering is maintained by the patented Braden brake valve known for its smooth performance. The brake not only provides smooth load control but also adapts well to most any hydraulic system. The brake is also backed up by an internal automatic multi-disc spring applied hydraulic released safety brake.

SPECIFICATIONS

Pull at First Layer : 9 tons in 0-12 m/min
Pull at Full Drum : 7.5 tons in 0-15 m/min
Drum Capacity : 120m x 22mm O wire rope



MARINE DRILLING RIG (ENV30) SPECIFICATION

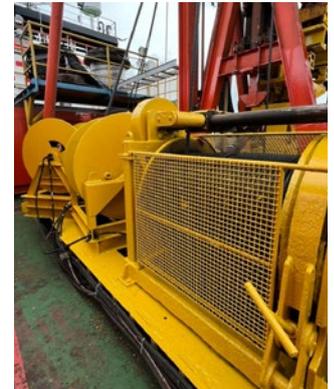
HEADLINE WINCH

The headline winch is a Pullmaster PL5-12-210-1 with high performance, high efficiency winch planetary winch, having equal speed in forward and reverse rotation. The automatic, multi-disc type brake of this unit is effective in one direction only and achieves an exceptionally smooth lowering control of the maximum load in a step less operation. The winch is powered by a hydraulic gear motor and the required reduction ratio of 39:1 is established by two planetary stages. The hydraulic motor drives directly into the planetary reductions. Dynamic braking is then achieved by modulation of the winch control valve handle. When the control returns to neutral position the brake applies automatically.



HEAVY LOAD WINCH

The heavy load winch is a Braden CH150A with high speed reverse. The winch is powered by a high efficiency gear motor designed specifically for winch applications to provide smooth operation. The motor torque is then transmitted and multiplied by the highly efficient computer-aided designed gear train to the winch drum. All rotating components are supported by an anti-friction bearing and run in oil minimize any frictional losses. Load control when lowering is maintained by the patented Braden brake valve known for its smooth performance. The brake not only provides smooth load control but also adapts well to most any hydraulic system. The brake is also backed up by an internal automatic multi-disc spring applied hydraulic released safety brake.



SPECIFICATION

Pull at First Layer : 10 tons in 0-10 m/min
 Pull at Full Drum : 7.5 tons in 0-12 m/min
 Drum Capacity : 1200m x 22mm Ø wire rope

SAMPLING WINCH

The sampling winch is a M+S Hydraulic MTB400 with high performance, high efficiency winch planetary winch, having equal speed in forward and reverse rotation. The automatic, multi-disc type brake of this unit is effective in one direction only and achieves an exceptionally smooth lowering control of the maximum load in a step less operation. The winch is powered by a hydraulic gear motor and the required reduction ratio of 41:1 is established by two planetary stages. The hydraulic motor drives directly into the planetary reductions. Dynamic braking is then achieved by modulation of the winch control valve handle. When the control returns to neutral position the brake applies automatically.



SPECIFICATION

Pull at First Layer : 200kg at 0-20 m/min
 Drum Capacity : 600m x 8mm Ø wire rope

TAIL LINE WINCH

The headline winch is a Pullmaster PL5-12-210- with high performance, high efficiency winch planetary winch, having equal speed in forward and reverse rotation. The automatic, multi-disc type brake of this unit is effective in one direction only and achieves an exceptionally smooth lowering control of the maximum load in a step less operation. The winch is powered by a hydraulic gear motor and the required reduction ratio of 34:1 is established by two planetary stages. The hydraulic motor drives directly into the planetary reductions. Dynamic braking is then achieved by modulation of the winch control valve handle. When the control returns to neutral position the brake applies automatically.

SPECIFICATION

Pull at First Layer : 2 tons in 0-10 m/min
 Drum Capacity : 60m x 12mm Ø wire rope



MARINE DRILLING RIG (ENV30) SPECIFICATION

HEAVE MOTION COMPENSATOR AND LINE TENSION (FOR SEABED TEMPLATE) SYSTEM

The function of the heave motion compensator compensatory and line tension (for seabed template) system is to apply a nearly constant tension to the string and seabed template whilst accommodating the relative vertical motion between the drill string/seabed template and the drill derrick resultant from vessel's heave. A standard hydraulic pressure is applied to the annulus of the two rams that link the travel to the roster box (sampling platform) and mounted on the base drilling rig. This hydraulic pressure is maintained by means of a Piston Accumulator connected to high pressure air cylinders.

The main components of the system are:-

- High Pressure Air Compressor
- Charge Pack
- Low Pressure Air Compressor
- Air Storage
- Accumulator



MUD SYSTEM

The function of the mud system is to mix and supply suitable mud at the required flow rate and at sufficient pressure to the drill bit via the drill string.

Mud is required to:

- Lubricate the drill bit and aid penetration.
- Lubricate the drill string.
- Lift cuttings up the annulus.
- Suspend cuttings during sampling. -Stabilize the borehole.
- Overcome down hole pressure if required.
- A seawater polymer mud is used to which Barite weighting material is added as required.

The main components of the system are:

- Mud Tank Agitator
- Mud Pump
- Mud Drill



MUD PUMP



MUD TANK WITH
AGITATOR

MARINE DRILLING RIG (ENV30) SPECIFICATION

PIPE RUNNING EQUIPMENT

The Component items are: -

- 1. DRILL PIPE** - Drill pipes are 5" API Range II grade E drill pipe with and external upset tool joints with 4 1/2" I.F threaded connections. The internal diameter of the tool joints is bored out to 4" to allow for the passage of down hole testing equipment.
- 2. DRILL COLLAR** - The drill collars are 6 1/2" OD and 4" ID a single collar is approximately 5m long but they are normally made up into double strands. 2 to 6 single collars are normally used depending on soil conditions and these are positioned above the BHA. Connections are 4 1/2" IF.
- 3. DRAG BITS** - Drag bits have short blades, each forged to a cutting edge and faced with tungsten carbide tips. Drag bits have a shearing action and cut rapidly in sands, clays and some soft rock formations.
- 4. TRICONE ROLLER BIT** - Tricone Roller bits have three or more cones ("rollers" or "cutters") made with hardened steel teeth or tungsten carbide inserts of varied shapes, length and spacing. They are designed so that each tooth applies pressure at a different point on the bottom of the hole as the cones rotate. The teeth of adjacent cones inter-mission so that self- cleaning occurs. The cutting surfaces of all roller bits are flushed by jets of drilling fluid directed from the inside (center) of the bit.
- 5. MOUSEHOLE CLAMP** - The mousehole clamp is designed to locate the tubular in line with the tilted power swivel to facilitate their addition to or removal from the drill String. The clamp must also prevent rotation of the tube to allow connections to the power to be made or broken.
- 6. DECK CLAMP** - The function of the PIPE CLAMP is to suspend the drill string and to prevent its rotation to facilitate the make up and break out of connections during pipe tripping.
- 7. LIGHT MANUAL TONG** - The light manual tong is employed to make up and break out connections to higher torque requirements than that afforded by the Power Swivel alone.
- 8. PIPE ELEVATOR** - The pipe elevator was designed specifically to enhance safety and efficiency. The Drill Pipe can be stabbed directly into pipe elevators and the tool's narrow profile latch design provides a wide, clear opening, without obstruction.
- 9. SAFETY CLAMP** - The need of safety clamp for safest handling of flush joint pipe and drill collars.



WISON – APB REAL-TIME (Hydraulic Umbilical CPT and WIVATAP Offshore Equipment) SPECIFICATION

OVERVIEW

The WISON-APB Real-Time system mainly consists of:

1. A 100kN type with a stroke of 1m and a 50kN type with a stroke of 3m.
2. A winch with an umbilical and hydraulic power pack .
3. A remote control for operating the winch.
4. A depth encoder with measuring cylinder for penetration depth measurement.
5. A sheave block for the guidance of the umbilical through the drill tower.

DESCRIPTION

The WISON-APB Real-Time is, in a simplified form, a double acting cylinder with a cone, a Wivatap vane tester or Wipusap soil sampler attached to the piston rod. An umbilical is attached to the WISON-APB for the power supply, the data transmission and the hydraulics from the winch. The WISON-APB is lowered into a drill string by paying out the umbilical on the winch. At the end of the drill string, a latching ring is mounted suitable for all WISON-APB types. The WISON-APB pushes against this ring during the CPT test by means of four latching jaws. At the end of the stroke (the end of the CPT test) the latching mechanism releases and the self-tensioning system on the winch will lift the WISON-APB back to the surface. The piston rod is pushed back to starting position by means of a water pump, mounted on the winch frame, before it can be used for the next test.

PROTECTION AGAINST SEAWATER	
Cylinder	Stainless steel
Rods	Hard chrome plated 100 μ
Other	Stainless steel or seawater resistant brass

Table 1. Protection Specification

TECHNICAL DATA	WISON-APB 50 kN	WISON-APB 100 kN
Penetration down thrust	50 kN	100 kN
Hydraulic cylinder working pressure	17.5 MPa	35 MPa
Stroke length	3000mm	1000mm

Table 2. Technical Specification

DIMENSIONS	WISON-APB 50 kN	WISON-APB 100 kN
Total length including water head connection	8550mm	4550mm
Total length including water head connection	90mm	
Cylinder diameter exterior / interior	85mm / 70mm	
Rod diameter exterior / interior	35mm / 16mm	

Table 3. Dimensions Specification



WIVATAP OFFSHORE

1. Product Description

The system consists of a down-the-hole unit, a wire (replacing the data acquisition system) and a surface control unit. The down-the-hole unit fits in the one meter push cylinder (WISON-APB 100 kN) replacing the cone. The data acquisition system is replaced by a wire and surface control unit. The length of the WIVATAP is constructed such that the latching ring on the drill string for the 3 meter tool is used when working with the WIVATAP and the one meter tool. After the WIVATAP is pushed one meter into the soil vane testing can commence. A reaction frame above the rotating vane delivers the rotational reaction force required to rotate the vane. This possible rotation of the push cylinder is prevented.

2. Technical Specifications

- Torque : 70 Nm maximum
- Speed of rotation : 0.1 – 1.0 °/sec
- Maximum inaccuracy : 0.5 % of full scale

3. Product Consist

- Down the hole WIVATAP-100
- Down hole motor speed control
- Down hole data acquisition system
- Control box WIVATAP with supply and data output RS 232 (RS232 to USB converter included)
- Connecting cables and connectors
- Set vanes.



WISON – APB REAL-TIME (Hydraulic Umbilical CPT and WIVATAP Offshore Equipment) SPECIFICATION

THE WINCH

The winch is remote controlled, which makes the WISON-APB very easy to operate during testing. Most of the time a small lab is used for data acquisition system and therefore it is very convenient to have the control of the WISON-APB system next to the data acquisition system.

Overall dimensions : 2.2m L x 2.2m W x 2.25m H (height during operations 3m)

Drum dimensions : ID 1.22m x OD 1.9m x 0.722m W

Weight : 3850 kg including cable

Electrical power supply : 20 KVA supply voltage 400 volt 50/60 Hz

Rotation speed drum : Adjustable between 0-22 r.p.m

Pulling speed maximum : 80m/min (1st layer)

110m/min (7th layer)

Pulling force : 12.2kN (1st layer)

840kN (7th layer)

Other facilities : Electrical water pump (12 liter at 5MPa), Hydraulic power pack for operating & De-airing hydraulic power pack



LATCHING SUB

The latching sub, needed to latch the thrust cylinders down the hole and relay the pushing force onto the drill-string, consists of four specially drill collars with locking grooves, spacers and stop ringing for the WISON-APB 50/100kN in various testing modes. The latching subs are provided standard with an API-4½" IF screw thread. The outer diameter is 6.5". The total length is approximately 6.9m.



TESTING SYSTEMS

1. Sampler.

Wire-line push and piston sampler adapters to fit underneath the WISONAPB 100kN thrust system. Samples are taken with a simple single tube system. The sample tube is driven into the soil by the continuing rate of penetration of 20mm per second. This guarantees undisturbed samples in most soil types. The push sample tubes have a length of 1020mm. The maximum length of the sample is 900mm.

2. Penetrometers (Electrical Cone)

The cone penetrometer is pushed into the soil by either the WISON-APB 50kN or WISON-APB 100kN. The standard rate of penetration of 20mm per second guarantees CPT results compliant with all international CPT standards.



Ranges

Point resistance : 0-100 MPa max.

Inaccuracy 0.1MPa

Location friction : 0-0.75 MPa max.

Inaccuracy 0.01MPa

Pore pressure : 0-1.0/2.5/5.0 MPa max.

Inaccuracy 0.5% from

For class one tests the cones can be specially calibrated

WISON – APB REAL-TIME (Hydraulic Umbilical CPT and WIVATAP Offshore Equipment) SPECIFICATION

2. Penetrometers (Electrical Cone)

A) Cone and System Test Unit

This set is used for system validation on location and has an accuracy of 2%. The cone and system test unit consist of a manually operated hydraulic pump with calibration gauges, a hydraulic jack to transfer the hydraulic pressure onto a load on the cone and high pressure chamber of testing the pore water pressure sensor.

B) Vacuum Pump and De-Airing Device

Vacuum installation needed for de-airing of electrical pore pressure cones. Without properly de-airing the pore pressure cones reliable pore water measurements are not possible. Electrical specifications: 230V 400VA.



DEPLOYMENT SYSTEM

1. Umbilical Cable

Umbilical cable 600m length with hydraulic high-pressure hose (inner diameter 9mm) in the center, surrounded by 8 copper cores for the electrical measurements. The cone penetration mode uses 2 cores, for vane shear testing 7 cores are used and for testing with seismic cones all 8 cores are required. A watertight polyurethane mantle surrounds those cores. Steel wires for hoisting purposes and finally a watertight outer skin of polyurethane again surround this. The break tensile strength of the umbilical is 9.0kg.

2. Connection House (Water-Head)

The connection house connects the umbilical cable to the down the hole tools by means of shear bolts that will fail in case the down the hole tool is stuck inside the drill-string thus releasing the umbilical cable. It can also contain the DA system and connections to other measuring devices. A pressure-regulating valve is fitted to control penetration speed.

3. Constant Tension Winch for Down The Hole Tools.

An electric driven frequency controlled constant tension winch for the umbilical cable. The hydraulic hose inside the umbilical cable is connected through a rotary with the hydraulic measuring cylinder.

The hydraulic measuring cylinder is used for:

- Penetration depth measuring.
- Pressure transforming to the working pressure of the down the hole tools.
- Barrier between the hydraulic oil from the power pack and the Airo-fluid used by the down the hole tools.

Furthermore the winch is fitted with a slip-ring housing with 8 rings and brushes for the connection to the umbilical cores used for supply and data transmission of the measured parameters.

4. Cable Conducting Wheel

The special designed cable-conducting wheel $\varnothing 1260\text{mm}$ to minimize the wear on the cable ensure a maximum life span of the umbilical cable. The cable-conducting wheel is used to guide the umbilical trough the derrick into the drill-string. The hanging point of the conducting wheel needs to be 9m above the drill-string with an offset of 600mm from the center of the drill-string in the direction of the winch location.



WISON – APB REAL-TIME (Hydraulic Umbilical CPT and WIVATAP Offshore Equipment) SPECIFICATION

PARAMETERS AND DATA ACQUISITION

The measured cone parameters are digitized and transmitted via the two supply conductors. Supply of and communicate with the DA system is through a receiver demodulator. They communicate by frequency shift signal on a proven format that is identical to the RS232 protocol, as usual between PC and associated equipment. This system uses only two wires of the umbilical cable. The transceiver-demodulator supplies the DA transmitter-modulator system and is connected to the measuring cylinder for penetration depth information. The unit also connects to a PC/laptop (RS232). Electrical power requirement 230V 50Hz 100VA.

The system consists of the following components:-

- I. A constant voltage source for cone supply.
- II. A drift compensated amplifier unit for four channels.
- III. A 16-bit A/D conversion of cone signals; for excellent accuracy the cone supply source is also used as reference for the A/D converter.
- IV. A microprocessor unit.
- V. A modulator and transceiver.



SOFTWARE

A) GO-onsite (recording software)

The specially developed GO-on-site software is used to control the transceiver system and reads the data from the demodulator. The CPT and WIVATAP data are stored in an organized manner. The data of every CPT and WIVATAP are in a separate file in GORILLA! Format and the files of one bore hole are organized in one directory. Moreover is the software making a log file that stores the cone data every second in a compressed file to track any abnormalities due to changing mud-weight.

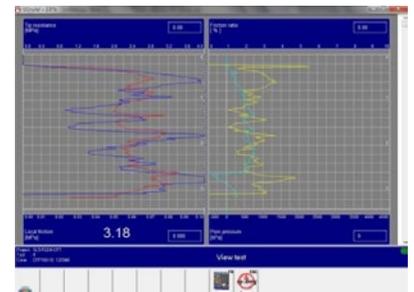


Figure 1: Go-onsite for CPTU

B) GO4! Software

GO4! Has been developed for the purposed of processing test results. It is a database oriented software package for downloading, presenting, processing, exporting, storing and printing CPT and WIVATAP test results. For printing the test results a layout editor is available for a customized print layout. CPT and WIVATAP test results can be selected by searching for client, location, project name or a combination of these. Graphs are available for all test results of all projects. To download CPT and WIVATAP test results several functions are available. For instance it is possible to download only individual test results or completed projects. Both GORILLA!-format and GEF-format are supported.

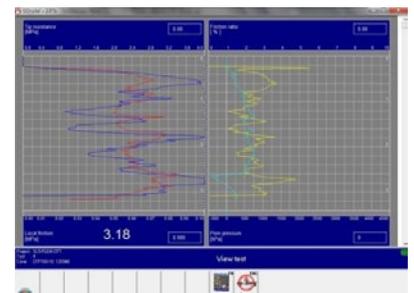


Figure 2: Go-onsite for In-Situ Vane Test

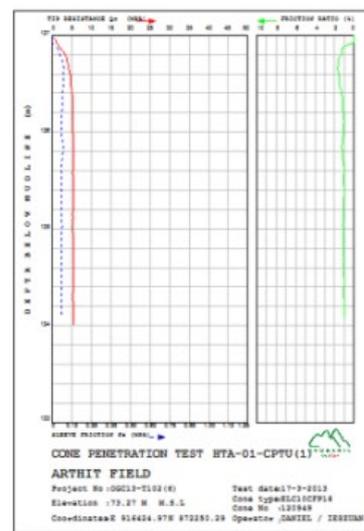
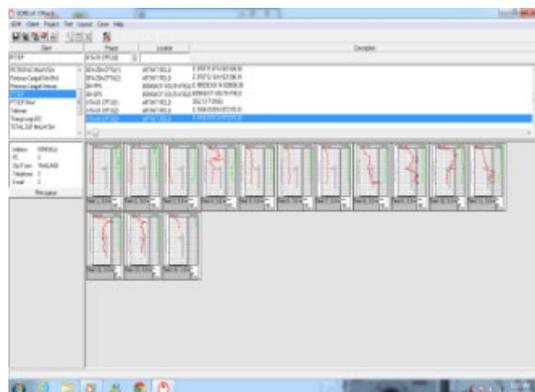


Figure 3: Tip Resistance & Local Friction Graph

A wide-angle photograph of the ocean under a bright, slightly cloudy sky. The water is a deep teal color with visible ripples and small waves. The horizon line is straight and divides the image roughly in half.

GEOPHYSICAL EQUIPMENTS

GEOPHYSICAL EQUIPMENTS (ANALOGUE)

RANGER 2 USBL - TRACKING POSITIONING

Ranger 2 Standard. Track everything, in any depth, from any vessel. Track a towfish, position an ROV, dynamically position your vessel, communicate with an AUV – or do all of this simultaneously. It's anything but standard.

SPECIFICATIONS

- Compatible with all makes of DP system – GE, Kongsberg, MT
- Configurations available for USV and temporary vessel installations
- Tracks multiple targets to 11 km; ROVs, AUVs, deep towed bodies



ECHOTRAC E20

A portable, compact and robust echosounder designed for survey in all environments allowing you to maximize your utilization of the equipment and reducing your costs by having one unit for all applications.

Easy to use and fast to mobilize, the E20 allows you to begin your survey rapidly, delivering accurate results first time, everytime. The E20 saves time and enables you to get results faster.

SPECIFICATIONS

- 1 or 2 frequency agile channels from 10 to 250kHz
- 0.5 to 6,000m depth range
- Ruggedized and shock-proof, water resistant IP67



SeaBat® T20-R

The SeaBat T20-R is a new addition to the leading SeaBat product range engineered from the ground up to evolve with your business. Combined with a Rack-mounted Sonar Processor (RSP), SeaBat T20-R provides uncompromised survey data in a highly compact package designed for small vessel use.

FEATURES

- All-in-one, fully flexible and fully integrated survey system
- The compact system allows for fast mobilization, minimal interfacing and extremely low space requirements
- Impressively clean and high data quality for faster operational surveys and reduced processing time



EDGETECH 4205

The next generation 4205 is a versatile side scan sonar system that can be configured for almost any survey application from shallow to deep water operations. The 4205 utilizes EdgeTech's Full Spectrum® CHIRP technology.

FEATURES

- Tri frequency side scan sonar
- Motion tolerant mode
- Improved target positioning
- Crisp, high resolution CHIRP imagery



GEOPHYSICAL EQUIPMENTS (ANALOGUE)

SES-2000 Medium-100 - Sub Bottom Profiler

The "Innomar medium-100" parametric sub-bottom profiler is designed for offshore applications down to 2,000m water depth. The transducer can be either mounted over-the-side or in the hull. This SBP model acquires full-waveform data (24 bit) that can be processed with any seismic software (SEG-Y format). Innomar also provides the ISE post-processing software specialized on the Innomar SBP data.

SPECIFICATIONS

- Heave and Roll (or Pitch) beam stabilization
- 24-bit SLF full waveform data acquisition / Innomar "SES3" data format
- Multi-ping mode for maintaining a high pulse rate in deep waters
- Multi-frequency signals

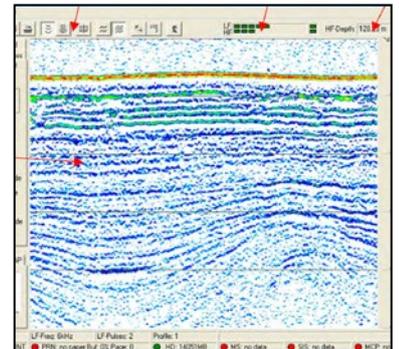


Innomar's SES-2000 Software

OVERVIEW

The SES-2000 SBPs come with the following Innomar software:

- **SESWIN** control and data acquisition software
- **SES Netview software:** This is used for online display of SBP data and system settings on slave monitors for QC and supervision.
- **SES Convert data converter software:** If the SES-2000 user likes to use third-party software for processing the data, this software can be used to export SES-2000 data into SEG-Y format.
- **ISE post-processing software:** With ISE you can re-process the digitally stored SES-2000 data print the data, digitise layers and objects and extract these data to common file formats (ASCII, AutoCad DXF, CODA, IVS Fledermaus).



Plus•X

The Plus•X is a logger that allows you to change the instrument's sensor load, in-the-field and on-demand. With the Plus•X, your CTD can become an SVTP; shallow pressure sensors can be swapped for deep; and temperature range can be extended or tightened, as needed. One single logger meets multiple deployment requirements.

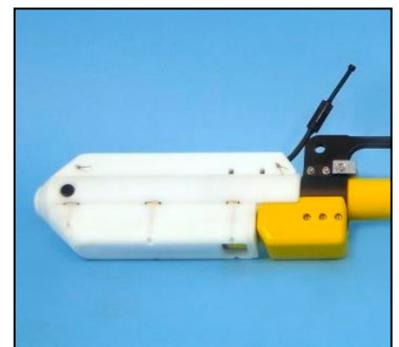
FEATURES

- Greater return on investment: Each instrument can multi-task as CTD or SVTP, at multiple pressure ranges, assuring greater usage .
- Right instrument always ready: Calibrated sensors are shared amongst all X•Series instruments, ensuring that the right instrument is always field-ready.
- Reduced downtime: Recalibrated sensors sent to the instrument means the instrument never leaves the field for recalibration.



G-882 MARINE MAGNETOMETER

The well proven Cesium sensor is combined with a unique and new CM-221 Larmor counter and ruggedly packaged for small or large boat operation. Use your computer and standard printer with our MagLogLite™ software to log, display and print GPS position and magnetic field data.



ADDITIONAL EQUIPMENTS

SEASTAR® 9410- AUT GNSS RECEIVER

The Seastar® 9410-AUT GNSS receiver provides users with access to the latest developments in High Performance Differential Global Satellite Navigation System (DGNSS) positioning.

SPECIFICATIONS

- GPS, GLONASS, Galileo and BeiDou receiver
- Fugro L-BAND DGNSS receiver
- Corrections via internet (Ntrip)
- Prepared for Fugro Satguard®
- Available in an IALA version. All through one antenna.
- Keypad and Web interface

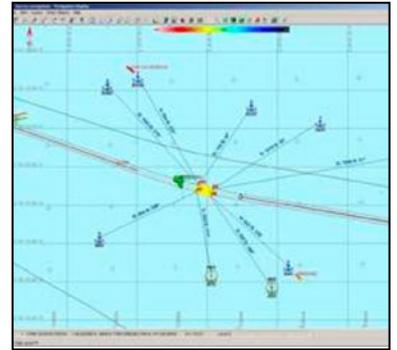


QINSY Navigation Software

From scraping diamonds of the seabed to dumping rock on pipelines, from anchor handling to bathymetric or side scan sonar surveys, its modular design and inherent flexibility makes QINSY perfect for a wide variety of applications.

USED FOR

- Hydrographic & Oceanographic Surveys
- Offshore inspections Surveys
- Marine / Offshore Construction Support
- ROV & AUV Tracking and data collection • Barge, Tug and Fleet Management
- Dredging Monitoring & Navigation
- OBC - Seismic support
- Electronic Navigation Chart production
- Engineering Chart production, Cross section creation and Volume calculations



AA252, AA301 Boomer Seismic Sound Source

The AA252 and AA301 boomer plates are seismic sound sources that produce a sharp repeatable pulse from a floating position on the sea surface. The AA252, deployed on either a robust CAT100 or CAT200 catamaran, is ideal for inshore surveys from small craft. The AA301 is designed for higher power applications and can also be used as a variable frequency boomer when combined with a CSP energy source.

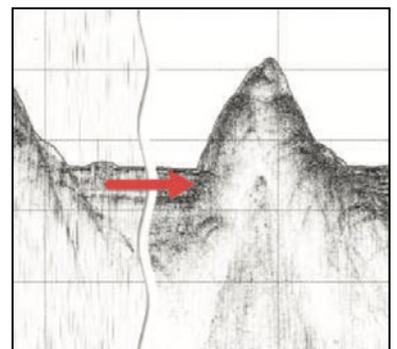
APPLICATIONS

- High and Ultra-High Resolution coastal geophysical surveys
- Single and multi-channel acquisition
- Suitable for freshwater or low salinity surveys
- Water depths of 5 to 1000m



SONARWIZ SUBBOTTOM

- Signal processing features designed specifically for marine survey data
- Apply laybacks, tides, heave filters and bathymetric alignment
- Easily visualize your data in two or three-dimensions
- Support for navigation, fathometer and magnetometer data



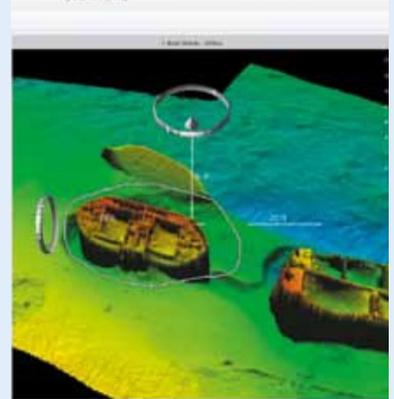
ADDITIONAL EQUIPMENTS

QPS QIMERA

Qimera is an easy to use yet most powerful sonar data processing application. Built using core QPS technologies, Qimera supports the major raw sonar file formats and by working with a Dynamic Workflow it revolutionizes the way data is handled.

FEATURES

- Operating on the latest computing technology, it is 64bit and the unique IO Balanced Multi-Core engine
- New user experience design
- Timeline data management and dynamic workflow
- Near real-time loading of data into a Qimera project

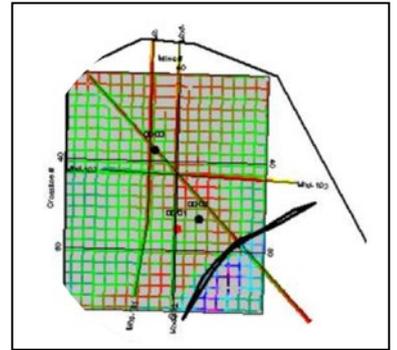


GVERSE GEOPHYSICS - Seismic Interpretation Software

GVERSE Geophysics software is a fully integrated 2D and 3D seismic interpretation system with a full range of fit-for-purpose interpretation capabilities, attribute analysis, and mapping tools. Whether exploring complex structural areas, or looking for subtle stratigraphic traps, today's geoscientist can employ the many tools available in GVERSE Geophysics to solve these otherwise challenging problems.

KEY BENEFITS

- Full Integration
- Superior Visualization
- Speed & Performance
- Accuracy and Reliability

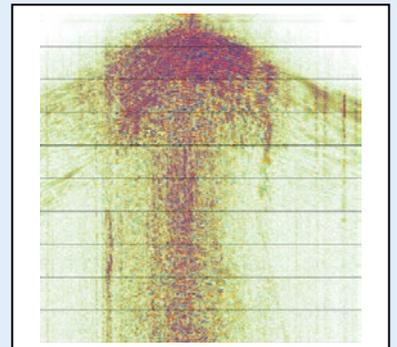


SeisSpace® ProMAX® Software Family

SeisSpace® ProMAX® software is a comprehensive seismic processing system for large-volume land or marine surveys of 2D or 3D prestack and poststack data. This system combines analysis tools, geophysical algorithms, and an optimized parallel processing infrastructure to quickly deliver large volumes of processed data.

FEATURES

- Interactive Processing/Visualization
- Easy-to-Use Interface
- Data Conditioning
- Full-Wave 3D Geophysics
- JavaSeis Data Format



GEOPHYSICAL EQUIPMENTS (DIGITAL/2HDR SEISMIC)

Digicourse 5010 Digibird Levellor

The Model 5010 is the DigiBIRD is an advanced, microprocessor-based device that is mounted externally on a marine seismic streamer cable. Controlled by the Digicourse Position Control System the 5011 DigiBIRD has a variety of functions and features.

SPECIFICATIONS

- Depth measurement
- Depth control
- Adjustable, depth control, algorithm parameters
- Information to assist in ballasting streamers

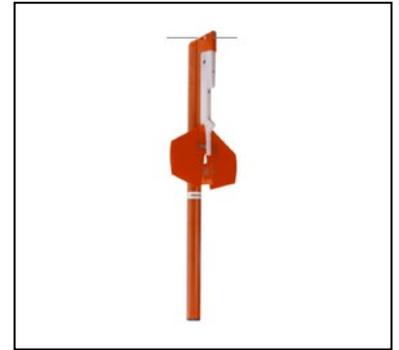


Digicourse 5011 Digibird Compass Levellor

The Model 5011 DigiBIRD is an advanced, microprocessor-based device that is mounted externally on a marine seismic streamer cable. Controlled by the Digicourse Position Control System the 5011 DigiBIRD has a variety of functions and features.

SPECIFICATIONS

- Compass Heading Information
- Heading Data correct for A,B and C terms
- Internal filtering of heading data
- Depth Measurement
- Adjustable, depth control, algorithm parameters
- Information to assist in ballasting streamers



Digicourse System 3 Positioning Control System

System 3 is a hardware and software package that controls and collects data from a network of acoustic sensors and streamer positioning devices. System 3 has on-line command, diagnostic, and performance-monitoring capabilities.

The hardware is composed of three main components:
a **Data Management Unit (DMU)**,
an **Operator Interface (OI)** computer,
a **Line Interface Unit (LIU)**.

System 3 is operated through the operational software on OI computer running windows XP or above.



Geometrics CNT-2 Seismic Recording System

The Geometrics CNT-2 is a Seismic recording system comprised of a Streamer Power supply unit (SPSU) and Digitiser modules connected at the head of streamer sections.

FEATURES

- Keeps track of survey parameters
- CNT-2 software records and displays a log of all shots
- It displays each shot as it is acquired and can perform a full assessment of Digitiser QC tests.



GEOPHYSICAL EQUIPMENTS (DIGITAL/2HDR SEISMIC)

Geometrics Geoeel Silicone Gel Streamer

The GEOEEL series of digital towed hydrophone streamers are the first small diameter arrays with the performance of larger systems..

FEATURES

- Easy to deploy, easy to transport and largely immune from the noise
- Filled with inert silicon Gel which make it environmentally safe
- Available in a range of channel group intervals from 12.5m group interval down to smaller UHR streamers at 1m or 1.56m group interval.



Sauer WP4321 High Pressure Air Compressor (Electric Driven)

The Sauer WP4321 compressor is an air cooled four stage, two crank, high pressure compressor. The fly wheels are driven by V belts and are combined with the drive shaft together in one liftable case.

SPECIFICATIONS

- Capacity: 30-50 CFM
- Pressure: 0–3300PSI
- Compressor Cooling: Air Cooled
- Number of Stages: 4
- Number of Cylinders: 5



GeoEel Solid

Introducing the ultimate in marine seismic fidelity: the GeoEel Solid™ from Geometrics. Built on our experience and success with the popular GeoEel™ digital streamer, the GeoEel Solid combines superior electronics with a patented solid active section design that delivers higher-quality data than ever before.

FEATURES

- Light and easy to handle
- 100% solid construction
- Wide bandwidth for more applications
- Free software upgrades forever

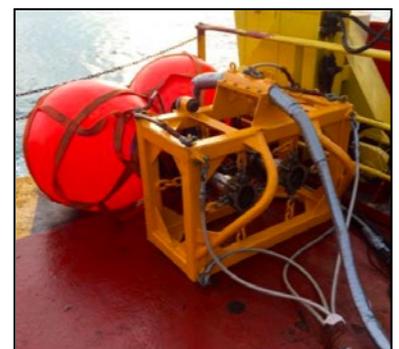


TI Sleeve Airgun

The TI sleeve airgun incorporates a new concept in airgun design — an external shuttle that produces a full 360-deg port. This design allows a more efficient acoustical pulse than the traditional airgun, whose shuttle is internal to the gun and from which air must exit through restricted ports.

FEATURES

- **Airgun Sizes available:** 5, 10, 15, 20, 40 Cubic Inch Chambers
- **Operating Pressure:** 2000PSI
- **Output Power:** At 2000 PSI: 5 Cubic Inch: 1.52 Bar-m 15 Cubic Inch: 1.75 Bar-m
10 Cubic Inch: 1.67 Bar-m 40 Cubic Inch: 2.08 Bar-m
20 Cubic Inch: 1.83 Bar-m



GEOPHYSICAL EQUIPMENTS (DIGITAL/2HDR SEISMIC)

MINI GI GUN

This new gun is a scaled down model of the well-known, appreciated and field-proven GI GUN. The Mini GI is primarily intended to advantageously replace the small air guns with wave shape kit or Watergun, normally used for high-resolution/well-site surveys.

FEATURES

- Higher frequency content of the Mini GI spectrum permits a tremendous saving in air consumption when compared to the standard GI GUN
- The good quality signal allows the user to design simple and efficient arrays always using the same element, giving to the outgoing signature a high degree of stability.
- The available volumes for each chamber are: 15, 20 and 30 in³.



TTS— DGPS Tailbuoy/Headbuoy/Source Position

SPECIFICATIONS

- Total GPS: Max 16 Operational Units
- Corrected Strings: 24 x Strings NMEA GGA available over network or serial output
- Accuracy: <1m DGPS fix Mode 1hz update
- Range: 2km Full line of sight
- Transmission: Radio Transmission, Frequency Adjustable
- Power: 12VDC System with 0.1amp constant current.

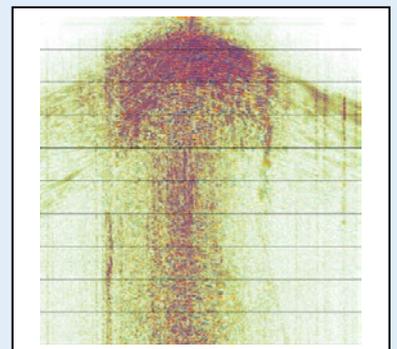


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FEATURES

- Interactive Processing/Visualization
- Easy-to-Use Interface
- Data Conditioning
- Full-Wave 3D Geophysics
- JavaSeis Data Format



MV TRINITY SURVEYOR - GENERAL ARRANGEMENT

