



## «PACIFIC ENGINEERING COMPANY»

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## SURVEY VESSEL “TRIAS”



*Technical specification*

## SV «TRIAS»



Survey vessel «Trias» of class KM L2 [1] is designed for drilling of engineering-geological boreholes and performance of engineering-geological surveys. The survey area is not limited. The vessel is capable to carry out geotechnical survey of the soils in the boreholes to the depth of 150 m at the water depth up to 300 meters, study soil cross-sections and their characteristics using the shipboard equipment (hydraulic, gravity and hydrostatic corers, seabed CPT) and using the stern portal frame with the capacity of 10 t and the overboard handling radius of 3 m. A vertical moon pool 2.4 x 2.4 m of size and a drilling rig with a bearing capacity of 50 ton and height of 26 m from the main deck of the vessel are installed midships for execution of drilling works. The vessel is also equipped with a four-anchor positioning system to keep the vessel at the survey location.




«Pacific Engineering Company» has been a technical operator of the vessel under the program OCIMF OVID since 2019.





<b>Register data</b>	
Vessel name	SV "TRIAS"
Shipowner	Pacific Engineering Company Ltd.
Flag	Russia
Port of registry	Korsakov, Russia
Type. Employment	Special purpose ship (survey vessel)
RF Register class	KM L2 [1]
Ship-classification society	Russian Maritime Register of Shipping
Registration number	841313
IMO ID-number	8402905
Call sign	UBNB
Year of manufacture	1984
Place of manufacture	Japan, Fukushima Zosen Co., LTD
<b>Technical Specifications</b>	
Capacity	Gross 2559 r.t., net 767 r.t.
Dimensions (length overall, beam, board height)	71.4 m x 16 m x 7.0 m
Draught	4.5 m
Accommodation capacity	50 persons including 22 crew members.
Propulsion machinery	Diesel electric ship 2 x 1030 kW each made by Fuji Dizel, Type: 6L27,5X, Auxiliary motor 3 x 8CHN 25\34, Diesel-generators 3 x 2A 500\500, Harbour electric generator 1 x 7D12A-1E.
Thruster units	2 x 250 kWt. Type: NTKKC, electrohydraulic
Living accommodation	- single cabins – 20 - double cabins – 2 - three-place cabin – 6 - four-place cabins – 2 - Ambulatory - 1

<b>Capacity and Consumption</b>	
Fuel stock	470 m <sup>3</sup>
Fuel consumption	Transit – 11 t/day, drilling – 6 t/day
Water capacity, ton	Technical water – 202, fresh water – 314.5
Osmotic declinator	5.0 t of water per day
Cruising radius	Unlimited
Self-sufficiency	45 days
Maximum speed	10 knots
Economic speed	7 knots
<b>Deck machinery</b>	
Electrohydraulic crane CHRS 25 x 22	Carrying capacity 25 ton
Stern hydraulic crane, SWL	Kanglim KS1256G-II. Bearing capacity - 7 ton
Electrohydraulic winch	Carrying capacity 16 t, with a steel cable 38 mm, length 1800 m x 4 pcs.
Electrohydraulic windlass	Carrying capacity 7.5 t x 2 pcs.
Electric capstan	Carrying capacity 1.5 t x 2 pcs.
Stern P – frame	Bearing capacity - 10 ton, overboard handling radius - 3 meters
Cable bridle	Diameter 42 mm, length 225 meters
Bow anchor	Hall's anchor, 2 x 2800 kg
Technical anchor	Denfort's anchor, 4 x 5000 kg
<b>Communication and navigation equipment</b>	
Gyrocompass	Vega x 1 pc.
Automatic helmsman	PR-2403-ST22 x 1 pc.
Hydroacoustic echo sounder	NEL M 3B x 1 pc.
Radar	FAR-28 x 7 with SARP element x 2 pcs. / JMA-2253 x 1pc.
Knotmeter	IEL-2M Induction type x 1 pc.
Satellite communication	Inmarsat C – Felcom-15 x 2 pcs.
Radio navigation system DGPS	SPR-1400 – 1 pc. / KGP-912 – 1 pc.
Weather receiver	Weather FAX JRC JAX 9A x 1 pc.
Communication radio equipment	MF/HF FC-2571C x 1 pc.
VHF transmitter	8800 S x 2 pcs.
Portable two-way communication radio stations	TR-20 x 3 pcs.
NAVTEX	NX-700 B x 1pc.
AIS	Seatex AIS – 100 x 1 pc.
Radar responder	SAR-20 x 2 pc.
Radio buoy	EPIRB SEP-406
Other modes of communication	Mobile telephone connection, IRIDIUM Motorola (9505A) x 1 pc., Inmarsat Fleet Broadband (FB-250) connection, High-speed access to Internet, email, several phones such as VoIP KU-BAND Maritime VSAT. Antenna SuperTrack Z12MK2 8 W.
E-mail:	<a href="mailto:trias@shipmail.ru">trias@shipmail.ru</a> , <a href="mailto:trias@pecoltd.ru">trias@pecoltd.ru</a>
Satellite phone	+7 929 420 0078 +7 929 420 0079


Navigation set (Primary and secondary positioning system)	GNSS receiver C-Nav 3050M – 2 sets. GNSS compass Vector VS330 Hemisphere GPS – 2 sets. Navigation computer ASUSTek. Echo sounder Simrad EA300. Probe-profilometer Valeport Midas CTD 3000. Underwater positioning (USBL) IXEA MIPS.
Navigation software	QINSy Survey 8.1 C-Setup 7.1 VectorPC 1.0.6.0 DataLog Express 0400/7115/H3
Electronic Chart Display and Information System	TRANSAS NAVI-SAILOR 4000
<b>Rescue Equipment</b>	
Life rafts	PSN 10 MK - 12
Life jackets	61
Hydrothermosuits	63
Safety buoys	5
Duty boat	1 x 6 persons
<b>Drilling and geotechnical equipment</b>	
Drilling rig of a tower type	Height from the rig base to the crow' nest – 26 m. Rated dynamic load – 50 t.
Allowable operation conditions:	- maximum vertical amplitude – 4 m. - maximum pitch angle – 4 degrees. - maximum roll angle – 4 degrees.
Heave compensator Fugro Hydrodine	Maximum amplitude compensation 3 meters, load 40 t.
Hydraulic power swivel Wirt	Type 3-5, Bearing capacity up to 600 kN Manufacturer: Wirt Three rotation speeds. 1- st speed 30 rot/min. 2720 kgm 2- nd speed 66 rot/min. 1280 kgm 3- rd speed 150 rot/min. 150 kgm
Hydraulically driven drill winch PWD 3700/CF	Force exerted rating 8 t, two speeds – 0-30 m/min
Winch for launching and lifting of the bottom frame or bottom CPT unit	Force exerted rating 10 t at the drum, diameter 22 mm, length 400 m.
Pipe collector with semi-automatic delivery of the drill string, with powered grip 2 x 2 t, with telescopic hoisters of steel drill pipe and drill collars	2 collectors capacity – 2 x 250 m. Total capacity - 500 m of pipes. Pipe diameter - 127 mm. Pipe supply – hydraulic. Auxiliary rack stack 200 m.
Hydraulic unit for executing mechanisms, it is located under deck	Two hydraulic pumps - 75 kW, one hydraulic pump - 132 kW, Three hydraulic pumps – 22 kW, 12 kW, 8 kW
Bottom frame	Max weight 10 ton, frame base 1.8 x 1.8 m., equipped with a running skirt for drill pipes and hydraulic clamping device for drill string stabilization in place.
System of drill mud preparation and storage	Three tanks, total capacity 17 m <sup>3</sup> , with mechanical mixers and hydraulic mixer
High pressure mud pump	Two pumps with effective pressure from 15 to 30 bar, discharge 360 l/min. One pump with effective pressure 100 kg, discharge 1000 l/min.
Stern P-frame with a hydraulically driven from 40 kW hydropower station	The width is 3,6 m, the height - 8 m, overboard handling radius - 3 m, bearing capacity 10 t.

<b>Sampling equipment</b>	
<p>Hydraulic winch for lowering/ascend and power supply of downhole equipment</p>	<p>Type Wison-APB Hydraulic winch.            Manufacturer: A.P. Van den Berg.            Length of flexible drill string: 600 m, diameter 40 mm.            Equipped with automatic tensioner system for vertical displacement compensation. Capacity 4100 кг.            Drum drive: electric with automatic tension system for the vertical motion compensation.            Complete set: oil station for feeding of the downhole devices; oil station for deaeration of the umbilical; water pump for recharging of the downhole devices; measuring cylinder.</p>
<p>A set of special equipment for drilling and soil investigations</p>	<p>Rotary drilling: configuration based on downhole motors with Wireline, Diameter of sampled core - 68 mm.</p> <p>Sampling and soil investigation in boreholes:</p> <ul style="list-style-type: none"> <li>- Christensen Marine Wireline Assembling</li> <li>- DownHole configuration,</li> <li>- Hydraulic device for undisturbed sampling Wipsampler Mk II,</li> <li>- hydraulic device for CPT in boreholes Wison – APB System,</li> <li>- hydraulic hammer downhole sampler 3 m long, 89 mm in diameter with WL technology.</li> </ul> <p>Outboard soil sampling devices:</p> <ul style="list-style-type: none"> <li>- hydrostatic sampler 4 m long, 127 mm in diameter,</li> <li>- gravity sampler 6 m long, 108 mm in diameter,</li> <li>- hydraulic hammer bottom sampler 6 m long, 146/127 mm in diameter,</li> <li>- CPT unit Wison-APB System made by A.P. Van den Berg.</li> <li>- sampler with a drive from downhole motors for sampling in strong rocks, the diameter of the sampled core is 62 mm.</li> </ul>
<p>Device for extraction of the undisturbed soil samples</p>	<p>Type Wison-APB Hydraulic winch.            Manufacturer A.P. Van den Berg.            Diameter of the extracted sample 72 mm            Length of the extracted sample up to 1 m.            Pushing force: 100 kN.            It can be used for CPT performance at the interval of 1 m.</p>
<b>CPT execution set</b>	
<p>For the execution of cone penetration testing the drilling complex is used, mounted on the survey vessel «TRIAS» consisting of tower-shaped derrick with compensation system for drilling string and seabed frame, hydraulic power swivel Wirth, automated pilerack, storage tank for mining of drilling mud, drilling pumps, equipment for execution of CPT and soil sampling WISON-APB.</p> <p>Cone penetration testing is carried out on route-by-route basis with drilling out of penetrated interval. Penetration depth for one route makes up to 3 m.</p>	
<p>Downhole CPT device</p> 	<p>Type Wison-APB-50kN.            Manufacturer A.P. Van den Berg.            Drive Hydraulic cylinder, working pressure 17.5 MPa.            Penetration down thrust 50 kN.            Rod diameter 35 mm.            Stroke length 3000 mm.</p>

<p>Winch for lowering / ascending and power supply of downhole devices</p> 	<p>Type Wison-APB System.          Manufacturer A.P. Van den Berg.          Carrying capacity 4100 kg.          Flexible drillstring length: 600 m, Ø 40 mm.          Drum drive: Electrical with automatic system for compensation of vertical movement.          Set: Oil-pumping station for service of downhole devices; oil-pumping station for deaeration of flexible drillstring; water pump for reloading of downhole devices; measuring cylinder.</p>
<p>Sheave Blok Wison-APB</p> 	<p>Type Sheave Blok          Manufacturer A.P. Van den Berg.          Carrying capacity 3500 kg.          Mass 382 kg.</p>
<p>CPT data registration device</p> 	<p>Type GoloG CCI Wison-APB          Manufacturer A.P. Van den Berg.          Measurable parameters: cone tip resistance (qc), friction (fs), pore water pressure (u), temperature.          Software GOnsite! Версия 2.87.          Files can be exported in *csv or similar formats for manipulation in MS Excel or similar.</p>
<p>CPT Electrical Cone 10 cm<sup>2</sup></p> 	<p>Type Electrical Cone CFP100-10.          Manufacturer A.P. Van den Berg.          Technical characteristics:</p> <p><b>Cone Resistance</b>          Accuracy 100.0 kPa or 5 %;          Nom.Cone Resistance 50 MPa;          Max.Cone Resistance: 100 MPa;          Effective Area 10 cm<sup>2</sup>;</p> <p><b>Local Friction</b>          Accuracy 25.0 kPa or 3.0 %;          Nom.Local Friction 10 MPa;          Max.Local Friction 15 MPa;          Effective Area 150 cm<sup>2</sup>;</p> <p><b>Pore Water Pressure</b>          Accuracy 15.0 kPa or 15.0 %          Nom. Pore Water Pressure 0.75 MPa          Max. Pore Water Pressure 1.5 MPa</p> <p><b>Temperature indication</b>          Temperature range (-5) - (+70) °C;          Accuracy 2 °C.</p>

<p>Cone Test Equipment</p>	<p>Type ELC-Tester  Manufacturer A.P. Van den Berg.  Content: Water Pressure, ELC- Tester, Pump Set.  Characteristics:  <b>ELC-Tester</b>  Cones 10 cm<sup>2</sup>, 15 cm<sup>2</sup>  Pressure 0-100 Mpa  <b>Water Pressure</b>  Cones 10 cm<sup>2</sup>, 15 cm<sup>2</sup>  Pressure 0-1,5 Mpa  <b>Pump Set</b> Driving unit hand-operated, Pressure 700 Bar.</p>
<p>Cone Deaeration Vacuum Assembly</p>	<p>Type Vacuum Installation.  Manufacturer A.P. Van den Berg.  Power supply 220 - 240 VAC.  Wattage 80 W.  Created discharging 8 x 10<sup>2</sup> mba.</p>
<p>Cone calibration</p>	<p>Cones for the execution of cone penetration testing were calibrated on manufacturing plant A.P. v.d.Berg, in Heerenveen, Netherlands. Calibrations are carried out predominantly on the yearly base or when required – by detecting of deviations in the course of verification.</p> <p>Verification of cones for the execution of cone penetration is carried out prior to the beginning of every project, and also by detecting of significant deviation of cone zero parameters in the course of works.</p> <p>Verification of cones for the execution of cone penetration testing is executed using special-purpose equipment including test stand for the checkout procedure of front resistance and lateral resistance of ELC-Tester and test stand for the checkout procedure of pore pressure of WaterPressureTester manufactured by A.P.v.d.Berg.</p> <p>Verification is executed by comparative measurement of values of actual pressure perceived by cone and registered by manometer with values registered by cone and displayed in GOnsite! software.</p>





### Cone Calibration Certificate

**Certificate:**  
Instrument Type: **GS-020509-001**  
Model: **Electric Compression Cone**  
Serial number: **ELC10-CFP**  
Calibration date: **020509**  
Client: **01-05-2018**  
Calibrated by: **Pacific Engineering Co. Ltd**  
Manufacturer: **H. Smit**

**Calibration Instruments**  
Manufacturer: **Hottinger Baldwin Messtechnik GmbH**  
HBM certificate no.: **49046**

**Calibration Conditions**  
Ambient temperature: **22.6 °C**  
Atmospheric pressure: **1019 mBar**


**Cone Specifications**  
Cone base area: **1000 mm<sup>2</sup>**  
Nominal load Tip Resistance: **50 kN**  
Friction sleeve area: **15000 mm<sup>2</sup>**  
Nominal load Local Friction: **11.25 kN**  
Nominal load Pore Pressure: **10 MPa**  
Temperature compensation (all channels): **0, .40+ °C**  
Maximum overload capacity (all channels): **100 %**  
Cone area ratio (a): **0.74**  
Friction area ratio (b): **1.0**


Cone Resistance	
Bridge-feeding (current):	12.5093 mA
Sensitivity at nominal load:	0.3997 mV/mA
Bridge-feeding (voltage):	4.3939 V
Sensitivity at nominal load:	1.1379 mV/V
Max. error, absolute:	< 35 kPa
Max. inaccuracy, relative to measurement value:	1.0 % FS
Measured cone area ratio (a):	n/a
Output at nominal load:	5.0000 mV

Local Sleeve Friction	
Bridge-feeding:	12.4430 mA
Sensitivity at nominal load:	0.4922 mV/mA
Bridge-feeding (voltage):	4.3977 V
Sensitivity at nominal load:	1.3737 mV/V
Max. error, absolute:	< 2 kPa
Max. inaccuracy, relative to measurement value:	1.0 % FS
Output at nominal load:	5.0000 mV

Pore Pressure	
Bridge-feeding (current):	0.4511 mA
Sensitivity at nominal load:	44.3400 mV/mA
Bridge-feeding (voltage):	1.9273 V
Sensitivity at nominal load:	12.2900 mV/V
Max. error, absolute:	< 35 kPa
Max. inaccuracy, relative to measurement value:	1.0 % FS
Output at nominal load:	20.0000 mV

This calibration is compliant with DeLundt Systems internal quality system, internal calibration procedures and meets the requirements of NEN2464, NEN-EN-ISO 22876-1, NEN-EN-ISO 22876-2 and NEN-EN-ISO 22876-3 using calibration equipment traceable to (inter-)National Standards.

Approved by:  B. van Eijk  
Date: 01-05-2018



Klant:	A.P. van den Berg	Ordernummer:	
Conus nummer:	020509	Conus type:	ELC10

Rechtheid in mm (Zie form. 409)	mm	(50%)	mm
Isolatie weerstand (min. 0.5 G ohm)	Ω	Ω	G ohm
Nulpunt Punt (Max. 2% van nom. bereik)	Ω	Ω	mV
Nulpunt Kleef (Max. 2% van nom. bereik)	Ω	Ω	mV
Nulpunt Waterspanning (Max. 2% van nom. bereik)	Ω	Ω	mV
Nulpunt Helling (max. +/- 1°)	Ω	Ω	mV
Diameter Punt (Zie form. 409)	Ω	Ω	mm
Diameter Kleef (Zie form. 409)	Ω	Ω	mm
Diameter Adapter (Zie form. 405)	Ω	Ω	mm
Sensor type			bar

Gebruikte Materialen	Artikelnummer	Aantal
Gebruikte Punt (CFP)	0101006 A	
Nieuwe Punt (CFP)	0101000 A	
Gebruikte Punt (CFP)	0101007 A	
Nieuwe Punt (CFP)	0101001 A	
Kleefmanset (CFP) (150 mm2)	0101050 A	
Mantel c.	0101052 A	
Centreerring pre pressure CF	0101121 A	
Centreerring pre pressure CFP	0101122 A	
Centreerringonderdeel	0101070 B	
Set Dichtingen	0100599 A	1
Quad ringen	77511000	2
Golfing	77680310	
Pre-pressure ring	0101111 A	
Connectorhuis 18 polig	1500010 A	
Connectorhuis 16 polig	1500020 A	
Slijfbijl	0101160 B	
Draadslijf (CFP)	0101010 A	
Draadslijf (CFP)	0101011 B	
Connector insert 18 polig	82450008	
Connector insert 18 polig small	82450010	
Connector insert 18 polig	82450006	
Drukstuk kleef + rektrookjes	0101210 A	

Diverse: filter met opdrukbringen

Dobouwe prepressure:  Oja  Niet

Technician: **H.Smit** Datum: **1-6-2018**

*Example of calibration certificate issued by manufacturing plant.*

### Onboard Soil laboratory

- ❖ Penetrometer Humboldt MFG. Co,
- ❖ Mini vane WF 23500,
- ❖ Laboratory vane Humboldt MFG. Co.,
- ❖ Hydraulic extruder,
- ❖ Triaxial compression device,
- ❖ Drying furnace SNOL 58/350,
- ❖ Scales with magnetic compensator Ohaus 700/800 Series,
- ❖ Munsel soil-color charts,
- ❖ Device for point loading of strong rocks.



Drilling rig



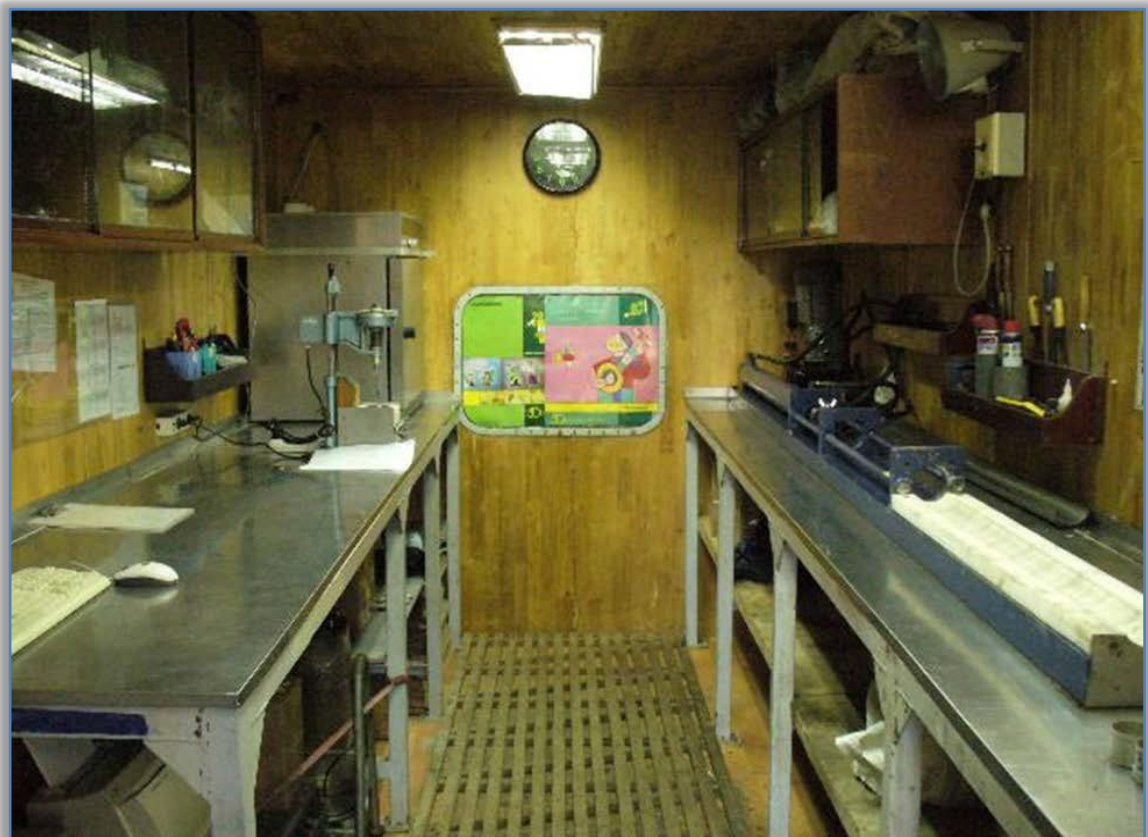
Automated Tube Rack



Drilling Rig Control Panel



Winches for sampling Wison-APB



Onboard Soil laboratory



Power Swivel Wirth with hydraulic drive



Drilling Mud Pumps



Downhole CPT device Wison-APB-50kN



Cone Test Equipment