

Annex V of the VAC
Technical Specifications for the equipment
(Lot 3 – Black Sea North)

Procurement procedure: EMSA/CPNEG/3/2022

Title: Service Contracts for Stand-by Oil Spill Recovery Vessel(s)

Phase II – Invitation to Tender

All the costs related to the purchase and transport of additional equipment, transportation of transferred equipment as well as servicing of the transferred equipment in line with this Annex and as per below requirements have to be included in the “equipment costs”

Content:

- 1. General description of the equipment**
 - 1.1 Equipment transferred
 - 1.2 Overhauling/servicing of the equipment
 - 1.3 Additional equipment
- 2. Handover procedure for equipment transferred**
 - 2.1. Date and place of the handover
 - 2.2. Transportation
 - 2.3. Storage and insurance
- 3. Use of the oil pollution response equipment**
- 4. List of transferred equipment and description**
- 5. Description of equipment**

1. General description of the equipment

The oil pollution recovery equipment comprises two different at-sea oil recovery systems designed to recover medium to high viscous oils. Those systems will be installed on board when operating as an oil spill recovery vessel although they will not be used at the same time.

The Contractor will receive the set of equipment as listed in Section 4 and described in detail in Section 5 of this document. However, the Contractor will be responsible for the correct functioning of the equipment according to the parameters of its technical specifications.

1.1. Equipment Transferred

The contractor will receive from EMSA the equipment listed below:

1. Sweeping arms system – 2 x 12 m Lamor rigid sweeping arms, associated weir cassette and brush cassette, pumps, cranes, hydraulic and oil hoses, controls and power packs;
2. Skimmer Set - One complete high-capacity skimmer system, Transrec 150, with two skimmer heads, pumps, remote control, hydraulic and oil hose on a reel, power pack, thrusters and crane. This system is integrated in 20 feet container rack;
3. Discharging Equipment;
4. Sampling and Testing Equipment;
5. Communications Equipment;
6. Cleaning Equipment;
7. RPAS Ancillaries.
8. Boom system Lamor

All tenderers will have the opportunity to verify the state of equipment on board of the vessel Amalthia and in the stockpile in Constanta (Romania) at request. In principle the visit will be organised in week 29. The visit details will be arranged with the requesting tenderer. If due to the COVID-19 travel restrictions or other health risk considerations the visits cannot be organised then EMSA will provide tenderers with additional detailed technical information on the transferred equipment including, manuals, pictures and videos.

1.2. Overhauling/servicing of the equipment

The equipment that will be transferred to the Contractor was purchased in 2009 - 2010. It is generally in good condition. The equipment has never been used to recover oil. The equipment has been categorised and appropriately labelled. It has undergone regular maintenance according to the manufacturer's specifications. The maintenance was closely monitored by EMSA. The working condition of the equipment is regularly verified by the Agency during drills.

The Contractor will be responsible for the safe, reliable and sustainable operational use of the equipment. Therefore, the Contractor should arrange servicing to the equipment after the handover but before expiration of the Preparation Phase. In such a case, each tenderer will include in its financial offer regarding the oil pollution response equipment, the estimated servicing costs. This

estimation will be considered as the ceiling that EMSA will reimburse in relation to the equipment servicing.

Detailed report of the service(s) actually carried out on the equipment item(s) shall be included by the Contractor as part of the Completion Report. This report should include as a minimum list of works performed, list of parts replaced and/or repaired, photos, etc.

The overhauling/servicing might be performed by a third party subcontracted by the contractor (e.g. manufacturer of the equipment or a specialised local company).

1.2.1 Equipment to be overhauled

Overhauling of the OSR equipment systems shall include repair or replacement of damaged, defective or worn parts, reassembly, testing and trial-run prior to returning the item to its full operating level. The contractor should take care also for the proper disposal of the parts to be replaced.

The overhauling works should as a minimum requirement comprise in general the following items:

- Replacement of all worn parts: belts, gaskets, seals, filters, rusty screws and washers, O-rings of all parts of the set;
- Replacement of all fluids: lube oil, hydraulic oil, gear oil, coolant of all parts of the set;
- Replacement of all rubber/flexible hoses and couplings/connections: all hydraulic hoses;
- Cleaning/brushing off rust/limestone/chalky deposits from all parts:
 - bring all the parts to a "new" finish;
 - sandblasting of rusty steel parts;
 - repaint (where applicable) with original or equivalent marine resistant paint (zinc primer, marine epoxy coating, marine epoxy topcoat);
- Grease/lubricate all joints/points.

Based on previous experience, below is the indicative list of the overhauling works to be performed:

a. Lamor Sweeping arms system:

I	No	Description of overhauling works
2 x Frame (including weir/brush modules)	I.1.1	Replacement of rubber fenders installed on each end
	I.1.2	Replacement of all hydraulic connectors
	I.1.3	Brushing off chalky/limestone deposits and bringing the aluminium brush/weir frame to a "new" finish
	I.1.4	Brushing off rust and repainting with original or equivalent paint
	I.1.5	Replacement of all wearing parts from the hydraulic motor(s) (seals, O-rings, gaskets)
	I.1.6	Replacement of brushes
2 x Crane	I.2.1	Replacement of all hydraulic valves and levers
	I.2.2	Replacement of gear oil
	I.2.3	Replacement of vent plug
	I.2.4	Replacement of hydraulic system filter
	I.2.5	Replacement of all winch cables
	I.2.6	Replacement of cable pulleys
	I.2.7	Replacement of all screws and bolts from the foundation pillar

	I.2.8	Replacement of all wearing parts from the winches
	I.2.9	Replacement of brake cylinder
	I.2.10	Replacement of brake clutch
	I.2.11	Replacement of worn parts of the slewing ring
	I.2.12	Brushing off rust and repainting with original or equivalent paint
	I.2.13	Replacement of hydraulic lines/pipes
	I.2.14	Replacement of spherical bearing
	I.2.15	Replacement of hydraulic cylinder
2 x Power Pack	I.3.1	Replacement of all fluids, gaskets/seals & filters
	I.3.2	Cleaning of all tanks and radiators
	I.3.3	Replacement of belts
	I.3.4	Replacement of flexible lines
	I.3.5	Cleaning the exhaust flame trap
	I.3.6	Replacement of all wearing parts from the hydraulic pump (gaskets, O-rings)
	I.3.7	Delivery of a new protection canvas
	I.3.8	Brushing off rust and repainting with original or equivalent paint
	I.3.9	Replacement of all wearing parts from the spring starter
	I.3.10	Delivery of a new spring starter (as back-up)
2 x Centrifugal Pump MSP 150	I.4.1	Replacement of seals, O-rings, washers and dust caps
	I.4.2	Replacement of hydraulic connections
	I.4.3	Replacement of all wearing parts from the hydraulic motor(s) (seals, O-rings, gaskets) x 2
	I.4.4	Brushing off rust and repainting the exterior casing with original or equivalent paint
	I.4.5	Replacement of impeller (rotor) x 2
	I.4.6	Renew protective coating of pump casing interior and suction cone interior with original or equivalent paint
I	No	Description of overhauling works (continuation)
2 x PDAS Pump GTA 115	I.5.1	Replacement of plate wheel sectional discs and wear plates
	I.5.2	Replacement of sealing ring
	I.5.3	Replacement of plate wheel shaft
	I.5.4	Replacement of plate wheel bearing
	I.5.5	Replacement of sealing/bearing discs
	I.5.6	Replacement of V-seal
	I.5.7	Replacement of stator cutting knife
	I.5.8	Replacement of all wearing parts from the hydraulic motor(s) (seals, O-rings, gaskets) x 2
	I.5.9	Brushing off rust and repainting the exterior casing with original or equivalent paint
	I.5.10	Replacement of impeller (rotor) x 2
	I.5.11	Renew protective coating of pump casing interior with original or equivalent paint

1.2.2. Equipment to be serviced

The contractor should arrange servicing to the following equipment:

- Transrec Skimmer Set
- Discharging Equipment;
- Sampling and Testing Equipment;
- Cleaning Equipment;
- Lamor Boom system. In addition, some items of the transferred boom system will have to be replaced (e.g. boom sections, hoses). More details are presented in point 5.8 of this document.

The servicing to this equipment should include the following:

- Check, test (new certification) and replace, if necessary, the hydraulic and cargo hoses;
- Check and replace, if necessary, the cables, wires, ropes, etc.;
- General overhauling of all pumps;
- Check the wear of the brushes of the skimmer and replace if needed;
- Check of power packs, change the engine and hydraulic oil, coolant liquid, filters (oil, air, fuel), belts;
- Replace all rusty couplings;
- Check the paint and repaint, if needed.
- Replacement of all seals, O-rings, etc, where applicable;
- Calibrate the Sampling and Testing Equipment, if necessary.

1.3. Additional equipment

Contractor will need to purchase/deliver the following equipment:

1. Slick Detection System: The oil encounter rate is improved when the oil layer thickness of the recovery area is larger. The vessel will have a system installed, which, without external aid, is capable of detecting the location of the highest concentration of oil. The system will permit the vessel to continue oil detection in low visibility conditions so that the oil recovery operations are not aborted due to lack of visibility.
The system must be permanently installed onboard. In the case a “pool” of vessels is offered, then each vessel must have a system installed. During data capture, the vessel movement will be compensated in order to ensure the reliability of the information.
The system will be able to provide continuous monitoring of the slick area and, in combination with current and wind data, predict the oil spill trajectory. It will be possible to record the evolution of the spill trajectory in video format. Such a format should be compatible with common media players software.
The system should also provide an estimate of the spill area by size, real time distance measurement to a defined point and will be able to be overlaid with an electronic map. The

ability to calculate volume in combination with other data is appreciated. However, a system which measures directly both slick size and thickness is preferred.

The detection range shall be at least 2 nautical miles and will operate efficiently in wind speed of 2m/s or more.

The integration with VHF frequency used in the AIS system is mandatory if such a system is not already installed on the vessel.

The Graphic User Interface shall be user-friendly with a PC-based data processing capability. The layout of display and colour, for use both day and night, will be specially made for operation on a vessel's bridge. The system must be regularly (annually) updated with the latest software for the system during the whole duration of the contract.

2. Flashpoint: As the tenderer shall offer an arrangement able to collect and store oil with a flashpoint below 60°C, then additional items may need to be purchased or replaced (e.g. for the power packs, remote controls, etc.).
3. Flow meter: to be used during drills to measure the flow of the pumps installed in the sweeping arms and skimmer.
4. EMSA logo on equipment: At least one EMSA logo must be attached/painted on a visible position on each sweeping arm and crane, skimmer frame (if possible), boom reel, power pack, containers. The dimension of the logos shall be in proportion to the items to be marked.

The Contractor will purchase the above listed additional oil pollution response equipment items and will obtain and conserve ownership of them until the Clearance of the Preparation Phase is completed. All provisions of the Contract including article IV.4.3 (transferable call option) shall apply to the additional oil pollution response equipment items.

5. Vessel Model: At the end of the preparation phase, the Contractor will deliver to EMSA, at its premises in Lisbon, a model(s) of the Vessel(s) at (approximate) scale 1/100. All oil pollution response equipment will be displayed, in the appropriate scale, on board the model(s). In particular, one system must be deployed, simulating recovery of oil with the option to display the alternate system (sweeping arms or boom/skimmer systems). The model(s) should be as detailed as possible, preferably made of plastic or metal. The model(s) remains the property of EMSA, only to be used by the Contractor upon request with the agreement of EMSA. Any cost related to the production of the model and its transportation costs shall be borne by the Contractor¹.

2. Handover procedure for equipment transferred

The conditions of handover, transportation, storage and insurance of the equipment are described below. If any part of the equipment delivered is not used by the Contractor due to the fact that it is not suitable for the vessel offered, the associated costs for the storage, insurance and maintenance shall be borne by the Contractor.

¹ The model price should be indicated in the bid for information only.

2.1.Date and place of the handover

Prior to the handover, the Contractor shall designate a representative whose name and position shall be communicated in writing to EMSA. The Agency may also designate a representative to witness the handover process.

The items listed in point 1.1 above will be made available for handover and ready for transportation at their relevant storage location in Constanta, Romania.

The handover will be done at a date to be mutually agreed between EMSA and the Contractor and shall not take place earlier than **21/05/2023** and not later than **21/06/2023**.

On the handover dates, the Contractor representative shall be present and verify the delivery of the equipment in question.

A delivery/receipt statement prepared by EMSA will be used in order to acknowledge handover of all the oil pollution response equipment items. By signing the delivery/receipt statement on the handover date, the Contractor representative accepts the equipment in its current condition.

2.2.Transportation

The Contractor shall bear all risks involved in transporting (including loading and unloading) for the items listed above from the handover place to the new storage facilities.

The Contractor shall arrange the packing and preparation of the items for transportation, provision of stevedoring services and lifting resources (e.g. forklifts, mobile cranes, etc.) and all necessary shipment.

The costs related to the transportation (including insurance during transport) of the equipment must be paid initially by the Contractor. However, these costs are, within the contract budget ceiling, reimbursed by EMSA as part of the oil pollution response equipment purchase. Accordingly, the tenderer shall include in its financial offer the estimated transportation costs for the oil pollution response equipment.

2.3.Storage and insurance

Prior to the equipment handover, the Contractor shall arrange for the appropriate storage and insurance of all the oil pollution response equipment.

For the purpose of taking out the full risk insurance policy covering the transferred oil pollution response equipment items, the value shall be the purchase value as described under in the table in point 4 below.

3. Use of the oil pollution response equipment

The equipment that must be installed/carried simultaneously on board for oil pollution response must include, as a minimum, the following configurations:

- the sweeping arm system,
 - the boom system (2 x reel) + high-capacity skimmer system,
 - the oil slick detection system,
 - other equipment (minilab, flashpoint tester, etc.),
- and their relevant power packs and ancillaries.

This configuration will be tested during all quarterly drills every year.

4. List of Transferable Equipment

No.	Category	Ref No.	Item	Delivery Date	Additional info	ID Codes
5.1	Sweeping arm set <i>Value for insurance purpose 1,054,310 EUR</i>	5.1.1	Frames	12/06/2009	Floating, Rigid, Lamor LJS 12m with towing chains and slings	GKMM362201 or 1114
				12/06/2009	Floating, Rigid, Lamor LJS 12m with towing chains and slings	GKMM362202 or 1115
		5.1.2	Skimmer modules	12/06/2009	BRUSH SKIMMER BELT 5C	GKMM310701 or 1118
				12/06/2009	BRUSH SKIMMER BELT 5C	GKMM310702 or 1119
				12/06/2009	WEIR SKIMMER ARRANGEMENT	GKMM314401 or 1120
				12/06/2009	WEIR SKIMMER ARRANGEMENT	GKMM314402 or 1121
		5.1.3	Pumps	12/06/2009	MARFLEX CENT. PUMP MSP150 300M3/H	GKMM283201 or 1122
				12/06/2009	MARFLEX CENT. PUMP MSP150 300M3/H	GKMM283202 or 1123
				12/06/2009	LAMOR GT A 115 PDAS 115 M3/H with water injection kit 3/4 I/O, outlet 5"	GKMM283203 or 1124
				12/06/2009	LAMOR GT A 115 PDAS 115 M3/H with water injection kit 3/4 I/O, outlet 5"	GKMM283204 or 1125
		5.1.4	Hydraulic hoses	12/06/2009	HOSE FOR GTA 115	GKMM223801 or 1134
				12/06/2009	HOSE FOR GTA 115	GKMM223802 or 1135
				12/06/2009	HOSE FOR GTA 115	GKMM223803 or 1136
				12/06/2009	HOSE FOR GTA 115	GKMM223804 or 1137

No.	Category	Ref No.	Item	Delivery Date	Additional info	ID Codes
5.1	Sweeping arm set (continuation)	5.1.5	Oil transfer hoses	12/06/2009	5" RIGID, FOR GTA 115	GKMM263601 or 1138
				12/06/2009	5" RIGID, FOR GTA 115	GKMM263602 or 1139
				12/06/2009	5" RIGID, FOR GTA 115	GKMM263603 or 1140
				12/06/2009	5" RIGID, FOR GTA 115	GKMM263604 or 1141
		5.1.6	Power packs	12/06/2009	DIESEL ENGINE, LPP 109 D, 109kW	GKMM272201 or 1143
				12/06/2009	DIESEL ENGINE, LPP 109 D, 109kW	GKMM272202 or 1145
		5.1.7	Cranes	12/06/2009	HIDROACAR CRANE	GKMM131501 or 1146
				12/06/2009	HIDROACAR CRANE	GKMM131502 or 1147
		5.1.8	Control stand	21/08/2015	Control stands 2 valves LCS 2 and hydraulic hoses	2053
		5.1.9	Storage container	12/06/2009	10 feet CONTAINER for storage of SPARE PARTS and ancillaries	GKMK422901 or 1193
			Spare parts	12/06/2009	ACCORDING TO EQUIPMENT SELECTION	GKMK342901

No.	Category	Ref No.	Item	Delivery Date	Additional info	ID Codes
						or 1192
5.2	High-Capacity Skimmer Value for insurance purpose 1,400,000 EUR	5.2.1	Storage reel	30/06/2010	FRAMO TRANSREC 150 STORAGE AND HANDLING UNINT WITH 95 METERS UMBILICAL	GKMI353402 or 1194
		5.2.2	Weir module	30/06/2010	FRAMO TRANSREC WEIR SKIMMER HEAD WITH PUMP, 2 THRUSTERS, FRAME AND CANVAS, INSTRUMENTATION PACKAGE AND EMULSION BREAKER	GKMI314401 or 1195
			Pump	30/06/2010	FRAMO, CENTRIFUGAL, INTEGRATED IN THE WEIR SKIMMER HEAD	2042
		5.2.3	Disc module	30/06/2010	HIVIS/HIWAX SKIMMER HEAD WITH 2 PDAS PUMPS, HOT WATER INJECTION SYS AND 2 THRUSTERS	GKMI311901 or 1196
			Pumps	30/06/2010	FRAMO, PDAS, INTEGRATED IN THE HIVISC SKIMMER HEAD	2043
				30/06/2010	FRAMO, PDAS, INTEGRATED IN THE HIVISC SKIMMER HEAD	2044
			Ancillaries	30/06/2010	LIFTING DEVICE FOR STORAGE AND HANDLING	GKMI020201 or 1197
		5.2.4	Control desk	30/06/2010	RADIO REMOTE CONTROL SYS (INCL PANEL)	GKMI111302 or 1198
		5.2.5	Storage flat rack	30/06/2010	WITH CANVAS FOR STORAGE AND HANDLING UNIT	GKMI352002 or 1199
		5.2.6	Ancillaries	30/06/2010	MANOMETER TOOLBOX	GKMI020202 or 1200
		5.2.7	Oil hose(s)	30/06/2010	12m WITH 6" QUICK COUPLING FOR TRANSREC AND 6" FLANGE FOR STORAGE TANK CONNECTION	GKMI263801 or 1202
		5.2.8	Hydraulic hose(s)	30/06/2010	12m HOSES FOR CONNECTION BETWEEN TRANSREC AND POWER SUPPLY	GKMI223802 or 1203
		5.2.9	Power pack	30/06/2010	DIESEL HYDRAULIC, 200 kW, INCLUDING LIFTING SLING AND CANVAS	GKMI272801 or 1204
		5.2.10	Spare parts	30/06/2010	TRANSREC SPARE PARTS	GKMI343801 or

No.	Category	Ref No.	Item	Delivery Date	Additional info	ID Codes
						1201
				30/06/2010	FOR DIESEL HYDRAULIC POWER PACK	GKMI343802 or 1206
5.3	Discharging <i>Value for insurance purpose 80,234.29 EUR</i>	5.3.1	UTI Oil/water interface	12/06/2009	HERMETIC UTIMETER	GKMD382901 or 1179
		5.3.2	Pumps	12/06/2009	LAMOR GT A 115 PDAS	GKMD283201 or 1180
				12/06/2009	LAMOR GT A 115 PDAS	GKMD283202 or 1181
		5.3.3	Pumps	12/06/2009	MARFLEX MSP 150 CENTRIFUGAL	GKMD283201 or 1182
				12/06/2009	MARFLEX MSP 150 CENTRIFUGAL	GKMD283202 or 1183
5.4	Sampling/testing <i>Value for insurance purpose 19,821.43 EUR</i>	5.4.1	Gas detector/explosimeter	12/06/2009	RKJ GX-2009	GKMH191801 or 1184
		5.4.2	Flash point tester	12/06/2009	STANHOPE-SETA, SETAFLASH SERIES 3	GKMH173901 or 1185
		5.4.3	Mini lab	12/06/2009	DM-340.1, CANNON DPV	GKMH231701 or 1186
5.5	Communication <i>Value for insurance purpose 850 EUR</i>	5.5.1	VHF's	12/06/2009	PORTABLE, VERTEX STANDARD, VXA-220	GKMC392901 or 1187
				12/06/2009	PORTABLE, VERTEX STANDARD, VXA-220	GKMC392902 or 1188
5.6	Cleaning <i>Value for insurance purpose 3,600 EUR</i>	5.6.1	Cleaning machines	12/06/2009	HI-PRESSURE CLEANER - POSEIDON 2-26	GKMB092901 or 1189
				12/06/2009	HI-PRESSURE CLEANER - POSEIDON 2-26	GKMB092902 or 1190
				12/06/2009	HI-PRESSURE CLEANER - POSEIDON 2-26	GKMB092903 or 1191
5.7	RPAS Ancillaries <i>Value for insurance purpose 5,731.10 EUR</i>	5.7.1	Computer	01/08/2020	Laptop (Dell, i7, Nvidia Quattro RTX 3000 with 6 gb GDDR6, 17,3 " 4k display, 16 GB RAM + bag + 2x10 meters NonCatProd CRE-114 cable ODU with RJ-45 connectors)	n/a
		5.7.2	VHF Headset	01/08/2020	Entel HT844 Marine VHF ATEX IIA 2W LCD, battery pack, belt clip, waterproof, ear defender headset	n/a

No.	Category	Ref No.	Item	Delivery Date	Additional info	ID Code
5.8	Boom Set <i>Value for insurance purpose 247,754 EUR</i>	5.8.1	Boom Segments	12/06/2009	HEAVY DUTY BOOM HDB 2000, 250 M	GKMA073601 or 1148
				12/06/2009	HEAVY DUTY BOOM HDB 2000, 250 M	GKMA073602 or 1149
		5.8.2	Towing Set	12/06/2009	TOWING LINES SET HDB 2000	GKMA374201 or 1150
				12/06/2009	TOWING LINES SET HDB 2000	GKMA374202 or 1151
				12/06/2009	TOWING LINES SET HDB 2000	GKMA374203 or 1152
				12/06/2009	TOWING LINES SET HDB 2000	GKMA374204 or 1153
				21/08/2015	BRIDLE SET FOR OPEN-U CONFIGURATION	2051
		5.8.3	Power Pack	12/06/2009	DIESEL HYDRAULIC POWER PACK LPP 7 HA/B8	GKMA272201 or 1162
		5.8.4	Hydraulic Hoses	12/06/2009	HYDRAULIC HOSES SET FOR HSR	GKMA223801 or 1163
		5.8.5	Air Blowers and Hoses	12/06/2009	HYDRAULIC AIR BLOWER HAB 200	GKMA032901 or 1157
				12/06/2009	HYDRAULIC AIR BLOWER HAB 200	GKMA032902 or 1158
				12/06/2009	AIR HOSES	GKMA053801 or 1159
				12/06/2009	AIR HOSES	GKMA053802 or 1160
		5.8.6	Boom Reels	12/06/2009	REEL 1 - HEAVY CONSTRUCTION 2228	GKMA353401 or 1154
				12/06/2009	REEL 2 - HEAVY CONSTRUCTION 2228	GKMA353402 or 1155
				12/06/2009	SUPPORT REEL	GKMA353403 or 1156

Disclaimer

Any specifications and/or graphic material must not be understood as a commercial endorsement by the Agency of any given piece of equipment and/or manufacturer/supplier.

If there is a contradiction between this Enclosure and the manufacturers' manuals, the manufacturers' manuals take precedence.

5. Description of the Equipment

The equipment to be transferred from the expiring contract, as described in this section, consist of the following sets:

- 5.1 Sweeping Arm Set
- 5.2 High-Capacity Skimmer
- 5.3 Discharging System
- 5.4 Sampling/Testing Equipment
- 5.5 Communications Equipment
- 5.6 Cleaning Equipment
- 5.7 RPAS Ancillaries
- 5.8 Oil Boom Set

5.1 Sweeping Arm system

Manufacturer:

Lamor Corporation Ab

Urakoitsijantie 12

06450 Porvoo

Finland Tel: +358 (0)20 7650 100

Fax: +358 (0)207 650 129

Email: info@lamor.fi, Website: www.lamor.fi

The Sweeping Arm Set (LAMOR Stiff Sweeping Arms LJS 12m) consists of:

- 5.1.1. Rigid Sweeping Arm Frames
- 5.1.2. Skimmer Modules
- 5.1.3. Pumps
- 5.1.4. Hydraulic Hoses
- 5.1.5. Oil Transfer Hoses
- 5.1.6. Power Packs
- 5.1.7. Cranes
- 5.1.8. Control desk
- 5.1.9. Storage container and spares

The sweeping arm system is supplied with an integrated weir skimmer and a brush module skimmer that can be assembled to the arm for recovery operations of high viscous oils. The skimmer may be

equipped with a centrifugal pump with screw impeller, Marflex MSP150-63 or with a LAMOR PDAS GT A 115 pump. The sweeping system is made up of the following components:

5.1.1. LAMOR Stiff Sweeping Arms Frames - LJS 12m

Each sweeping arm consists of an outer pontoon, a bridge and an inner pontoon welded together. The inner pontoon contains the weir collection chamber in which the pump (centrifugal or PDAS) is fitted. In this inner pontoon may be fitted the Brush skimmer module.

Table 1 Sweeping arm dimensions

Width	approx. 3300 mm
Length	approx. 12000 mm
Height	approx. 1900 mm
Weight	approx. 4000 kg



Figure 1 Drawing of sweeping arm structure

The free-floating frames can be fixed with twist locks on the deck. When in recovery position, the inner float leans against the ship side. The float is protected with round fenders allowing the arm to move with the ships rolling movement and waves.

The LAMOR Oil Recovery System uses the forward motion of the vessel to deflect surface water and oil towards the collection area formed by the apex of the Stiff Sweeping Arm where is collected by the skimmer and pumped on board into the storage tanks. The Lamor Stiff-Sweep recovery system collects oil at speeds of up to 2 to 3 knots, depending on the wave height and other operating conditions.

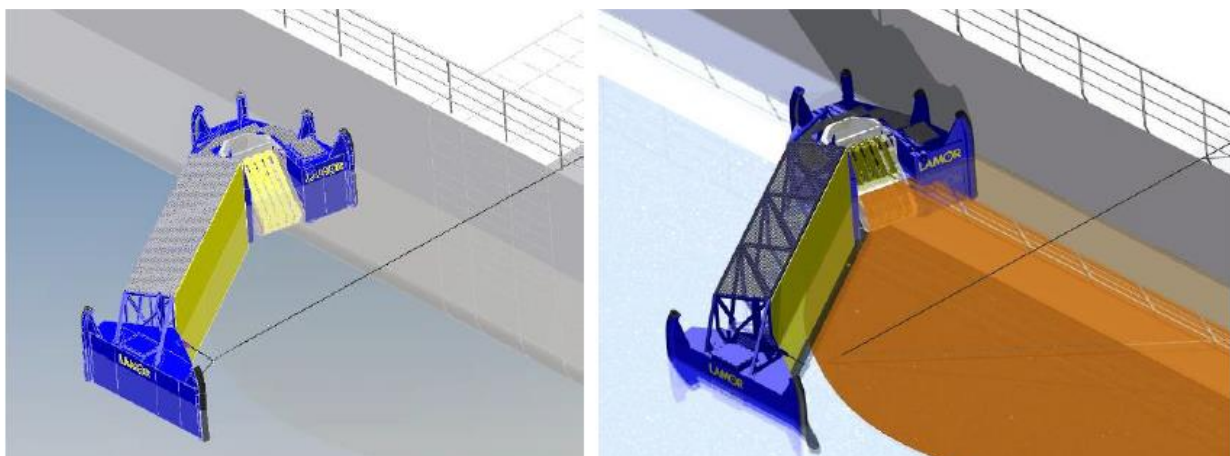


Figure 2 Drawing of sweeping arms in use

The construction is made of aluminium and steel. The oil guiding plate is of polyethylene, an easy to clean, glossy surface where the oil does not stick.

Table 2 Sweeping arm performance parameters

Significant wave height:	1.5 m to 2 m
Recovery speed:	up to 3 knots
Sweeping width:	20 m + vessel beam
Recovered water:	< 5 % of total recovered volume (Brush skimmer pack)
Type of Oil to recover:	All grades and ages, including debris, seaweed and tar balls.
Min air temperature:	- 20 °C
Min water temperature:	0 °C
Max operating temperature:	+ 60 °C

5.1.2. Skimmer Modules

Brush Skimmer

The 5 Chain LAMOR Brush Conveyor Belt is a removable recovery system for oil spills on the water surface. The Brush Pack consists of 5 parallel brush chains, driven by a hydraulic motor and controlled by a control panel.

The “brush conveyor” is supported and protected within a stainless-steel frame. The brush cleaning mechanism is a comb-like device mounted at the upper end of the brush conveyor. During operation, the cleaner is positioned below the top axle of the conveyor, to allow recovered oil and debris to drop directly into the discharge chamber from which it is transferred to a storage tank on board by the oil transfer pumps. The conveyor belt is mounted in the apex of the Stiff arm and is removable.

The sweeping arms may be equipped with the LAMOR GT A 115 PDAS pumps as they are more adequate to handle high viscous oils and the pumping rate meets the feeding capacity of the brush chains.

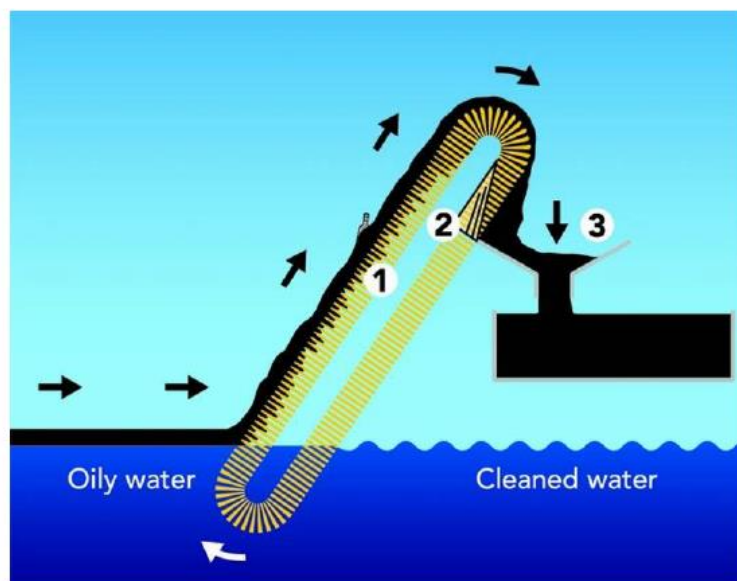
**Figure 3** Brush skimmer**Figure 4** Brush working principle

Table 3 Brush Conveyor technical specification

Operational Sea State:	Effective in 2 meter significant waves and wind driven chop. This is highly depending also on the vessel size used.
Viscosity Range:	0 to > 3,000,000 cSt
Dimensions:	5 Brush Chains mounted in steel frame approx. 2000 mm long (between shafts)
Brush Cleaner:	Patented cleaner/comb installed at upper end for gravity discharge of oil and debris into collection hopper.
Hydraulic Motor:	Danfoss type, Installed and fitted with Quick Disconnects.

Once dismantled the sweeping arm recover the oil directly with the weir skimmer.

Weir Skimmer

The brush conveyor belt can be removed from the skimmer apex to create a weir type skimming system.

The weir module consists of a stainless-steel hopper in which bottom is fitted the oil pump. In the fore part of the hopper is assembled a plate that hinges up and down depending on the oil-water inflow rate. For the operation with the weir skimmer the sweeping arms may be fit with the Centrifugal screw impeller pumps MSP 150.



Figure 5 Weir Skimmer module

5.1.3 Oil Transfer Pumps and Ancillaries

Marflex Centrifugal Pump MSP150

Manufacturer:

Marflex B.V.

Postal Address:

Louis Pasteurstraat 12

3261 LZ Oud-Beijerland

The Netherlands

Phone: +31 186 89 02 00

Fax: +31 186 89 02 49

E-mail: info@marflex.com

www.marflex.com



Figure 6 Marflex Centrifugal Pump MSP150

The Marflex pump type MSP-150 is a hydraulically driven portable single stage vertical centrifugal pump that has been designed for efficient handling of viscous liquids, bulky solids and shear-sensitive liquids. The MSP 150 portable pump is based upon a centrifugal screw impeller that combines the properties of a screw pump with those of a centrifugal one.

The pump impeller is keyed directly onto the hydraulic motor shaft. The high pressure oil is led into the hydraulic motor through the pressure hose, the leak oil connection is connected to the return oil outlet port on the hydraulic motor, the return oil flows back to the main hydraulic system. A special shaft seal arrangement has been developed in the hydraulic motor to segregate the hydraulic and the cargo.



Figure 7 MSP 150 installed in the weir skimmer module

Table 4 Technical specification of the Marflex Centrifugal Pump MSP150

Design	Single stage centrifugal
Capacity/Head	360m ³ /h-40 mcl
Viscosity/Specific Gravity	1.0 Cst. At 20°C/1.0
Speed	2000 rpm. maximum
Hydraulic Motor Type	Axial Plunger with Mechanical Seal.
Hydraulic working Pressure	200 bar
Maximum Pressure	320 bar
Maximum Return Pressure	6 bar
Maximum oil flow	130 l/min
Outer Diameter	490 mm
Height	610 mm
Weight excluding hoses	85 kg
Hydraulic connections (Tema quick couplings)	1" Tema 10021, 3/4" Tema 7511, drain 3/8" aeroequip.
Power required	50 kW
Discharge connector	6" Camlock or flange (included adaptor to 5")
Materials	Housing – Aluminium Impeller – Nodular Cast Iron Seals – Nitrile Hydraulic Motor – Cast Steel Quick Couplings – Yellow Passivated Steel

PDAS Pump Lamor GT A 115

The pump is multipurpose submersible Archimedes screw pumps with a pumping capacity of 115 m³/h. This type of pumps has been designed for use in skimmers and transfer or offloading pump applications and are able to pump a wide range of liquids ranging from water to the heaviest debris-laden viscous oils. The pumps can deliver a maximum of 12 bar outlet pressure, benefits from water/steam annular injection flange on the inlet as standard and debris cutting knife to handle solids such as seaweed, plastics and ropes.

The GT A pump range is constructed from robust seawater resistant aluminium for the casings and stainless, acid proof steel internals with special seals that ensure the pump remains “dry”. The pump can handle solids up to 30 mm in diameter, should the pump become clogged, and it can be reversed to expel the blockage.

The GT A pump received accreditation from Bureau Veritas confirming their recovery capacities with oils of varying viscosities.

The pump speed can be adjusted freely between 0...100 % from the control panel on the deck. It is capable of pumping oils with viscosities up to 1,000,000 cSt.

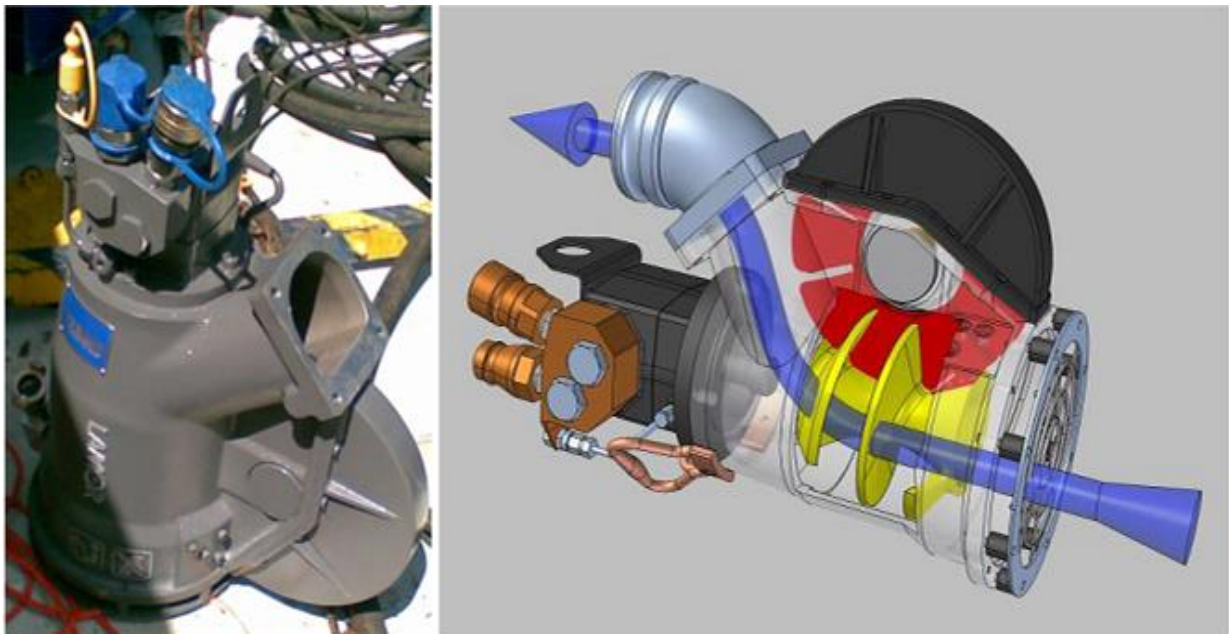


Figure 8 Oil Transfer Pump PDA LAMOR GT A 115

Table 5 Technical specification of the PDAS Pump Lamor GT A 115

Length	500 mm
Width	300 mm
Height	598 mm
Weight	71 kg
Capacity	115 m ³ /h
Hydraulic flow	160 max l/min
Hydraulic pressure	210 max bar
Power req.	56 max kW
Discharge pressure	12 bar

Water injection outlet 5" GTA pump

The GTA water injection flange can be fitted to the outlet side of the GTA pump. The kit can be retrofitted by removing the original outlet assembly with the Camlock (4 bolts) and bolting on the new assembly. It is recommended that the supply lines to the inlet and outlet Annular Water Injection Flanges (AWIF) are equipped with a non-return valve, which will prevent the line and the flange from getting contaminated inside by extremely sticky and viscous product.



Figure 9 Lamor water injection flange mounted on a GTA pump

A standard high-pressure steam or hot water cleaner is recommended for the provision of steam/hot water to the outlet AWIF. The recommended heating capability of the cleaner unit is minimum 35 kW for the GTA 140 pump. There are several obvious applications for the steam injection technique, of which a few could be:

- Emergency pump transfer of oil under arctic conditions
- Emergency pump transfer of cold bunker C from sunken vessels
- Pump transfer of bitumen from skimmers or temporary storage tanks
- Clearing a "path" through discharge lines clogged with solidified product

5.1.4 Hydraulic hoses and couplings

The equipment is supplied with all necessary hydraulic hoses. The hoses are manufactured in a durable material for long service and supplied with reliable stainless steel "Tema" connectors for secure linkages.

5.1.5 Oil transfer hoses

The equipment is supplied with 4 oil transfer semi-rigid hose sections (5" x 10 meter) fitted with Camlock.



Figure 10 Oil transfer hose connected to the weir module

5.1.6 Power Pack LPP 109 D

The 2 Lamor multipurpose power-packs are designed for flexible operation of many types of hydraulically operated oil spill clean-up equipment. The power pack is containerized and has a steel frame with perforated cover to ensure a good cooling for the air-cooled diesel engine.

The main components of the Power Pack are:

- Air cooled diesel engine
- Hydraulic pump
- Hydraulic power outlet connectors
- Hydraulic oil tank and fuel tank
- Battery
- Hydraulic PVG-100/32 valves
- Frame



Figure 9 LPP 109 Power-pack

The power-packs are easy to move thanks to 4 lifting points on top and forklift channels.

The Lamor power-packs have a Danfoss Proportional Hydraulic Valve System. The proportional System makes it possible to freely adjust the flow of oil to the component to be used. The flow will always remain as adjusted when again the pressure will vary according to power required.

Table 6 LPP 109 Power-pack technical specifications

Diesel engine	Deutz BF4M1013C, water cooled
Cylinders	4
Max. RPM	2300
Power	109 kW
Start system	24 V
Fuel tank	200 l. max.
Hydraulic oil tank	400 l. max.
Hydraulic pump	Sauer Danfoss ERR 147C
Displacement	147 cm ³
Max. pressure	210/280 bar
Max. oil output setting	330 l/min
Hydraulic filter	UFI I FRA-52 B16 NCD
Hydraulic oil cooler	AKG T6
Hydraulic couplings	TEMA 3800-10000
Variable clutch	Centaflex FL-SAE-12-127
Chalvwn valve	Chalvwn CH-D80
Spark arrestor	Donaldson M070068
Length	2000 mm
Width	1300 mm
Height	1900 mm
Weight with hydraulic oil	2500 kg

The hydraulic aggregate is equipped with an automatic shutdown system. If an engine malfunction should occur, the hydraulic or engine operation will be shut down if:

- no electric charging
- low oil pressure
- high oil temperature
- low hydraulic oil level
- high hydraulic oil temperature

If a malfunction should occur, one can easily locate the fault by checking the warning lights on the electric control panel.

The Lamor LPP 109 D is equipped with electric start (air/hydraulic start optional) and incorporates an easily accessible control panel and hydraulic oil cooler into the framework.



Figure 12 Power-pack hydraulic connections

5.1.7 Hidroacar Cranes

Manufacturer:

Address: Ankara Yolu 24.Km.

Konya, TURKIYE

Tel.: + 90 332 271 33 55

+ 90 332 245 61 29

Fax: + 90 332 271 33 91

+ 90 332 245 24 49

Web: www.hidroacar.com.tr

Email: acar@hidroacar.com.tr

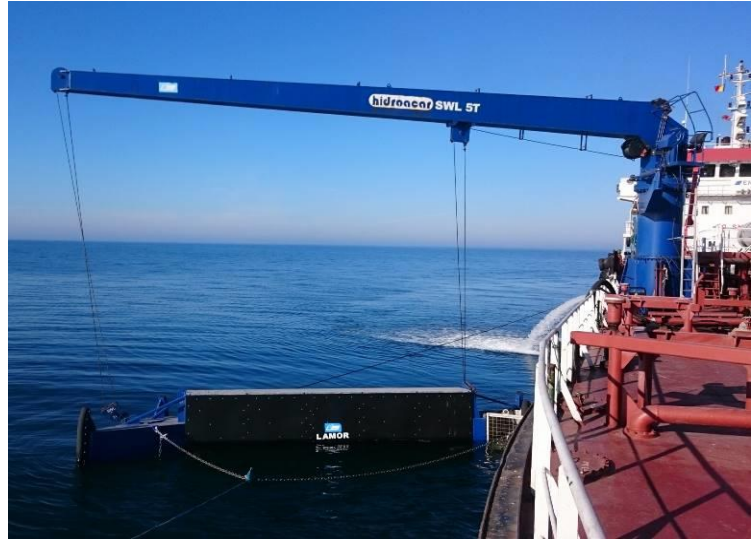


Figure 13 10 Hidroacar crane in operation

The arrangement includes 2 Hidroacar gravity cranes to deploy the sweeping arms floating frames. The cranes have a platform with control panel for the operation of the sweeping arms and two lifting points.

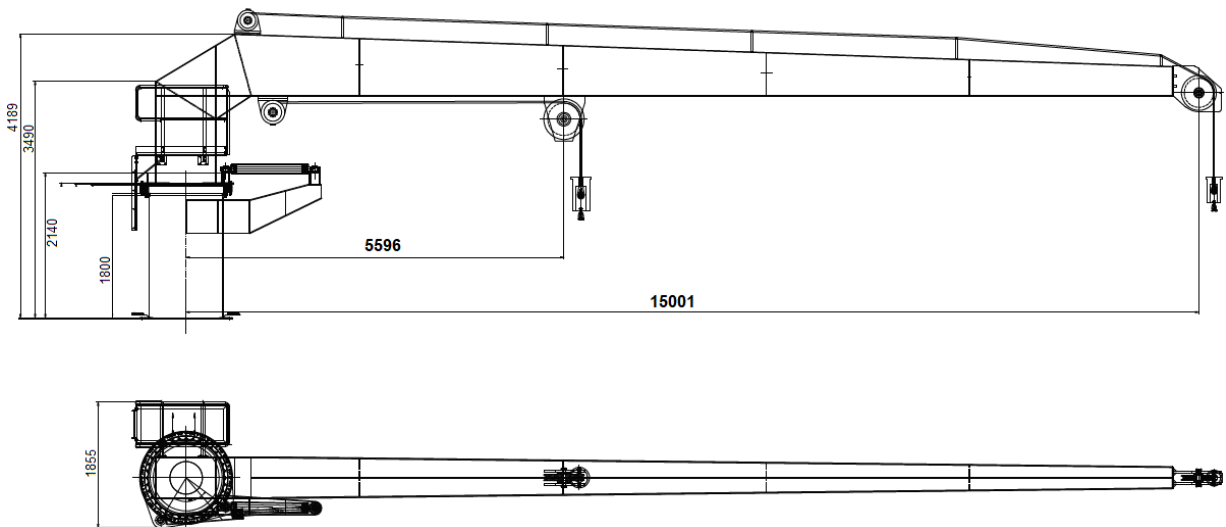


Figure 14 Crane dimensions

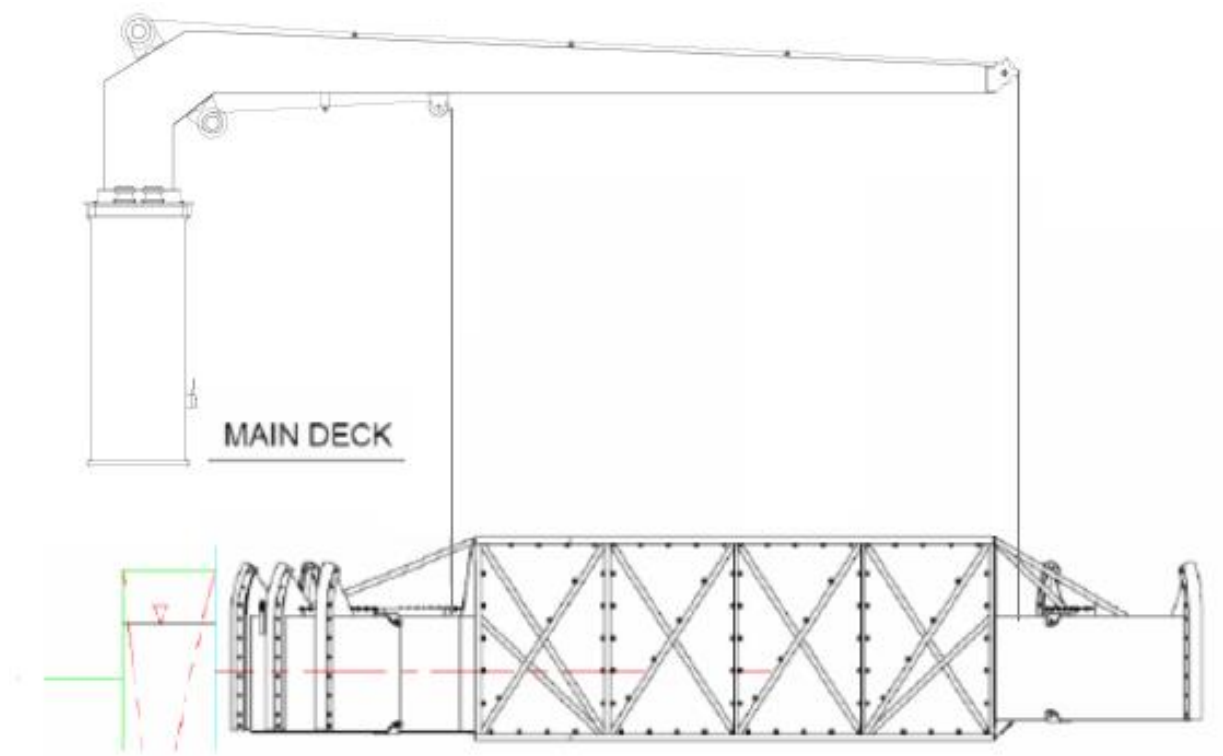


Figure 15 Crane and sweeping arm frame assembly in operation



Figure 16 Sweeping arm control platform

5.1.8 Control stands - LCS 2

Manufacturer

Lamor Corporation Ab
Urakoitsijantie 12
06450 Porvoo
Finland Tel: +358 (0)20 7650 100
Fax: +358 (0)207 650 129
Email: info@lamor.fi,
Website: www.lamor.fi

The control-stand 2 valves LCS 2 is used to control, from the main deck, the operation of the brush skimmer and associated pump. It comes with hydraulic hoses:

- 1 ¼" x 5m, SS-TEMA T15000;
- 1 ½" x 5m, SS-TEMA T15000;
- ½" x 5m, SS Aeroquip ½"
- 3/8" x 5m, SS-TEMA 3800



Figure 17 Lamor control stand LCS 2

5.1.9 Storage container and spares

Manufacturer

Lamor Corporation Ab
Urakoitsijantie 12
06450 Porvoo
Finland Tel: +358 (0)20 7650 100
Fax: +358 (0)207 650 129
Email: info@lamor.fi,
Website: www.lamor.fi

Container (10 ft.) for spare parts and ancillaries storage

The 10 ft. steel container (service container ISO 10') is used for the storage and transportation of the spare parts and ancillaries. The container come equipped with twist locks for transportation, lifting hooks and forklift channels as standard. There is an anti-slip floor for safety.



Figure 18 Lamor container for spare parts and ancillaries

Spare parts

All the equipment is supplied with all required ancillaries and spare parts. These spare parts include among other elements the especial tools needed for the regular maintenance and basic repairs of the sweeping arms, skimmers, power-packs, pumps and other elements (i.e. brush chain master link tool, brush segments, brush pins). However, given their age, some spare parts may no longer be fit for purpose. During the planned overhauling of the equipment this aspect should be considered.

5.2 Skimmer Set – Transrec 150

Manufacturer:

Frank Mohn Flatøy AS
Flatøyvegen 24
5918 Frekhaug
Norway

Phone: + 47 55 99 94 00

Telefax: + 47 55 99 95 81

E-mail: oil&gas@framo.no

5.2.1 Transrec 150 storage reel and handling unit

5.2.2 Skimmer module – Weir head

5.2.3 Skimmer module – HIWAX head

5.2.4 Control desk

5.2.5 Storage flat rack

5.2.6 Ancillaries

5.2.7 Oil hoses

5.2.8 Hydraulic hoses

5.2.9 Power pack – 200 Kw

5.2.10 Spare parts – Transrec 150 and Power pack

Description

The Transrec oil recovery and transfer system consists of two interchangeable skimmer heads: a weir skimmer and a high viscosity skimmer head. The skimmer head is connected to the outer end of the floating umbilical. A dedicated power pack provides the necessary hydraulic supply. The system is a complete integrated unit with a built-in crane arm. The Transrec skimmer and hose handling system is designed to recover oil and oil emulsions with medium to high viscosity from the sea surface under calm to rough weather conditions. The skimmer has two thrusters to secure the best recovery position in the floating containment boom. The thrusters are hydraulically driven and controlled from the remote-control box.

The Transrec System is a complete self-contained unit, including:

- Skimmer head
- Floating umbilical
- Storage and handling unit
- Integrated crane arm
- Diesel hydraulic power pack
- Skid

The system is designed for operation by only 1 person. All functions are operated from the machine control panel or from a radio control panel. Being a complete self-contained unit, it can be installed at anywhere on-board a vessel, independent of other systems.

The integrated crane arm is used to lift and slew the skimmer head over the stern/side of a vessel. After deployment of the skimmer head, the floating umbilical is unwound to a length sufficient to reach into the V or U shape of the oil boom where the oil is concentrated.

Holding this position, the operator then starts the pump in the skimmer head and the oil recovery operation will take place. On completion of operation, the umbilical is rewound and the skimmer head lifted on-board and parked. No manual handling is required.

The system is designed and manufactured to comply with Det Norske Veritas for operation in hazardous area Gas Zone II, corresponding to the deck area of an oil recovery vessel during oil recovery operations.

5.2.1 Transrec 150 storage reel and handling unit

Handling Unit

The Transrec consists of the following main parts;

- skid
- drum for storage hand handling of floating umbilical
- floating umbilical
- integrated crane arm with spooling device
- skimmer head

All functions are hydraulically operated



FLOATING UMBILICAL

The Floating Umbilical has the following main functions;

- Lift the skimmer head for deployment and for retrieval
- Transfer hydraulic oil to and from the skimmer head
- Transfer oil from skimmer head to storage tanks
- Transmit electrical signals and power
- Transfer recovered oil (ship to ship)
- Off-loading of vessels in distress

The following elements are vulcanised in fixed positions inside the floating umbilical:

- Cargo hose
- Hydraulic pressure hose
- Hydraulic low-pressure hose
- Line for electrical wires
- Line for emulsion breaker injection or for hydraulic drain oil
- Flotation elements
- Tension members



Figure 20 Floating Umbilical

All lines are terminated into an endplate for connection to the skimmer heads.

Transportation

In an emergency situation the system can easily be transported by truck. The system is delivered with a standard ISO 20-ft containerized skid with standard twist lock connection for easy transportation by sea, rail, air or road.



Figure 21 Transportation by truck

Technical specifications

Storage and handling unit

1. Overall dimensions in stored position with 20-ft container type skid:
 - Length: 6058 mm (20 ft)
 - Width: 2440 mm
 - Height: 3467 mm
 - Weight complete w/umbilical: Approx. 18000 kg
2. Crane arm: Telescopic type
 - outreach from centre drum : 7500 mm
 - lifting capacity 3000 kg at max. outreach
3. Spooling device: Yes
4. Material: Hot galvanised carbon steel
5. Controllers;
 - adjustable pump speed: Yes
 - telescopic crane arm: Yes
 - hydraulic arm up/down : Yes
 - mooring control: Yes
 - winding control: Yes
 - rotating control (360°): Yes
6. Painting: FRAMO Standard
7. Electrical system: 240 V 50/60Hz 10A EEXD

Floating umbilical

1. Total length: 95 meters
2. Built in lines:
 - 1 cargo hose: 6" oil resistant hose
 - 1 high pressure hose: 1 1/4"
 - 1 low pressure hose: 1 1/2"
 - 1 for 6 electr. wires: 1/2"
 - 1 for emulsion breaker: 1/2"
 - 1 for drain: 1/2"
 - 1 line in spare: 1/2"

3. Built in float material: Type PZ 940 Polyethelene with closed cells
4. Outer cover: Neoprene rubber
2. Connection to skimmer head: 6" Flange connected to longitudinal reinforced cargo hose and hydraulic quick couplings

Table 7 Operational limits

The maximum weather window is: Skimming condition.		Survival condition.	
Waves	6,0 m		8,0 m
Towing speed	0 – 4 knots		4,0 knots
Temp. range (air)	-40° C to + 50 °C		
(sea)	-2° C to + 40 °C		
Based on a Dynamic factor of 1,25			

5.2.2 Skimmer module – Weir head

This skimmer head is designed to recover large quantities of light to medium viscosity oil.

- Typical viscosities: 1 – 15 000 cSt.
- Recovery rate: 0-400 m3/hr.

The skimmer head is equipped with an automatically adjusted wave compensated weir giving a minimum of free water intake. The skimmer head is fitted with thrusters for increased manoeuvrability.



Figure 22 Weir Head

Table 8 Technical specifications Weir Head

Model	Weir Skimmer 150
Dimensions (ODxH)	2300 x 2320 mm
Weight	560 kg
Max. pump capacity	400 m ³ /hr
Material main frame	Seawater Resistant Aluminium NS 17305
Type of pump	Hydraulic driven centrifugal pump
Discharge flange	6" nominal DN150 PN 16 DIN 2633
Weir	Automatically adjustable, wave compensated
Weir entrance diameter	1600 mm
Materials	Oil Resistant PU
Thrusters	2
Positioning	45 degree
Power	2x7 hp
Operation	Hydraulic motor

5.2.3 Skimmer module – HIWAX head

This skimmer head is built to handle extremely high viscosity oil as well as oils with high wax content. Typical emulsion viscosities range 10.000 -1 Mill cSt The skimmer head has drums with paddles catching the oil and squeezing it into the pump well. 2 thrusters force the skimmer head into the oil layer.



Figure 23 HIWAX Skimmer Head

Water Lubrication System

The HiWax skimmer head is equipped with a water lubricating system to decrease the friction in the cargo hose thus obtaining a higher flow capacity.

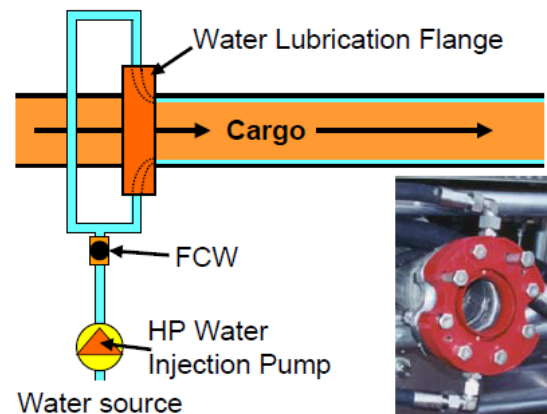


Figure 24 HIWAX Lubrication system

Table 9 Technical specifications HIWAX Head

Main data	
Dimension (L x W x H)	3400x2790x1860 mm
Weight	1530 kg
Max. pump capacity	180 m ³ /hr
Max. hydr. pressure	280 bar
Max. oil flow	390 l/min
Type of pump	Archimedes, positive displacement, screw pump
Material	
Main body and paddles	Seawater Resistant Aluminium NS 17305
Drum data	
Quantity	2
Operation	Hydraulic motors, speed controlled
Adjustment	Electric hydraulic proportional reverse revolution
Thrusters	
Quantity	2
Positioning	45 degree
Power	2x7 hp
Operation	Hydraulic motor

5.2.4 Control desk

Radio Remote Control

The Transrec 150 is supplied with a portable radio control panel. This unit will allow the operator to operate the Transrec from different positions such as from the bridge and other suitable positions giving the operator the possibility to keep away from deck and thus be protected against all kinds of weathers. All functions of the Transrec can be controlled from the radio control panel.



Figure 25 Remote control

5.2.5 Canvas for storage unit

The storage and handling flat rack unit is covered with a PVC cover for protection of the equipment.



Figure 26 Protection cover

5.2.6 Ancillaries

A manometer toolbox for the Transrec 150 is provided.

5.2.7 Oil hoses

Standard hoses for connection between Transrec, hydraulic power supply and cargo line.

For the connection of the handling and storage unit to the vessels tank 12 m hydraulic hoses are included in the system.

Table 10 Technical specifications cargo hose

Cargo hose	Length	Dimension	Material	Coupling Transrec	Coupling to vessel system
Cargo hose	12 m	6 "	External: Neoprene Internal: Nitril	6" Female Hammerlug coupling	6" Flange DN 150 PN 16 DIN 2623

5.2.8 Hydraulic hoses

For the connection of the handling and storage unit to the power pack 12 m hydraulic hoses are included in the system.

Table 11 Technical specifications hydraulic hoses

Hydraulic hoses	Length	Dimension	Material	Coupling Transrec	Coupling to vessel system
Pressure hose	12 m	1 1/4"	Nitril rubber	Snap tight SH71-2C16	Snap tight 71-SH71-2C16
Return hose	12 m	1 1/2"	Nitril rubber	Snap tight SVHC24	Snap tight SVHC24

Drain hose	12 m	½ "	Nitril rubber	Tema 5010 Femail ½"	Tema 5020 Mail ½"
------------	------	-----	---------------	------------------------	----------------------

5.2.9 Power pack – DPHH 150 -200 Kw

The Transrec System is supplied with a hydraulic power pack. The power pack is a separate portable containerised unit for easy transportation and may be used for other purposes such as emergency off-loading etc. It is compatible with the full range of FRAMO portable pumps.

Technical specifications

The power pack is a containerised unit built for operation of Transrec 150 or Framo portable pumps such as TK80, TK125, TK6 and TK150. The unit is designed to operate in area classified as Gas Zone II.

1. Engine

- type: Water cooled, naturally aspirated 6 cyl., 4 stroke diesel engine, type Cummins
- Rating: 200 kw – 272 hp at 2300 rpm
- Fuel tank: 80 l
- Forklift channels: Yes
- Air filter: Dry type
- Instrumentation:
 - Tachometer
 - Hydraulic pump pressure gauge
 - Hydraulic fluid level gauge
 - Hydraulic fluid temperature
- Silencer/Spark arrestor: Yes
- Automatic stop:
 - In case of to low lub-oil pressure
 - In case of to high engine temp.
 - In case of to low hydraulic oil level
 - In case of over speed
- Starting equipment: Hydraulic, spark proof

2. Hydraulic system

- Hydraulic pump flow: 0 - 430 l/min max.
- Hydraulic pressure: 0 – 300 bar
- Hydraulic connection: 1" pressure, 1 1/2" return,
- Hydraulic oil cooler: Radiator type
- Hydraulic oil tank: 120 l

3. Material: Base, frame, tank and panel are all manufactured in SW-resistant aluminium alloy. All screw, nut and bolt connections in Stainless steel.

4. Weight/dimensions

- Weight: 1.950 kg incl. oil and water
- Dimension (L x W x H): 2450x1378x1530 mm

5. Fuel consumption: Approx 60 l/hr at full load

6. Approval: Classified by DNV. for hazardous area Zone II operation and complies with EEMA, The Engineering Equipment and Material Users Association, Publication No. 107:1992



Figure 27 Power Pack DHPP 150

5.2.10 Spare parts

A box with special spare parts for the for the Transrec 150 skimmer and Power Pack DPHH 150 are provided. However, given their age, some spare parts may no longer be fit for purpose. During the planned overhauling of the equipment this aspect should be considered.

5.3 Discharging system

Supplied by

Lamor Corporation Ab
Urakoitsijantie 12
06450 Porvoo
Finland Tel: +358 (0)20 7650 100
Fax: +358 (0)207 650 129
Email: info@lamor.fi, Website: www.lamor.fi

To perform inboard handling of the recovered oil products two submerged pumps LAMOR GTA 115 and two submerged pumps Marflex MSP 150 are available. These pumps can be inserted into the tanks to manage the transfer from the decanting tanks to the oil storage tanks. A technical description can be found under section 5.1.3 Oil transfer pumps.

5.3.1 HERMetric UTImeter Otex

The transfer of the recovered oil from the decanting tank other tanks can be controlled by the interface detection system type HERMetric UTImeter Otex. The HERMetric instrument is a portable multiple functions gauging system that is designed to perform under open conditions in a single operation 3 measurements:

a) Ullage (outage). Optionally innage is available.

b) Oil/water Interface level.
Tape resolution: 1 mm (1/16 ")
Tape accuracy: ± 1.5 mm over 30 m
($\pm 1/16$ " approx. for 100 feet)
Ullage/interface detection accuracy:
 ± 2 mm (± 0.08 " approx.)
Minimum detectable tank bottom interface or liquid level: 4 mm (0.16" approx.).

c) Temperature by continuous reading at any level.
Ambient temperature range: -20°C to 50°C
(-4°F to 122°F)
Sensor measurement range: -40°C to 90°C
(-40°F to 194°F)
Resolution: 0.01° or 0.1°, selectable
Accuracy over calibration range: $\pm 0.1^\circ\text{C}$ (0°C to 70°C); $\pm 0.2^\circ\text{F}$ (32°F to 158 °F)
Temperature reading: °C or °F, selectable.
This HERMetric device meets the requirements of API MPMS Chapter 7 2001, table 3, ISO 4268 and IP PMM Part IV.

Thanks to the small diameter of the sensing probe this instrument can be used with openings of diameters down to 25 mm (1") only.



Figure 28 UTImeter

5.3.2 Lamor GT A 115 PDAS pumps

Refer to point 5.1.3 above.

5.3.3 Marfex MSP 150 Centrifugal pumps

Refer to point 5.1.3 above.

5.4 Sampling equipment

5.4.1 Gas Detector RKI GX-2009

Manufacturer:

RKI Instruments, Inc.
33248 Central Ave. Union City
CA 94587 • Phone (800) 754-5165 • (510) 441-5656 • Fax (510) 441-5650

Supplied by

Lamor Corporation Ab
Urakoitsijantie 12
06450 Porvoo
Finland Tel: +358 (0)20 7650 100
Fax: +358 (0)207 650 129
Email: info@lamor.fi, Website: www.lamor.fi

Description


The GX-2009 simultaneously monitors and displays combustibles, oxygen, carbon monoxide, and hydrogen sulfide. It includes dual audible alarm ports and alarm LED's on 3 sides of the instrument, so that alarm conditions are obvious from multiple perspectives especially in high noise environments. Other features include a waterproof and dustproof design with IP 67 rating, an impact resistant rubber over-mold body that is RFI resistant, and a large capacity data logging system included as standard.

Other standard features are vibration alarm, auto-calibration, calibration and bump test lock out or reminder control, STEL / TWA readings, peak hold, auto backlighting at alarm on a large LCD display, and it even tells the time! All of these controls and features are operated through 2 simple glow-in-the dark, glove friendly buttons. The NiMH battery set will operate for 20 hours and will fully charge in 3 hours. A huge capacity data logging function is a standard feature on all GX-2009 instruments. The data logging software will store up to 100 calibration records and is Windows 7, XP, and Vista compatible. The GX-2009 is also functional with the Data Cal 2000 instrument maintenance system and the SM-2009U single calibration station. The GX-2009 is designed around RKI's compact and proven sensors, utilizing catalytic combustion, electrochemical and galvanic sensor technologies. Each miniaturized sensor is manufactured with the same high quality control that has made RKI sensors and instruments the most reliable and long lasting monitoring devices in the industry.



Figure 29 RKI GX-2009

Table 12 Technical specifications Gas Detector RKI GX-2009

Target Gas	Combustibles, Methane (CH ₄) calibration standard*	Oxygen (O ₂)	Hydrogen Sulfide (H ₂ S)	Carbon Monoxide (CO)
Range (Increment)	0-100% LEL (1% LEL)	0-40.0 vol% (0.1 vol%)	0-100.0 ppm (0.5 ppm)	0-500 ppm (1 ppm)
Detection Method	Diffusion			
Response Time	T90 Within 30 Seconds			
Accuracy	± 5% of reading or ± 2% LEL (whichever is greater)	± 0.5% O ₂	± 5% of reading or ± 2 ppm H ₂ S (whichever is greater)	± 5% of reading or ± 5 ppm CO (whichever is greater)
Display	Digital LCD			
Gas Alarms (Factory Settings)	Alarm 1: 10% LEL Alarm 2: 50% LEL Over: 100% LEL	Alarm 1: 19.5 vol% (Decreasing) Alarm 2: 23.5 vol% Over: 40.0 vol%	Alarm 1: 10.0 ppm Alarm 2: 30.0 ppm Over: 100.0 ppm TWA: 10.0 ppm STEL: 15.0 ppm	Alarm 1: 25 ppm Alarm 2: 50 ppm Over: 300 ppm TWA: 25 ppm STEL: 200 ppm
Operating Temperature and Humidity	-20 to 50° C/Below 85% RH (Without Condensation)			
Safety/Regulatory	 C/US 186718 CSA classified, "C/US", as Intrinsically Safe. Exia. Class I, Groups A, B, C, & D. Class I, Zone 0, Group IIC. Temperature Code T3C.			
Power Supply	NiMH Batteries (2.4 VDC Nominal), Direct Charging			

5.4.2 Setaflash Series 3 closed cup Flash Point Tester

Manufacturer:

Stanhope-Seta, London Street
Chertsey, Surrey, KT16 8AP, UK
Telephone: +44 (0)1932 564391
Fax: +44 (0)1932 568363

Supplied by

Lamor Corporation Ab
Urakoitsijantie 12
06450 Porvoo
Finland
Tel: +358 (0)20 7650 100
Fax: +358 (0)207 650 129
Email: info@lamor.fi, Website: www.lamor.fi

Description

The Setaflash Series 3 Closed Cup Flash Point Tester is an easy to use instrument that can complete a flash/no-flash test in less than two minutes and in many cases in 60 seconds, or determine the flash point of a sample within a temperature range of 0° to 300°C.

Features

- Ambient to 300°C
- Flash point test in less than 2 minutes
- Small sample size - 2 or 4ml
- Automatic flash detection
- Audible and on-screen prompts
- Cost effective
- Portable operation
- Simple calibration



Figure 30 Setaflash Series 3

Table 13 Technical specifications Setaflash Series 3 closed cup Flash Point Tester

Temperature range	Ambient to 300°C (0° to 300°C with 13870-0)
Cup material	Aluminium
Test modes	Rapid Equilibrium
Sample size	2ml for flash points up to 100°C 4ml for flash points above 100°C
Test duration, Rapid Equilibrium Mode	1 minute below 100°C, 2 minutes above 100°C
Heating and Cooling System	Cartridge heater
Power	2ml for flash points up to 100°C 4ml for flash points above 100°C
Voltage	110/120V or 220/120V, 50/60Hz (switchable) 12Vdc with optional heater
Gas supply	Laboratory gas, 3kPa (0.44psi) maximum pressure or Butane from optional Portable Gas Tank 13667-0
Size (HxWxD)	26 x 28 x 26cm
Weight	4 kg
CCCN Code:	Tariff 90268020

5.4.3 Mini Lab

Density Meter DM-340.1 – DenDi

Manufacturer:

JSC LEMIS Baltic
26 Ganību dambis Str.
Rīga, LV-1005, LATVIA
Tel: +371 67383223 ; Fax: +371 67383270
E-mail: info@lemis-baltic.com; Website: www.lemis-baltic.com

Supplied by

Lamor Corporation Ab
Urakoitsijantie 12
06450 Porvoo
Finland
Tel: +358 (0)20 7650 100
Fax: +358 (0)207 650 129
Email: info@lamor.fi, Website: www.lamor.fi

Description

The portable laboratory density metre DenDi is designed for both – mobile and indoor laboratories for real density and temperature measurements of liquid in samples. The device can be operated in the following conditions:

- Ambient temperature: +15 - +30 Deg. Celsius
- Relative humidity: 45 – 80 % at 20 Deg. Celsius

The device consists of density and temperature sensor combined with signal converter unit. All submersible parts are made from corrosion-resistant materials. The operation principle of the DenDi2 is – weighting of the glass float in liquid. It allows measuring real density and temperature of wide range of liquids. The buoyancy force of liquid acts on the float, which has precise weight and volume; the float's movement is transmitted to the beam with balance. Converter processed electrical signal to digital signal. The results of measurement appear on the LCD. Besides data of real density and temperature, the device allows to read recalculated data of:

- D15 – relative density at 15 Deg. Celsius
- D20 – relative density at 20 Deg. Celsius
- SG – specific gravity at real temperature
- SG60F – specific gravity at 60 Deg. F
- API – API gravity at real temperature
- API60F - API gravity at 60 Deg. F
- Alc. – alcohol concentration



Figure 31 Density Meter DM-340.1

The device is not explosion proof; operation in an explosive zone is not permitted.

Table 14 Technical specifications Density Meter DM-340.1 – DenDi

Range of	density	0.5000...2.000 g/cm ³ (500.0...2000.0 kg/m ³)
	temperature	+10...+50 Deg. Celsius
Accuracy of	density	± 0.0005 g/cm ³ (± 0.5 kg/m ³)
	temperature	± 0.2 Deg. Celsius

Resolution of	density	$\pm 0.0001 \text{ g/cm}^3$ ($\pm 10.1 \text{ kg/m}^3$)
	temperature	$\pm 0.1 \text{ Deg. Celsius}$
Dimensions	(HxLxW)	230 x 130 x 180 mm
Weight		2.3 kg
Power supply		NiMH battery 6V / 1200 mAh
Charging device		90-240 V 50/60 Hz with output voltage 11-12 V and output current 600-700 mA
Submersible parts materials		Quartz glass / Stainless steel
Volume of sample, max		55 ml
Accessories		Built-in IR data port

Viscometer – CANNON Digital Rotational Paddle

Manufacturer:

CANNON Instrument Company
2139 High Tech Road
State College PA 16803, USA

Supplied by

Lamor Corporation Ab
Urakoitsijantie 12
06450 Porvoo
Finland

Tel: +358 (0)20 7650 100

Fax: +358 (0)207 650 129

Email: info@lamor.fi, Website: www.lamor.fi

Description

The CANNON Digital Rotational Paddle Viscometer has been designed to accurately measure the viscosity of emulsified asphalts, suspensions, marine fuels, residual oils, slurries, paints and similar materials between 30 and 30,000 centipoise (mPa·s) at temperatures of 25°C, 40°C, 50°C, 80°C, and 100°C (see temperature specifications for temperature associated with each model). It follows Standardized Test Methodology ASTM D7226 for emulsified asphalt testing. Available in two models (standard and water-cooled), the Digital Paddle Viscometer can also be used for other applications consistent with its temperature control and viscosity measurement capabilities. Ideally suited for field use, the Digital Paddle Viscometer can determine the viscosity of lubricating oils, marine fuels and other liquids, yielding results with an accuracy of five percent or better for most materials—better than that required by ASTM D445 for residual oils at 50°C.

The Digital Paddle Viscometer consists of a base, adjustable heated tray assembly, two sample cups, head unit, and two paddles (high and low viscosity), each with a one-hundredfold range. A digital display on the front panel of the head unit indicates viscosity in centipoise (cP or mPa·s), or centistokes (cSt or mm²/s) and Saybolt Furol Seconds if a known density value is input by the operator prior to testing. The digital display also indicates the temperature, duration of test, and test status. Test data can be transferred to the optional label printer via an RS232 connector.



Figure 32 DPV Paddle Viscometer

Table 15 Technical specifications Cannon Digital Rotational Paddle Viscometer

Dimensions:	191 mm wide x 235 mm deep x 451 mm high (7.5 x 9.5 x 17.75 inches) [150 mm rear clearance required]
Weight:	7.7 kg (17 lbs)
Shipping Weight:	12.3 kg (27 lbs)
Viscosity Range:	30 to 30,000 cP (100-fold range dependent on paddle selection)
Viscosity Accuracy:	±5% from 30-3000 cP; 10% from 300-30,000 cP
Test Temperatures:	Standard Model: 40°C, 50°C, 80°C, 100°C Water-Cooled Model: 25°C†, 40°C, 50°C, 80°C, 100°C
Temperature Accuracy:	±0.1°C
Operating Conditions:	15°C to 30°C, 15 to 95% relative humidity, non-condensing
Power Requirements:	100 to 120V, 50/60 Hz, 120W; 200 to 240V, 50/60 Hz, 120W

5.5 Communications equipment

Manufacturer:

Vertex Standard Co LTD
P.O. Box 75525
1118 Shiphoh
Netherlands

Supplied by

Lamor Corporation Ab
Urakoitsijantie 12
06450 Porvoo
Finland

Tel: +358 (0)20 7650 100

Fax: +358 (0)207 650 129

Email: info@lamor.fi, Website: www.lamor.fi



Figure 33 Vertex VXA-220 Pro VI

Description

The Vertex Standard VXA-220 Pro VI is a compact, solid, submersible (IP7: 3 ft for 30 minutes) hand-held transceiver providing communication (transmit and receive) capability on the International Aircraft Communication Band ("COM" band: 118 ~ 136.975 MHz), and it additionally provides receive on the "NAV" band (108 ~ 117.975 MHz). The VXA-220 boasts 0.7 Watt of clean audio output from its 1.4" (36-mm) diameter loudspeaker, and it also provides 8.33 kHz synthesizer steps for the new narrow-band channel plan. The VXA-220 displays with our exclusive Omni-Glow™ display back-lighting for minimal

degradation of your night vision, NOAA weather band monitoring, 8-character Alpha/Numeric Display, 150 Memory Channels, and 100 "Book Memory" Channels.
This Radio has been tested and complies with the Federal Communications Commission (FCC) RF exposure limits for Occupational Use/Controlled Exposure Environment.

Technical Specifications

General

Frequency Range: TX: 118.000 - 136.975 MHz,
RX: 108.000 - 136.975 MHz,
Weather Channels (WX-01 - WX-10: USA version only)
Channel Spacing: 25 kHz
Emission Type: TX: AM,
RX: AM & FM (FM: for receiving the Weather Channels, USA version only)
Supply Voltage: 6.0 - 15.0 VDC
Current Consumption (approx.): 250 μ A (power off),
35 mA (battery saver on, saver ratio 1:5)
60 mA (squellch on),
200 mA (receive),
850 mA (transmit 1.5 W Carrier)
Temperature Range: +14 °F to + 140 °F (–10 °C to +60 °C)
Case Size (WxHxD): 2.36 x 4.09 x 1.2 inches (60 x 104 x 30.5 mm) w/o knob & antenna
Weight (approx.): 12.7 oz (360 grams) with FNB-83, antenna, and belt clip

Receiver

Circuit Type: Double-conversion superheterodyne
IFs: 47.25 MHz & 450 kHz
Sensitivity: AM: Better than 0.8 μ V (for 6 dB S/N with 1 kHz, 30 % modulation)
FM: Better than 0.16 μ V (for 12 dB SINAD)
Selectivity: More than 8 kHz/–6 dB
Adjacent CH. Selectivity: Less than 25 kHz/–60 dB
AF Output (Internal speaker): 0.7 W @ 16 Ohms, 10 % THD

Transmitter

Power Output (@ 7.2 V): 5 W (PEP), 1.5 W (Carrier Power)
Frequency Stability: Better than ± 10 ppm (+14 °F to + 140 °F [–10 °C to +60 °C])
Modulation System: Low Level Amplitude Modulation
Spurious Emission: >60 dB below carrier
Int. Microphone Type: Condenser
Ext. Mic. Impedance: 150 Ohms

5.6 Cleaning Equipment - Nilfisk Alto Poseidon 2-26

Manufacturer:

Nilfisk-Advance A/S
Sognevej 25, DK-2605
Broendby, DENMARK
Tel. +45 43238100
Fax +45 43437700
Website: <http://www.nilfisk.com/>

Supplied by

Lamor Corporation Ab, Urakoitsijantie 12,
06450 Porvoo
Finland Tel: +358 (0)20 7650 100
Fax: +358 (0)207 650 129
Email: info@lamor.fi, Website: www.lamor.fi



Figure 34 Nilfisk Alto Poseidon 2-26

Three water portable pressure washers are supplied. The Poseidon 2 offers high performance and maximum mobility. They are compact and easily transportable. A tubular steel châssis protects the motor and pump. They are low weight. The equipment is fitted with a gun system ERGO 1000 (fast connection accessories), brass cylinder head and ceramic pistons. They can automatically be switched on / off.

Table 16 Technical specifications Nilfisk Alto Poseidon 2-26

Power consumption	3.2 kW
Maximum water flow	610 litres / hour
Pump pressure	140 bar
Cable length	5 m (15 m extension option and quick coupler)
Dimensions	555 x 290 x 275 mm
Weight	26 kg
Torque	20 N

5.7 RPAS Equipment

5.7.1 Laptop and ancillaries

Supplier

Nordic Unmanned AS
Rådhusgata 3
4306 Sandnes Norway
Phone: +47 926 66 659
E-mail post@nordicunmanned.com
Web: www.nordicunmanned.com

The portable computer (laptop) is part of the RPAS system, and it is dedicated for data/video receiving, processing and transfer using the NLIVE software.

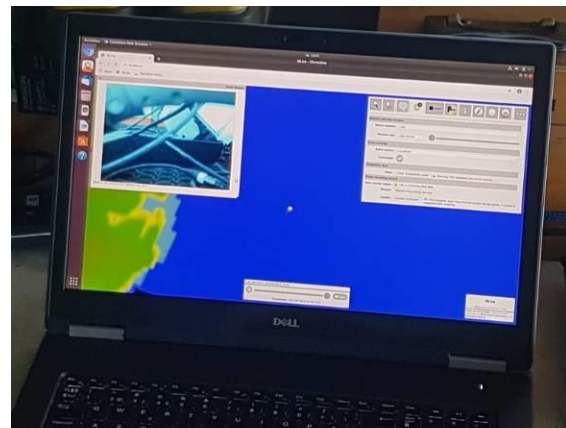


Figure 35 RPAS dedicated Laptop

Table 17 Laptop and accessories technical specifications

Laptop	
Processor	Intel Core, i7-9850 six cores, 12 MB buffer, 2,6 GHz up to 4,6 GHz turbo
Operating system	Ubuntu 18.04 and Windows 10
Graphics	Nvidia Quattro RTX 3000 with 6 gb GDDR6
RAM	16 GB, 3200 mhz, DDR 4 without ECC
HDMI 2.0	1
Mini Display Port	1
USB 3	3
RJ 45 (Network), 1 gigabit (LAN Port)	1
Hard drive	1 TB PCIe NVMe, SSD, Class 40
Optimizer	Dell Precision Optimizer
Monitor	17,3" Ultra Sharp UHD IGZO 3840 x 2160 (4K) AG NT, without WWAN, Camera/Microphone
Wireless	Intel WIFI 6 AX200 2x2.11ax 160 mhz and Bluetooth 5.0
Bluetooth	Yes
Socket	European
Battery	6-cell 97 watthours li-ion with Express Charge
Software	Windows 10
	Office '19

	NUVIEW
	Ubuntu 18.04
Accessories	ICY BOX 3 Port USB 3.0 Hub & Gigabit-LAN
	TP-Link TLSG105E Switch
	Laptop bag
Cables	Cat 5E cable, 10 meters
	2 x cables (10 m each) type NonCatProd CRE2-144-Cable-ODU-RJ45

5.7.2 VHF Set – Entel HT844 Marine VHF ATEX IIA 2W LCD

Supplier

Tototheo Trading Limited
89 Omonoias Avenue, 3048,
P.O. Box 51449, 3505, Limassol,
Cyprus
Tel: +357 25 56 91 55
Fax: +367 25 56 70 33
Web: www.tototheo.com

The Marine VHF Headset system is to be used by the RPAS pilot during flights for communication with the bridge and the Oil Spill Coordinator.



Figure 36 Entel HT844 Marine VHF kit

The 2-way VHF Radio is waterproof (up to 2 meters) and supplied together with:

- 1800 mAh rechargeable Lithium-Ion battery
- drop-in charger
- spring loaded belt clip
- high efficiency antenna
- ear defender headset with cable for connectivity and adjustable microphone

5.8 Oil Boom Set – Lamor Heavy Duty Boom (HDB) 2000/125m

Manufacturer:

Lamor Corporation Ab
Urakoitsijantie 12
06450 Porvoo
Finland
Tel: +358 (0)20 7650 100,
Fax: +358 (0)207 650 129
Email: info@lamor.fi Website: www.lamor.fi

The Lamor Heavy Duty Oil Boom (HDB) is specifically suited for use in open seas, harbours, semi-sheltered waters and permanent installations such as oil terminals and power plants. The Lamor HDB is constructed so that 2 layers of synthetic fabric are vulcanized together with synthetic oil resistant rubber outer layers. The synthetic coated outer layer gives the Lamor HDB excellent resistance to the effects of oil and UV degradation. The boom is equipped with galvanized ballast chain that guarantees correct deployment in sweeping operations and promotes sea keeping properties. The total boom weight is given including the ballast chain weight. The Lamor HDB comes with end ASTM connectors as

standard and can be supplied with towing adaptors or other standard connectors at the customer's request. The Lamor HDB is constructed using fully vulcanized and rubber welded parts without the use of any pop rivets.

The system includes 2 units of 250m of boom on storage reels with all necessary deployment equipment including air inflation system. The space required on board is at a minimum as the boom is deployed directly from the reel over the aft or the side of the ship.

The Lamor – HDB 2000 set includes:

- 5.8.1 Boom section
- 5.8.2 Towing set
- 5.8.3 Power pack
- 5.8.4 Hydraulic hoses
- 5.8.5 Hydraulic blower and air hoses
- 5.8.6 Boom reel

5.8.1 Boom section (to be replaced)

Description

On deployment the Lamor HDB sits symmetrically in the water allowing it to be manoeuvred easily and face an oil slick from either side. Inflation of the Lamor HDB is quick and efficient thanks to the Lamor F1 air valve and use of a Lamor air blower. The aluminium F1 valve is flat in design and has an incorporated airlock. The complete use of the air valve at inflation can be done by one man without additional help. Lamor HDB is stored on a dedicated hydraulically powered reel, enabling deployment of up to 200m in approximately 15 minutes.



Figure 37 Lamor HDB 2000 Boom

Table 18 Technical specifications HDB 2000

Section length	125 m
Freeboard	560 mm
Draft	1160 mm
Boom Height	2000 mm
Standard Length	250 m
Colour	Black
Flotation	Air (atmospheric pressure)
Weight	17.1 kg/m
Ballast weight	4.4 Kg/m
Ballast Material	Galvanised Steel Chain
Temperature resistance	-40 ... +60°C
Base fabric	EP 400
Fabric tensile strength	20000 N/5cm
Air chamber length	3 m
Efficient in waves	Up to 4.5 m

5.8.2 Towing set

The Lamor TS HDB 2000 towing set consists of an aluminium ASTM connector bolted to a galvanized steel towing post fitted with a certified 3-point wire towing bridle, 12mm/4m. This configuration ensures even and stable operation when towing, mooring or trawling with the boom. Also supplied with the set is 55 m of 24 mm diameter towing warp and 400 mm diameter buoy.

Towing set for HDB 1800 components:

- 1 pc towing end
- 1 pc ASTM
- 1 pc braided polypropylene rope 24mm/55m
- 1 pc towing wire 12mm/4m
- 1 pc buoy 400mm

Cross Bridle

The cross bridle is a net piece that can be mounted on the boom to give it desirable shape if it is to be towed in a J-formation. The cross-bridle towline allows boom to form a straight line 90-degree angle from reel/vessel to form the J- or U-sweep.



Figure 38 Towing Set

5.8.3 Power pack – Lamor LPP 7 HA/B8 (to be serviced)

Description

The Lamor multipurpose power pack is designed for flexible operation of many types of hydraulically operated oil spill clean-up equipment. The LPP 7HA/B8 is a unit equipped with an air-cooled diesel engine. The frame of the unit is manufactured in steel. The engine is equipped with a electric start and with a hand start option as well.

The main components of the Power Pack are:

- Air cooled diesel engine
- Hydraulic pump
- Hydraulic power outlet connectors
- Hydraulic oil tank and fuel tank
- Operation valve PVG 32
- Battery
- Frame on wheels

The power pack can be used for the independent operation of the oil boom set HDB 2000. The HDB 2000 can also be operated by the power packs for the sweeping arms the LPP 109 D.



Figure 39 Lamor Power Pack LPP 7 HA/B8

Table 19 Technical specifications Lamor Power Pack LPP 7 HA/B8

Diesel engine	Hatz 1B40, air cooled
Cylinders	1
Max. RPM	3600
Power	7,3 kW
Electric start /Hand start	Yes
Battery	12V, 30 Ah
Hydraulic pump Gear Pump	8 cm ³ (B8/SNP8)
Hydraulic couplings	TEMA 2500-5000 male/female
Hydraulic flow	Max 28 l/min
Hydraulic pressure	170 bar
Hydraulic control valve	Danfoss PVG 32
Fuel tank Approx.	5 litres
Hydraulic Oil	Tank 30 l
Standard outlets	5 l/min Tema 2500 male/female for oil collectors (optional Aeroquip) 25 l/min Tema 3800 male/female for oil boom reel and oil collectors (optional Aeroquip)
Length	945 mm
Width	850 mm
Height	785 mm
Dry weight	140 kg

5.8.4 Hydraulic hoses (to be replaced)

Hydraulic hose set for Lamor Oil Boom Reels consists of 2 x 15 m 3/8" hydraulic hoses and with standard Tema couplings 3811 and 3821 (M/F).

Hose Construction:

Tube: oil resistant synthetic rubber

Reinforcement: two high tensile steel wire braids

Cover: abrasion and weather resistant synthetic rubber

Temperature range: -40 C to +100 C (+120 C max)

Length 15 m



Figure 40 Hydraulic couplings

5.8.5 Hydraulic air blower (to be serviced)

The Hydraulic air blower HAB 200 is used for inflating the Lamor Inflatable Booms. The air blower consists of a hydraulic motor and air blower installed in a portable aluminium frame. The unit is supplied with hydraulic quick release TEMA couplings. The internals of the Lamor HAB 200 are protected by a suction filter.

The Lamor HAB 200 has a set discharge pressure so the oil boom cannot be damaged during the inflation operation. Additionally, the HAB 200 can be configured to provide suction for deflation of the boom. The Lamor HAB 200 can be powered by one of the family of Lamor hydraulic power packs or using vessel hydraulics.



Figure 41 Lamor Air Blower

Hydraulic hose set for Lamor HAB 200 (to be replaced)

Components included:

2 pc(s) Hydraulic Hose 1/2" x 15m Q/R Tema 5000
 1 pc(s) Hydraulic Hose 3/8" x 15m DRAIN ISO75242
 Hose Construction:
 Tube: oil resistant synthetic rubber
 Reinforcement: two high tensile steel wire braids
 Cover: abrasion and weather resistant synthetic rubber
 Temperature range: -40 C to +100 C (+120 C max)

5.8.6 Boom reel HSR H 1822 (to be serviced)

Description

The Lamor hydraulic operated storage reel heavy model HSR H1822 is designed to store up to 200m length of up to 2000 mm height heavy duty oil booms like Lamor HDB offshore rubber boom. The reel frame is manufactured in steel and the spool in marine grade aluminium. The winder frame comprises fork lift channels and 4-point lifting points as standard for easy handling both on and offshore. Marine twist locks and container corner guides are fitted. The Lamor HSR-H is driven by 2 hydraulic motors, requiring a power-pack such as the LPP 14 and allowing for easy deployment and recovery using minimal manpower. Base frame dimensions (footprint): 2740 x 1800 mm.



Figure 42 Lamor Boom Reel HSR H 1822

Standard hydraulic connectors: Tema 3811/3821

Table 20 Technical specifications Lamor Boom Reel HSR H 1822

Length	2900 mm
Width	1800 mm
Height	2114 mm
Weight	605 kg
Reel diameter	1800 mm
Reel inner width	2200 mm
Reel material	Aluminium
Frame material	Steel
Forklift channels	Yes
4-point lifting rings	Yes
Hydraulic flow	10 l/min
Hydraulic pressure	200 bar
Power requirement	3 kW