Vessel requirements for installing Koseq equipment

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Index

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1. Introduction.

Koseq made its first developments in dynamic oil recovery in 1968. Since then Koseq leads the market of dynamic oil recovery with the Rigid Sweeping Arm Systems, and has sold numerous systems to Coast Guards, response and salvage companies, international dredging companies and local Authorities.

Koseq developed through time a wide range of models. Besides the renowned Rigid Sweeping Arm, the Victory Oil Sweeper with Floating Debris Removal Unit and the Compact Sweeping Arm models are made available. The latest development is the Compact 502, a stand-alone oil recovery system which features a Compact 5 sweeping arm with crane and diesel hydraulic power pack installed in a 20' container.

Koseq Sweeping Arm Systems proved to perform very well in offshore oil recovery under difficult sea conditions. Some main oil spill incidents we would like to highlight are the "Prestige", "Sea Empress", "Erika" and "Gulf War" disasters. EMSA, the European Maritime Safety Agency has witnessed these oil recovery processes and described them in their independent report, "Action Plan for Oil Pollution, Preparedness and Response" (2004) . Their finding was that during these disasters, vessels equipped with Koseq Rigid Sweeping Arms, like the "Arca" and "Rijndelta" have been able to recover higher quantities of the extreme viscous fuel oil at sea under difficult weather conditions than any other ship with other oil recovery systems.

This document provides more technical information about the Rigid Sweeping Arm system. Usually these systems are permanently installed on board of oil recovery vessels, but can be used as a mobile system as well.

2. Description.

2.1 Conditions for recovery operations

Depending on the vessel dynamics on which the oil recovery equipment as described is installed, the sweeping arm system is capable to remove oil from the sea under the following conditions:

- Wind up to 7 Beaufort.
- Max Sea state 4 for standard Koseq equipment, may be increased to Sea state 5 upon request.
- Cranes are in general not subject to Class regulations, however upon request they can be build and certified accordingly.
- Maximum trailing speed with sweeping arms deployed: 4 knots.
- Optimal sweeping speed: 1 to 2 knots, depending on sea state conditions, currents and thickness of the oil layer on the water surface.
- Course corrections of the vessel have to be executed at lowest possible speed with only gradual speed variations.
- Ambient temperature between -10 °C. and +50 °C.
- Seawater temperature between -2 °C. and +30 °C.

2.2 Basic function of Koseq rigid sweeping arms

A typical oil recovery system consists of one or two rigid sweeping arms installed on port and/or starboard side of the vessel.

The Sweeping Arms are free floating and being pulled by the ship alongside the ship with the inside fenders of the sweeping arm positioned against the hull. The Sweeping Arm is held in position by the forward movement and lines to the front and back of the ship.

The basic principle of sweeping is that while the ship is sailing through the oil spot, the oil is guided along the bulkheads of the rigid sweeping arm through the adjustable debris screen to the height adjustable weir skimming oil collecting chamber of the inner pontoon. From here the oil flows into the collection chamber and is then pumped by the hydraulically driven submersible cargo pump through the 6“ flexible oil rig hose into the recovered oil collecting tank on-board of the ship. If desired, the debris screen can be folded away hydraulically.

The rigid sweeping arms will be deployed and retrieved by a deck crane or by means of specially designed dedicated rigid sweeping arm handling cranes. These cranes makes quick start-stop possible and ensure safe handling of the sweeping arms in emergency recovery operations.

2.3 Description rigid sweeping arms.

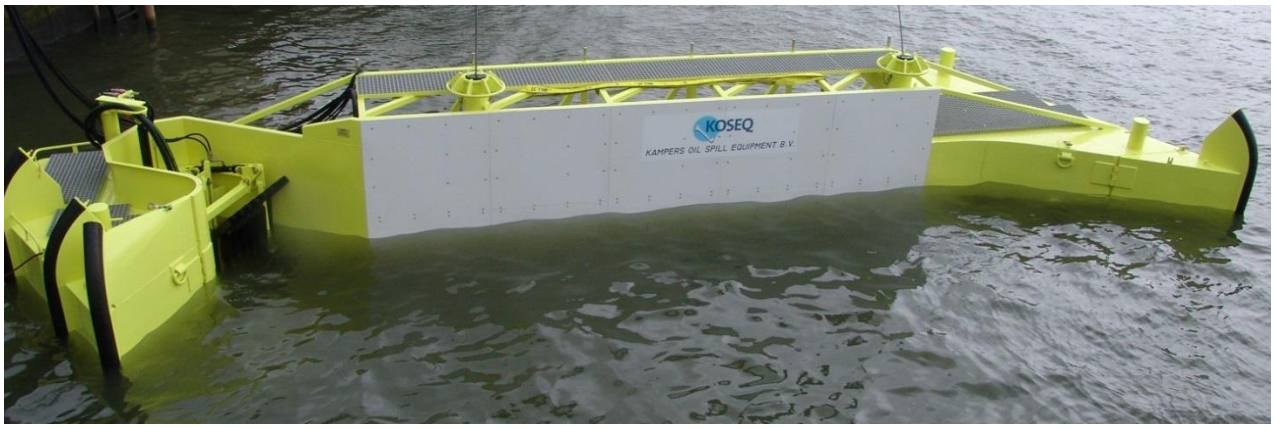
The rigid sweeping arm is a floating structure, designed to be pulled alongside a vessel. The length can vary from 10 meter up to 15 meter or longer. Typically 12 meter or 15 meter arms are installed, depending on the available space on deck.

The rigid sweeping arm consists of three dismountable sections; the inner pontoon, the middle section and the outer pontoon. The inner pontoon is made of steel and has three oil resistant rubber fenders and one foldable end, also fitted one boulder, two fixing lugs with two adjustable chains, to be connected to the towing bridle and two rigid sweeping arm sea fastening lugs. Furthermore, the inner pontoon possesses:

- Height adjustable oil collecting chamber with a weir skimmer.
- Hydraulic cylinder to move the oil collecting chamber up & down.
- Movable debris screen, with adjustable spacers.
- Hydraulic cylinder to move the debris screen up & down.
- Hydraulically driven submersible pump placed in separate lifting frame for easy repair and maintenance and piping assembly.

The middle section of steel lattice type framing, covered on one side with exchangeable oil resistant synthetic paneling. Two lifting points (catchers) are integrated into the middle section for matching with the handling crane catchers. Offshore rated PVC anti-slip grating, stanchions and ropes are mounted on the top of the sweeping arm for safe personnel passing. All bolts, nuts and washers are made of stainless steel.

The outer pontoon is made of steel and has one oil resistant rubber fender and a foldable end, also fitted one boulder and two fixing lugs with adjustable chains.



3. Dimensions weights and hydraulic requirements.

3.1 12 meter sweeping arm system

Foldaway point not folded:

Length sweeping arm on deck:	12,1 m.
Width sweeping arm on deck:	3,5 m.
Total length of system on deck (crane + sweeping arm):	15,2 m.

Foldaway point folded:

Length sweeping arm on deck:	11,8 m.
Width sweeping arm on deck:	2,9 m.
Total length of system on deck (crane + sweeping arm):	14,9 m.

Height of crane (with standard pedestal height of 3385 mm):	6,1 m.
Height of sweeping arm (from twist locks to top of catcher):	2,3 m.
Weight of sweeping arm:	4300 kg.
Weight of crane:	6800 kg.

3.2 15 meter sweeping arm system

Foldaway point not folded:

Length sweeping arm on deck:	15,4 m.
Width sweeping arm on deck:	3,5 m.
Total length of system on deck (crane + sweeping arm):	18,2 m.

Foldaway point folded:

Length sweeping arm on deck:	15,1 m.
Width sweeping arm on deck:	2,9 m.
Total length of system on deck (crane + sweeping arm):	17,9 m.

Height of crane (with standard pedestal height of 3385 mm):	6,1 m.
Height of sweeping arm (from twist locks to top of catcher):	2,3 m.
Weight of sweeping arm:	4800 kg.
Weight of crane:	7000 kg.

3.3 Hydraulic requirements

If connected to the ships hydraulic system, per sweeping arm a hydraulic flow of 140 litre/minute @ 320 bar is required.

There are also controls needed:
Sweeping arm pump: proportional valve 140 litre/minute @ 320 bar
Skimmer height: proportional valve 15 litre/minute @ 200 bar
Debris screen: black/white valve 5 litre/minute @ 200 bar

4. Installing on the deck.

4.1 General

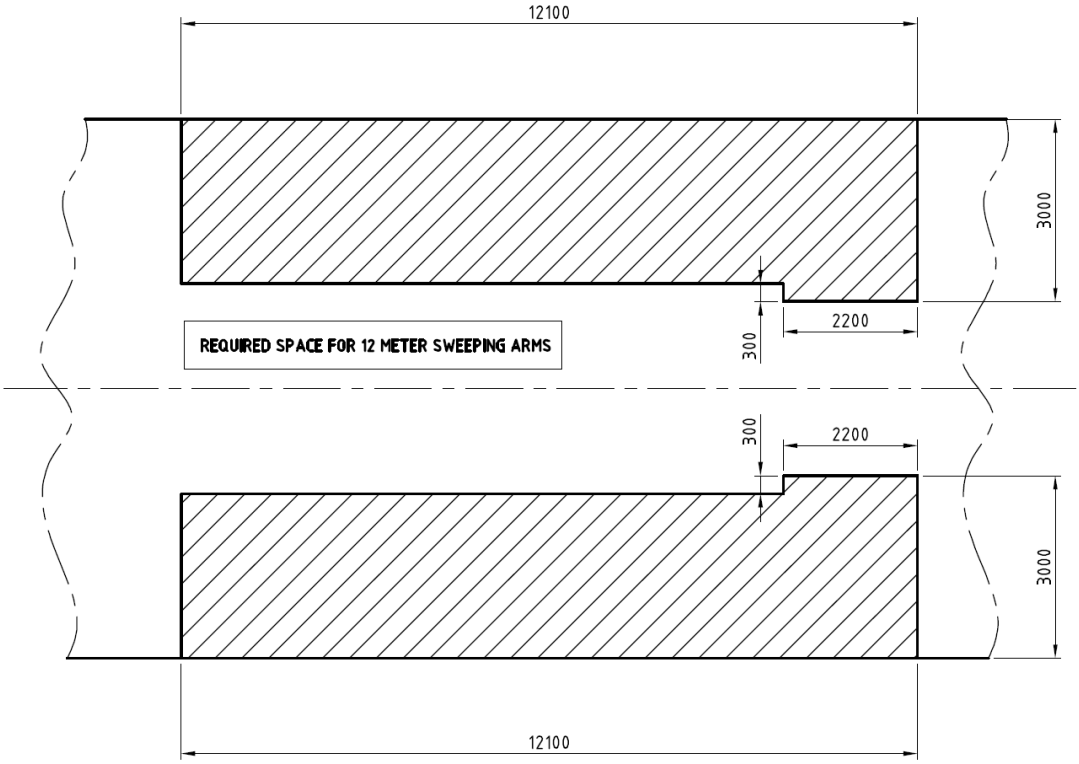
Prior to the installation of the sweeping arms, the vessel has to be checked and calculated for stability. The sweeping arms and, if also installed, the dedicated handling cranes ad a significant amount of weight that is moved over board.

4.2 Sweeping arms without dedicated handling cranes

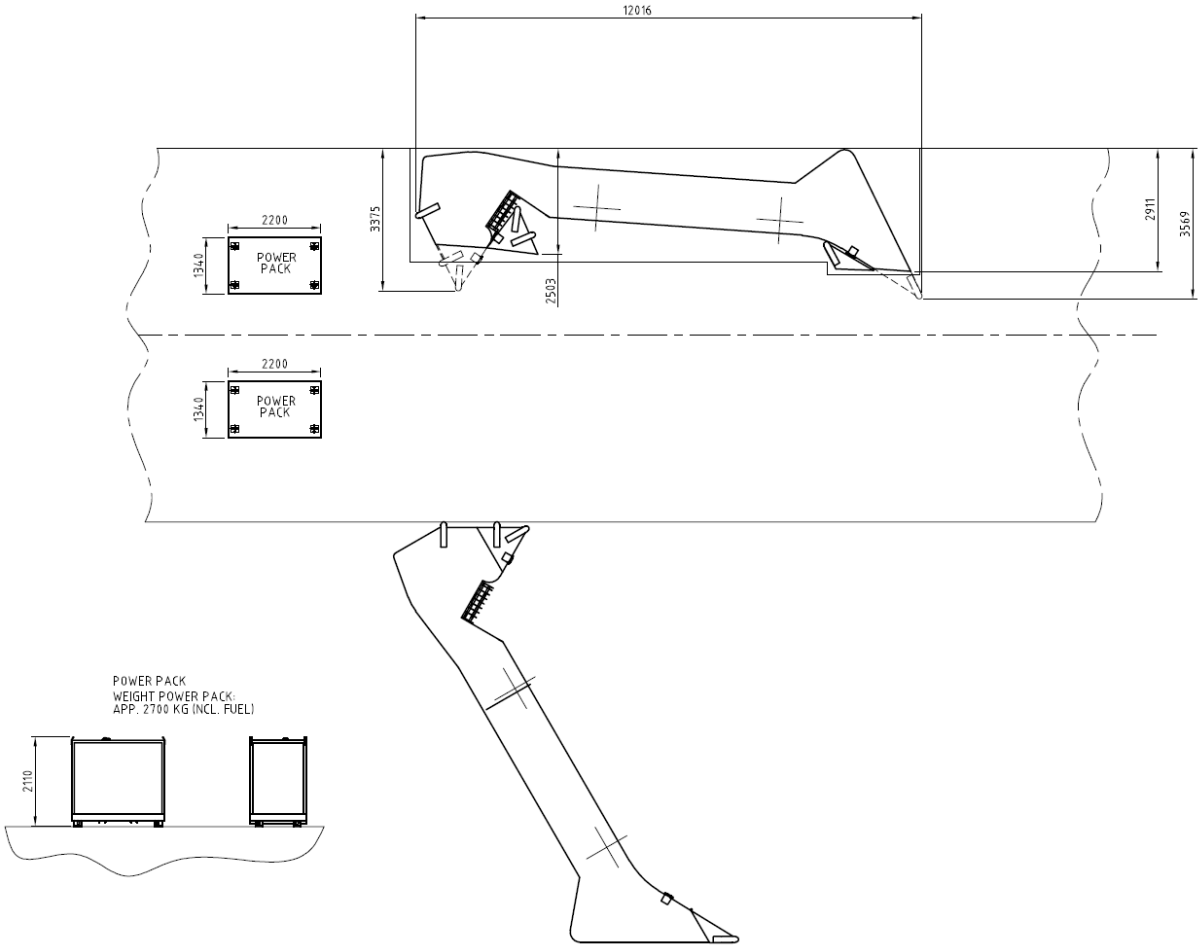
When the sweeping arms are installed on a vessel without the dedicated handling cranes, a suitable deck crane with sufficient capacity and range is to be used.

4.2.1 12 meter sweeping arms

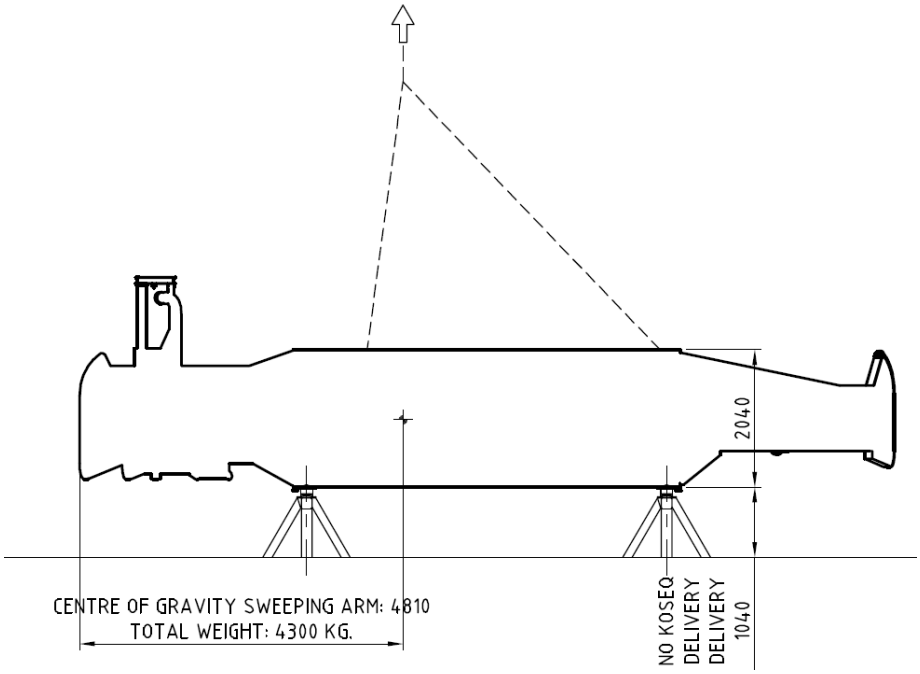
The deck crane must be able to lift 4.5 T at approximately 4,2 meter outside the ships hull.



Footprint of the 12 meter Rigid Sweeping Arm without dedicated crane on deck.

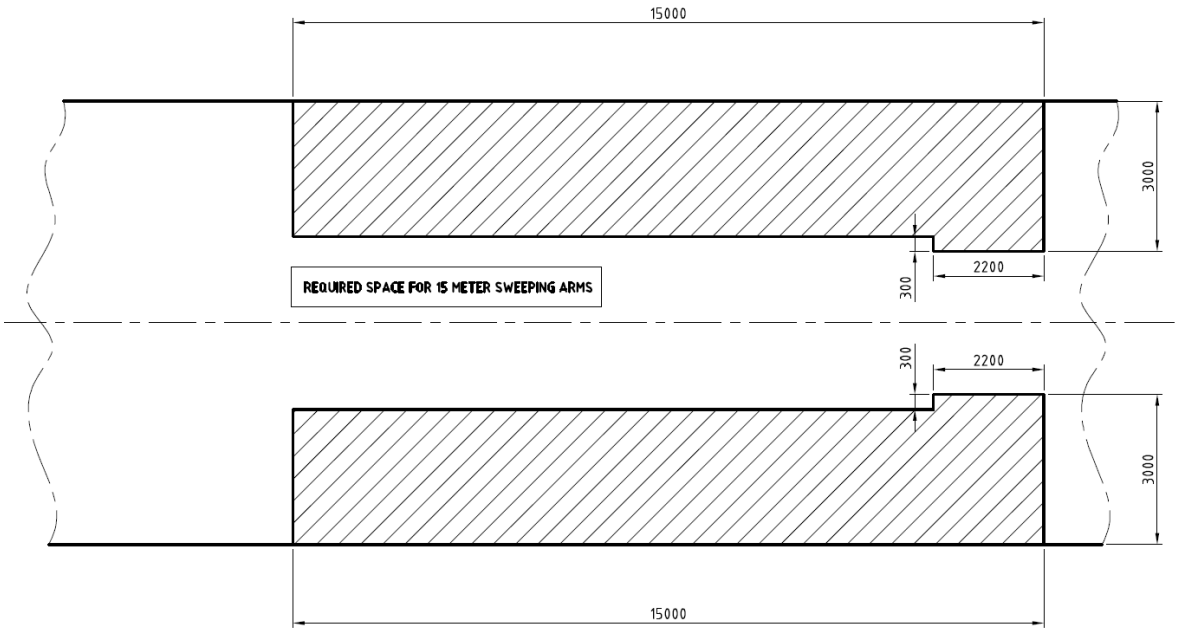


Top view of the 12 meter Rigid Sweeping Arm with power pack, but without dedicated crane on deck

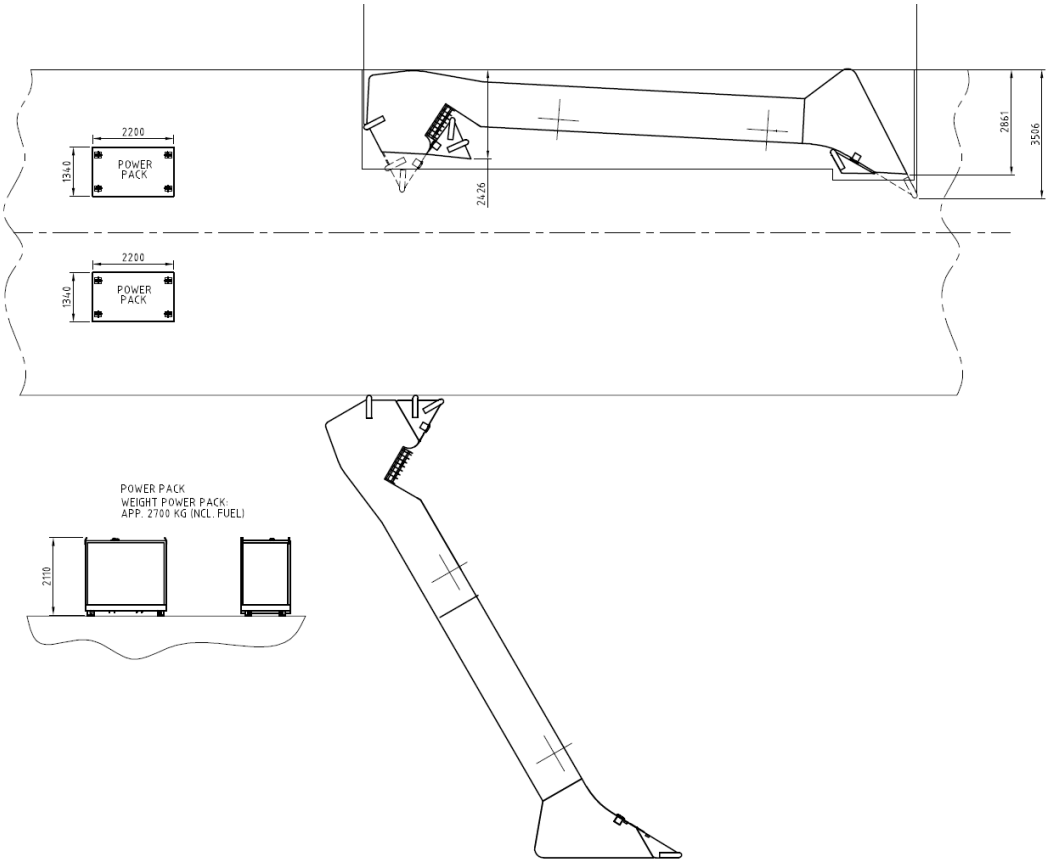


4.2.2 15 meter sweeping arms

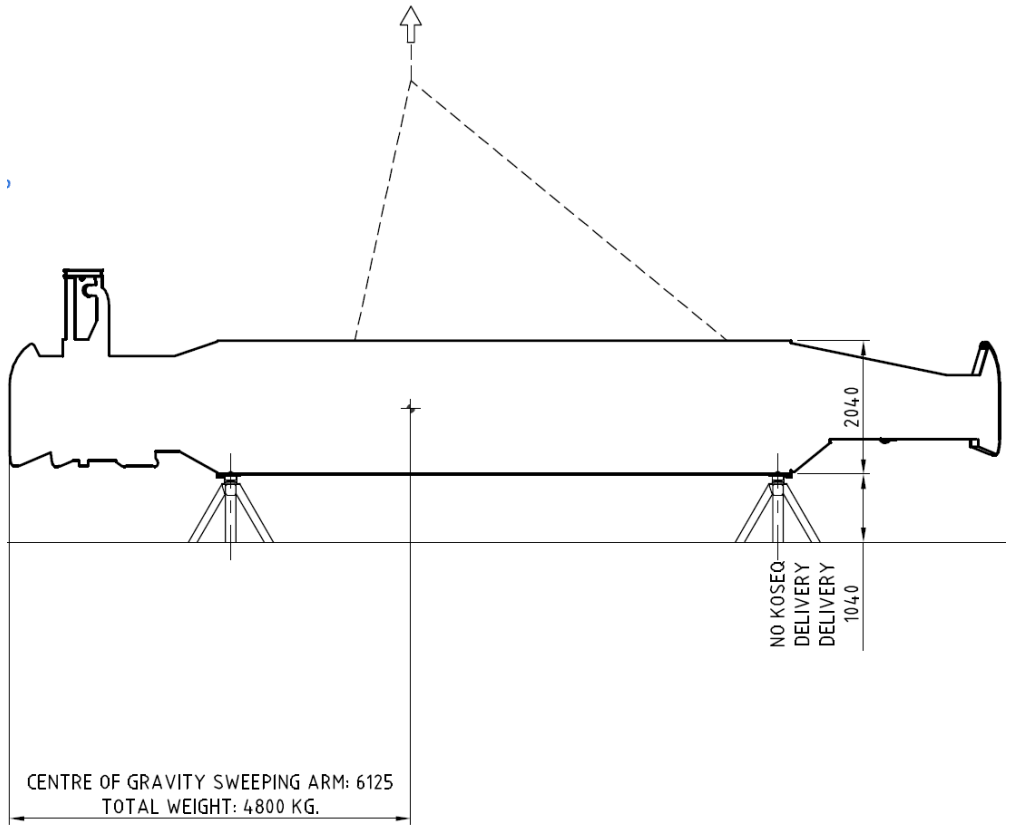
The deck crane must be able to lift 5 T at approximately 5,8 meter outside the ships hull.



Footprint of the 15 meter Rigid Sweeping Arm without dedicated crane on deck.



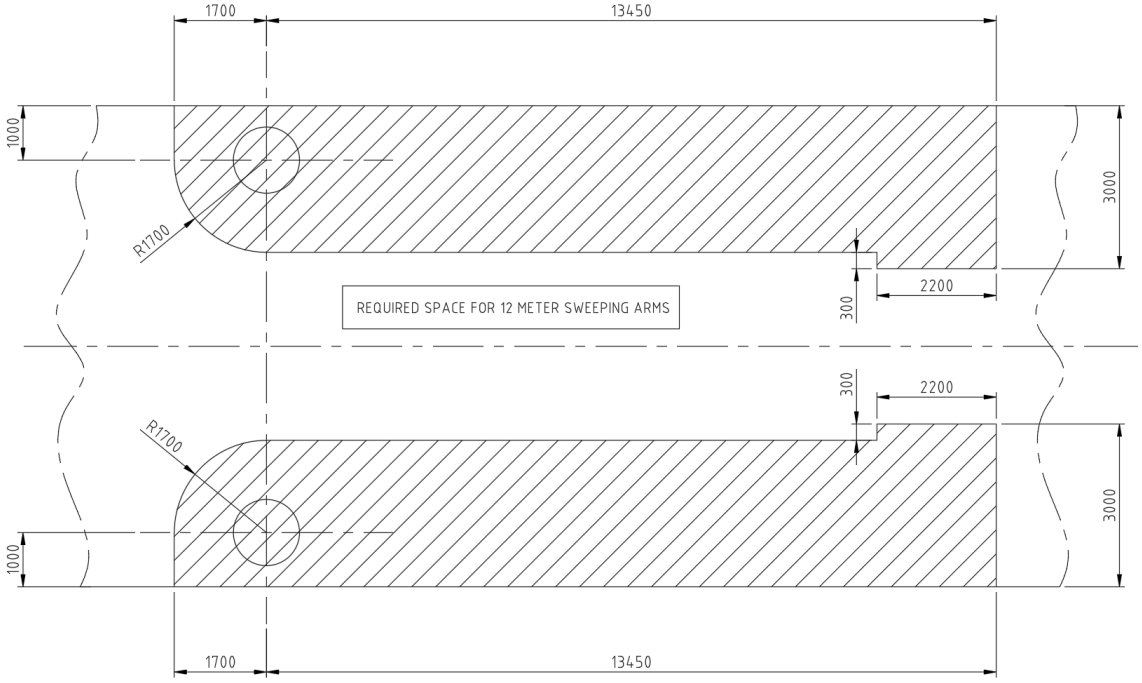
Top view of the 15 meter Rigid Sweeping Arm with power pack, but without dedicated crane on deck


2040
NO KOSEQ DELIVERY
DELIVERY 1040
CENTRE OF GRAVITY SWEEPING ARM: 6125
TOTAL WEIGHT: 4800 KG.

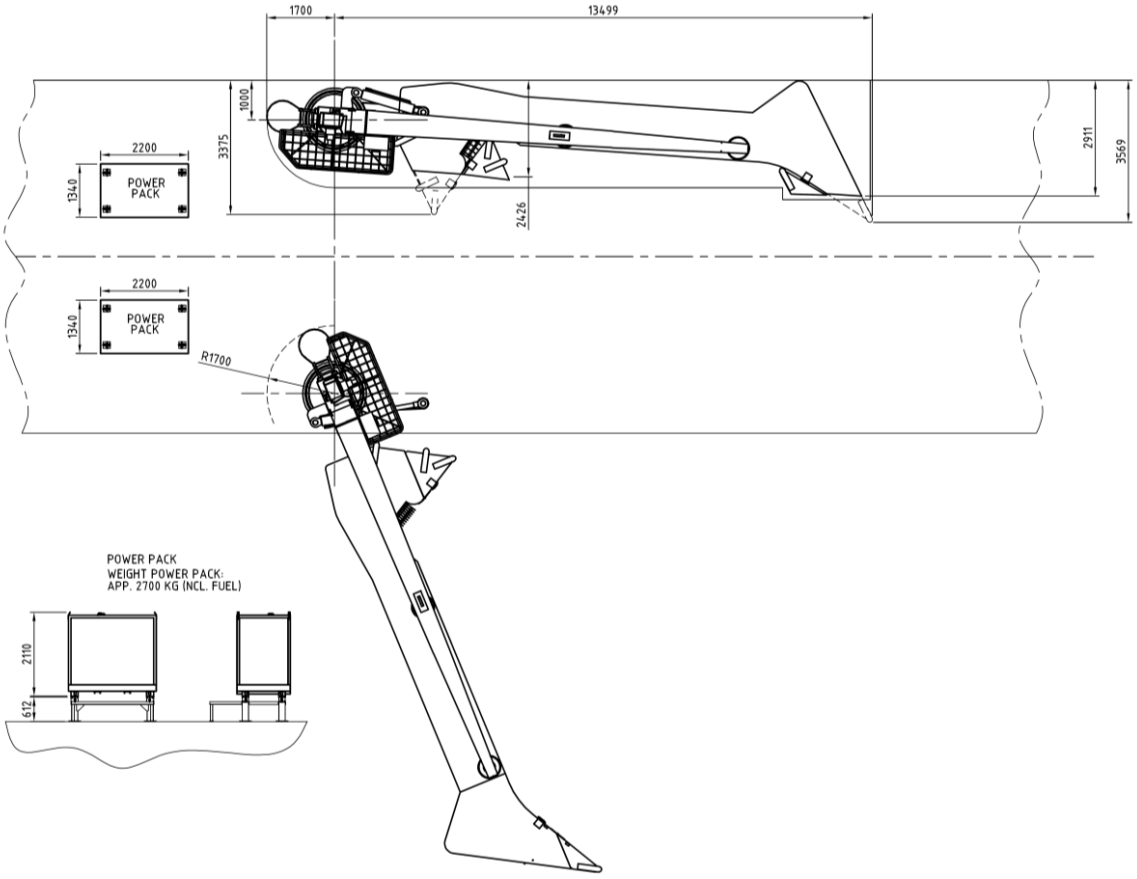
4.3 Sweeping arms including dedicated handling cranes

Dedicated sweeping arm cranes are executed with catchers for safe handling of the sweeping arm. For installing on board, a pedestal pipe has to be integrated in the ships hull. This has to be done according class regulations.

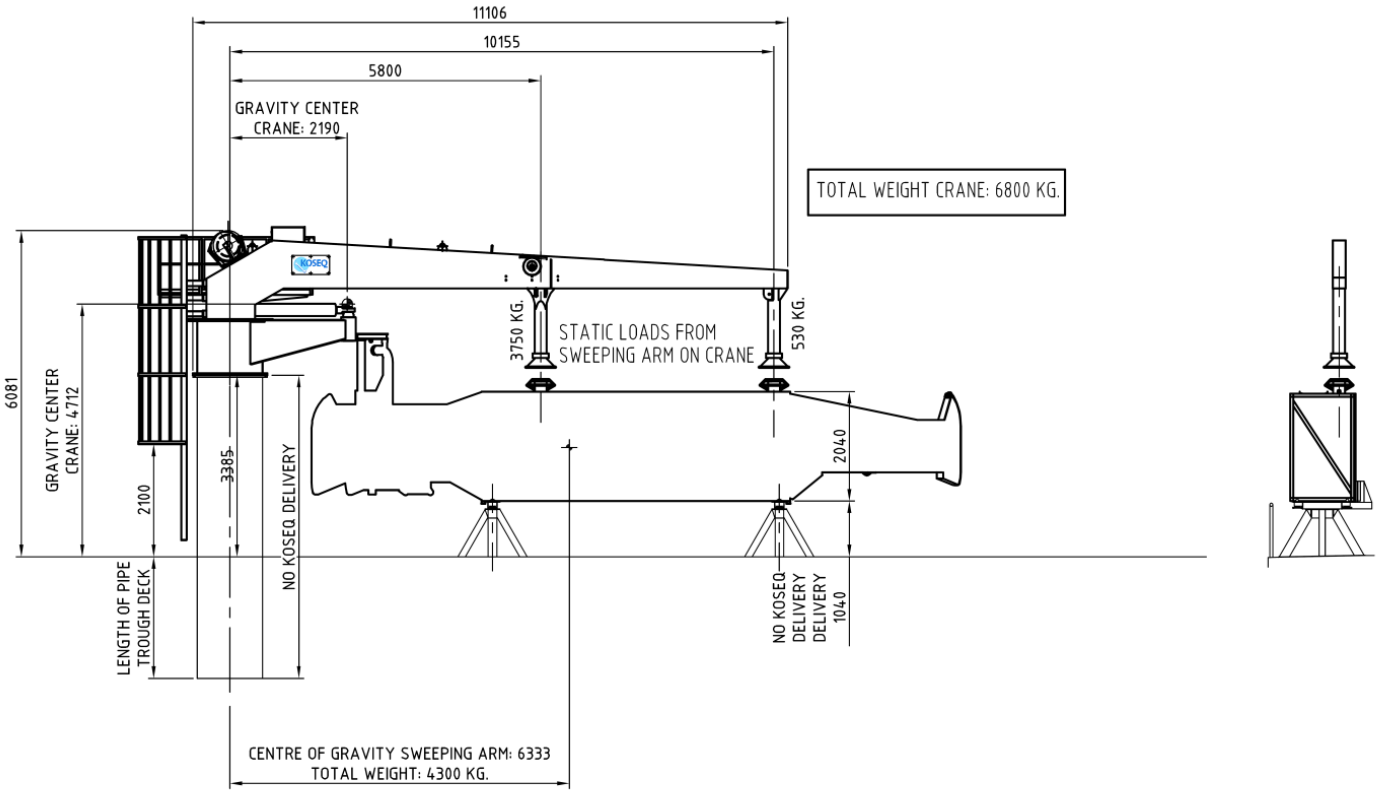
4.3.1 12 meter sweeping arms including dedicated handling cranes



Footprint of the 12 meter Rigid Sweeping Arm with dedicated crane on deck.

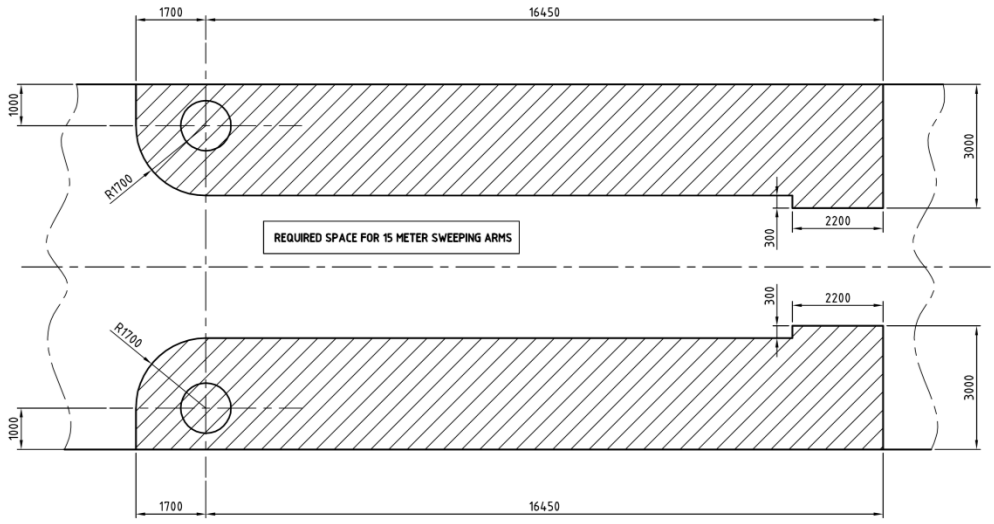


Side views of the 12 meter Rigid Sweeping Arm with dedicated crane on deck.

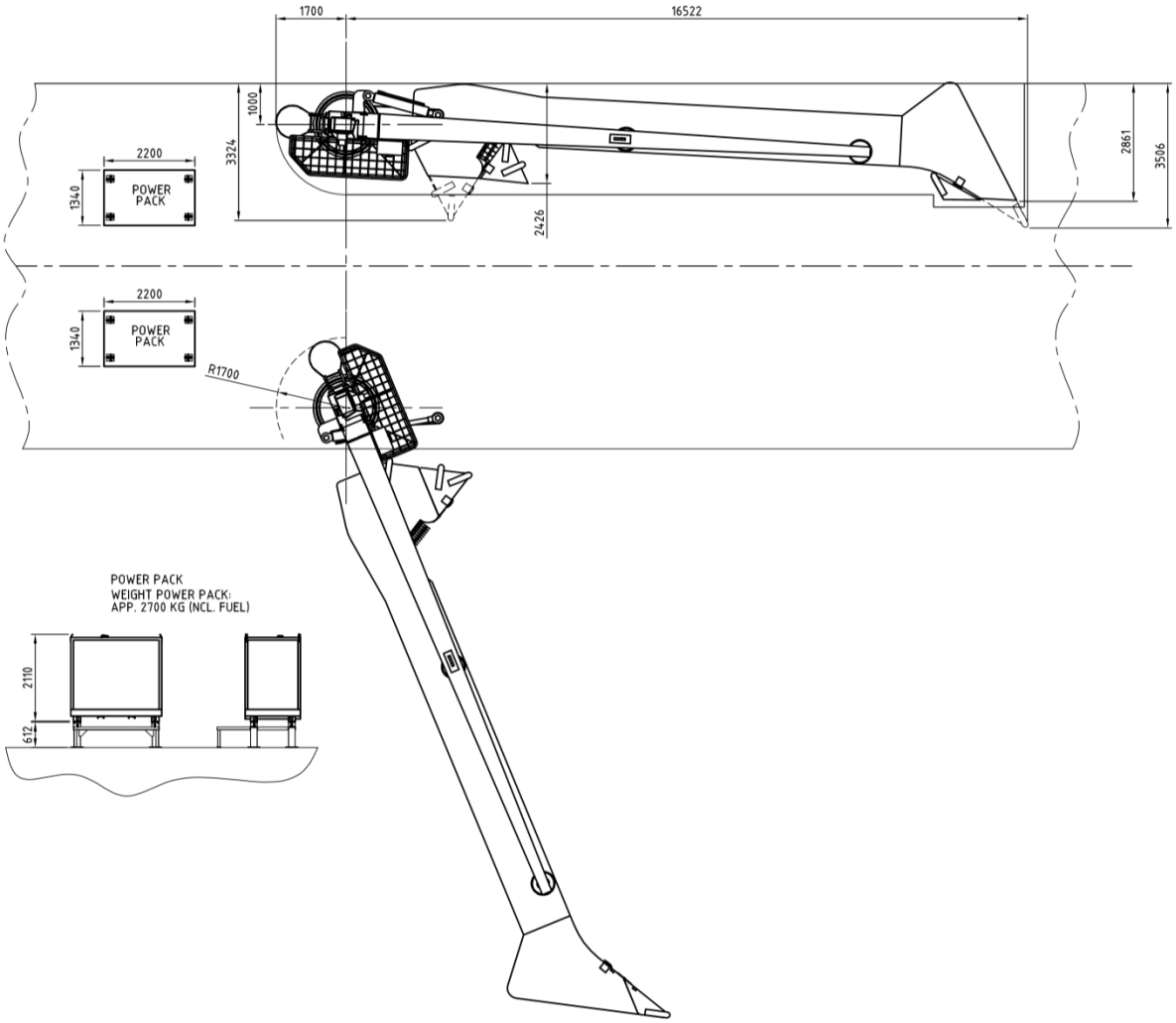


Top view of the 12 meter Rigid Sweeping Arm with dedicated crane on deck and power pack.

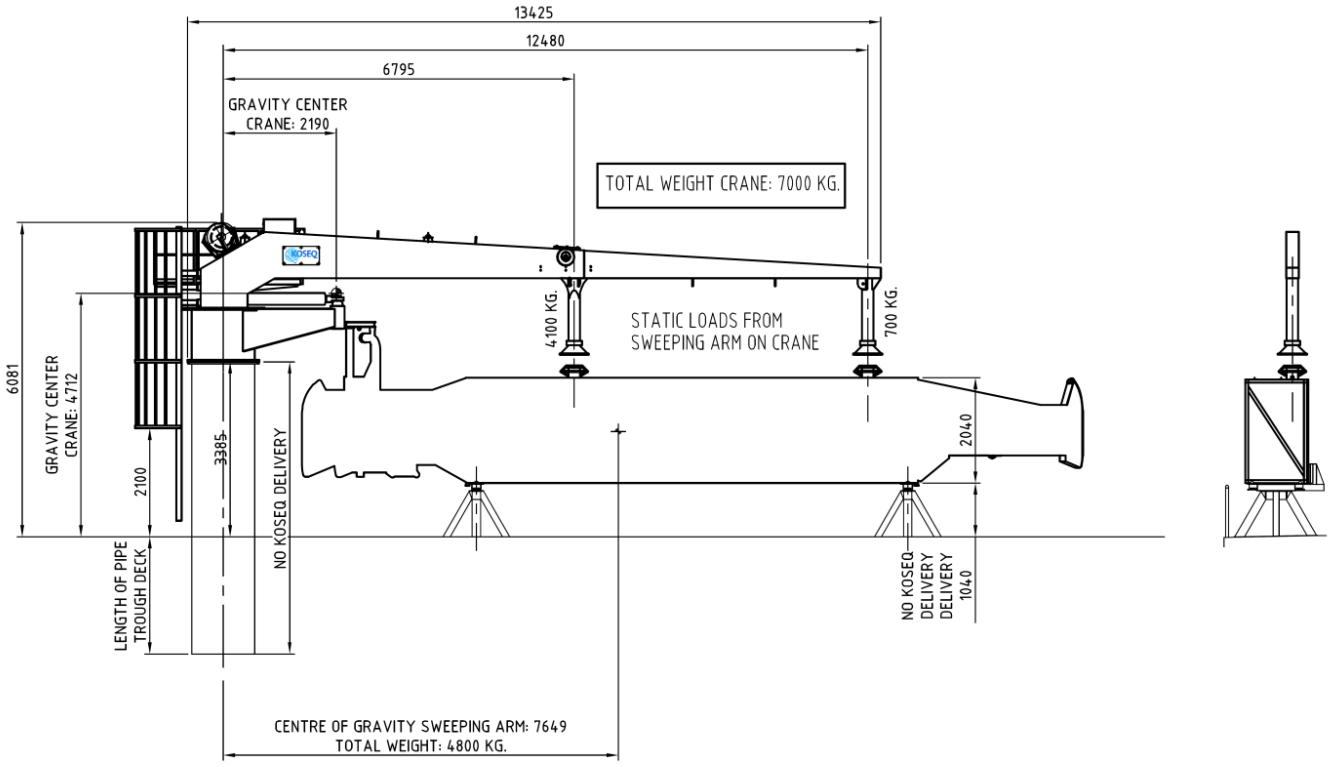
4.3.2 15 meter sweeping arms including dedicated handling cranes



Footprint of the 15 meter Rigid Sweeping Arm with dedicated crane on deck.



Top view of the 15 meter Rigid Sweeping Arm with dedicated crane on deck and power pack.



Side views of the 15 meter Rigid Sweeping Arm with dedicated crane on deck.

4.4 Sweeping arms installed by using Modular Crane Pedestal System

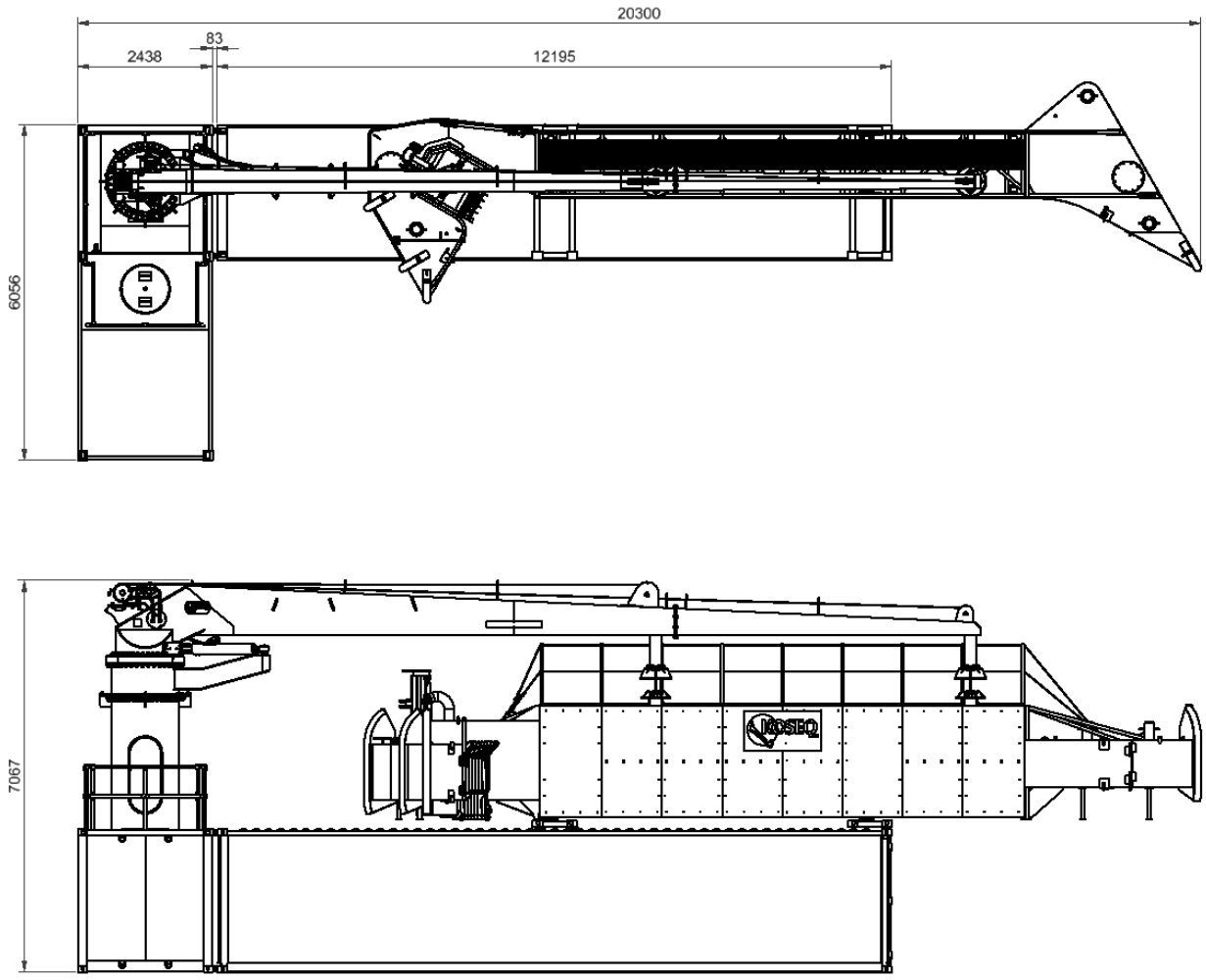
The Koseq rigid sweeping arm system can also be placed on a flat deck, like on a PSV by means of the Koseq Modular Crane Pedestal System. This system does not require any adaptations to the vessel. The system uses a specially designed 20’ pedestal container and a 40’ storage container as support for the sweeping arm and the dedicated sweeping arm crane.

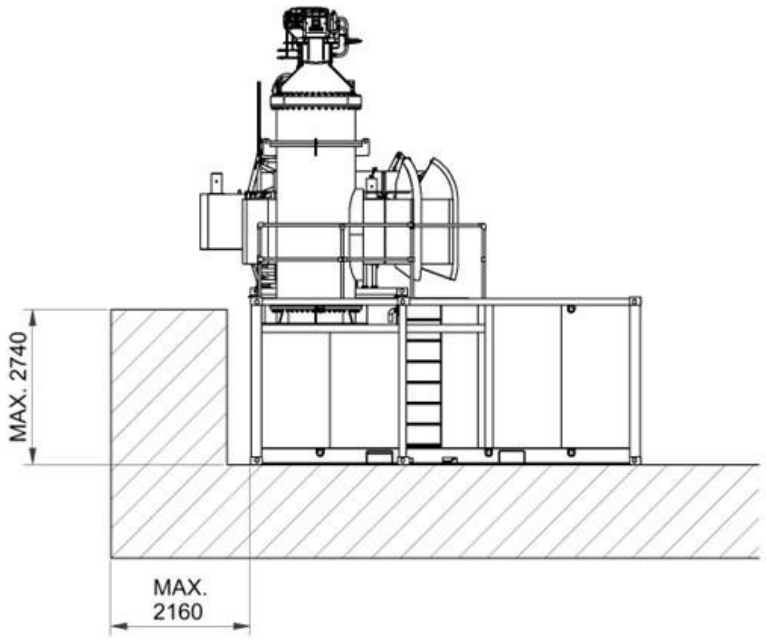
The 20’ pedestal container is to be ballasted with water. After installation on the deck the containers are to lashed to the deck properly.

A power pack and controls are also to be installed on the deck.

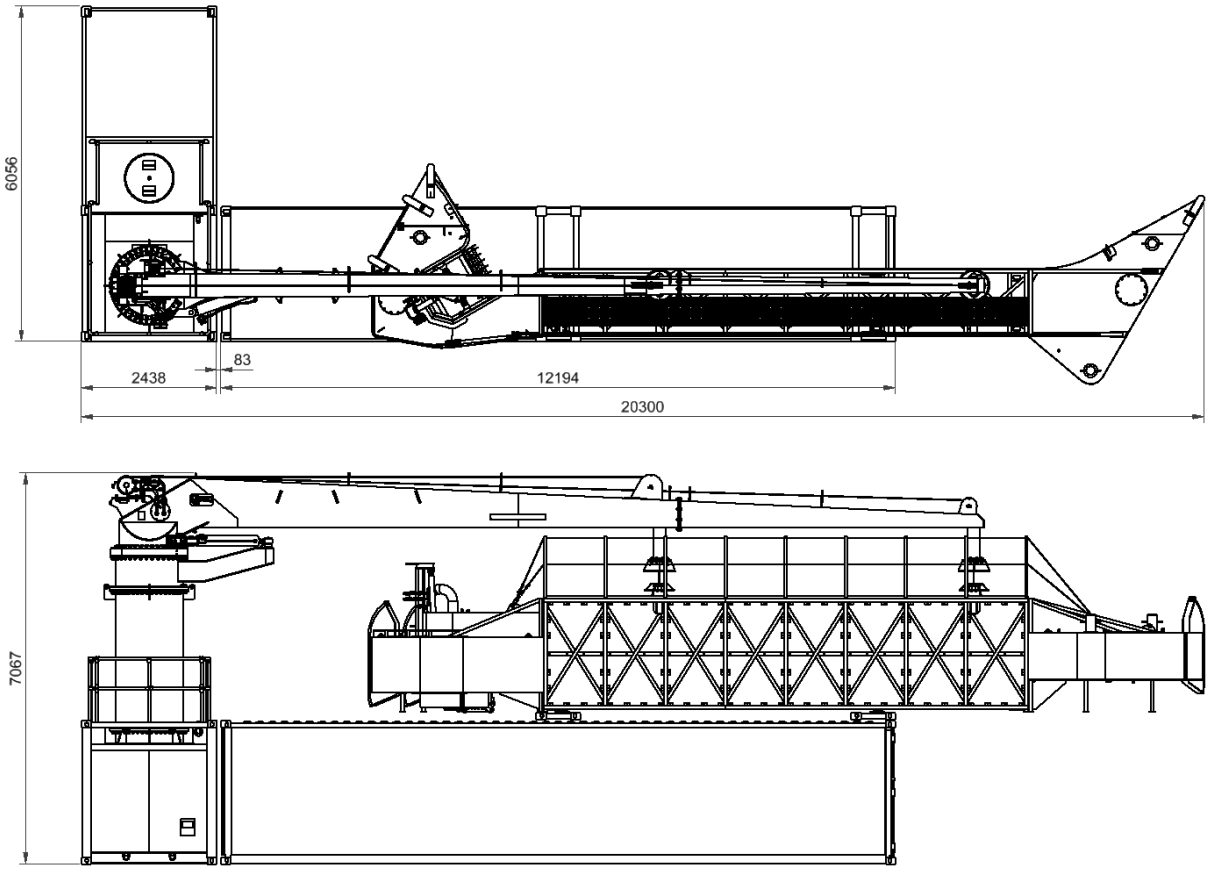
Total weight per side of the vessel: 55 T, including containers, sweeping arm, crane and ballast water.

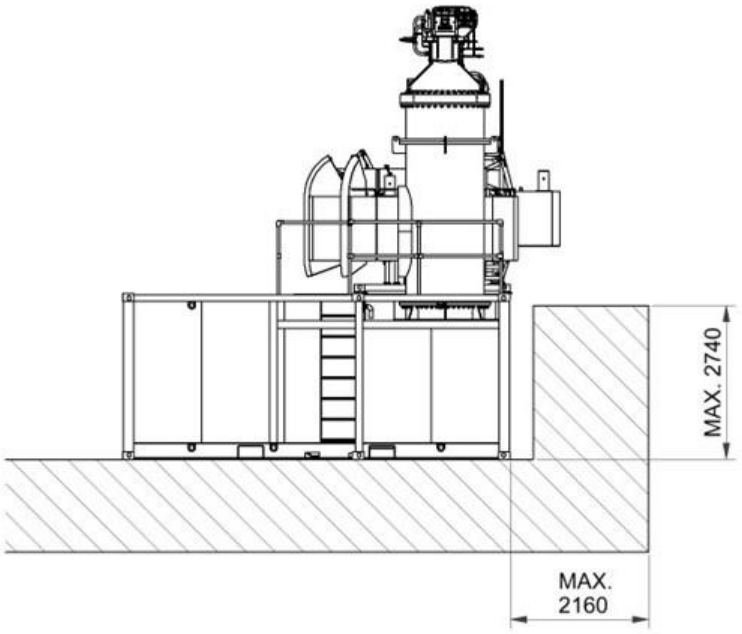
4.4.1 15 meter sweeping arms including Modular crane pedestal system for port side





4.4.2 15 meter sweeping arms including Modular crane pedestal system for starboard side

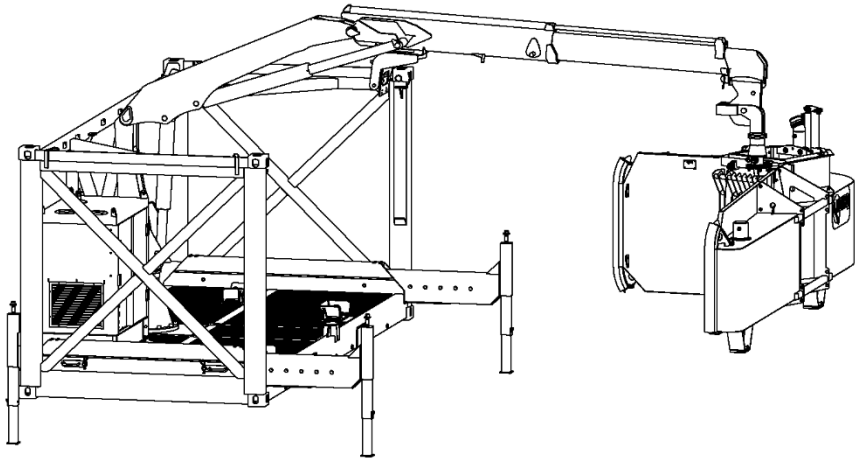




4.5 Installing Koseq Compact 502 system

The Compact 5 is a smaller sweeping arm which is easier to transport and suitable for smaller vessels. This made quick dynamic oil recovery on open water like inland waters, harbors and near shore in bad weather conditions possible.

The Compact 5 is now integrated in the Compact 502 system. A containerized unit with a standalone diesel hydraulic power pack and crane to deploy the Compact 5 sweeping arm. Only a storage tank for storing the recovered oil is needed in the ship. This makes it possible to turn any vessel of opportunity into a world-class oil recovery ship.

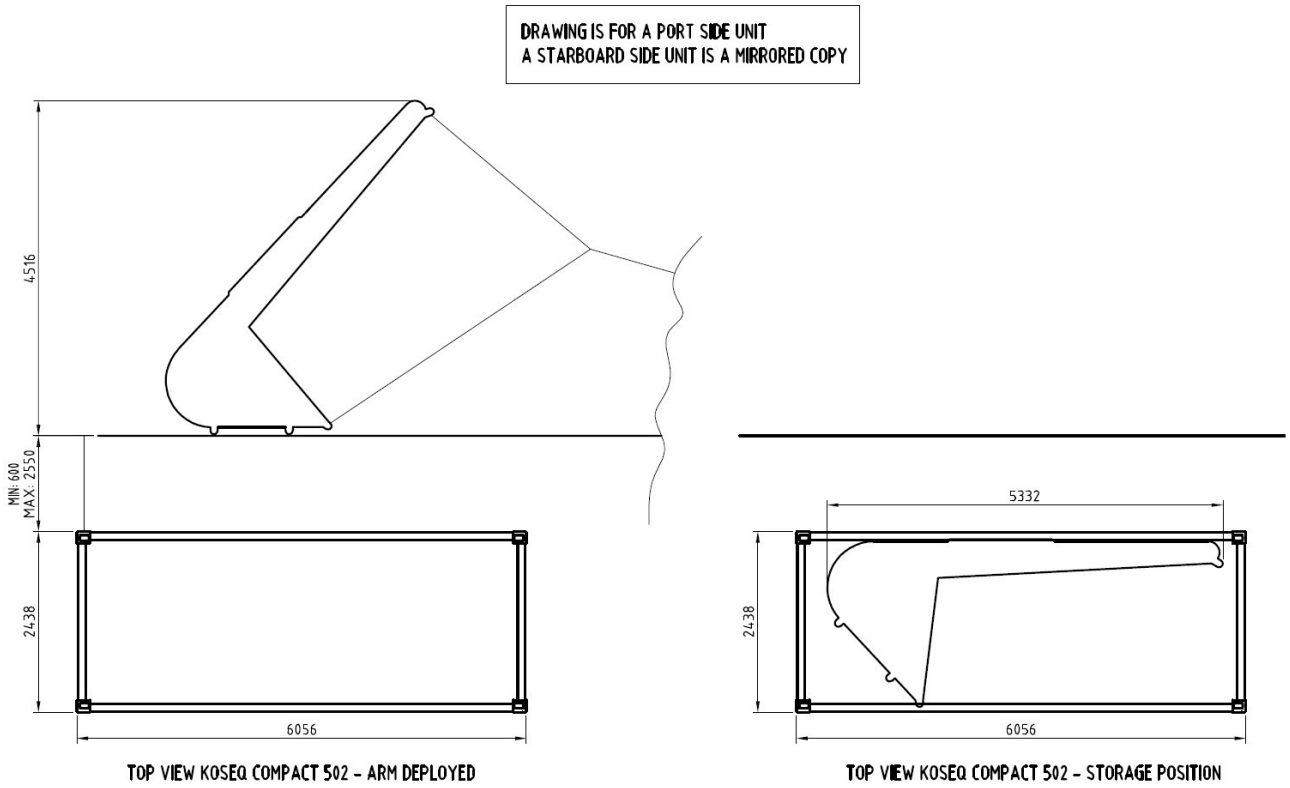


The Koseq Compact 502 consists of the following main components:

- Frame containing all equipment
- Koseq Compact 5 sweeping arm
- Diesel driven hydraulic power unit
- Knuckle boom crane
- Hydraulic valve block with remote control unit

The unit is made for use on portside or starboard side of the vessel.

4.5.1 Positioning of the Compact 502 system on the deck



In case there is piping or other objects on the deck, the extendable legs van be used to position the unit over these objects.

The unit has to be secured on the deck with twist locks / and or be lashed to the deck.

Total weight of the unit: app. 10 T.