To:	PSW
From:	IOS Intermoor: Inge Moy
Date:	26.08.2015
Copy to:	Songa Offshore
Rev	Rev 2. Re-issued for information: • Added rig and anchor coordinates. • Fairlead locations are included • Additional information of the surface buoy system is included. Rev 3. Re-issued for information • Added rig and anchor coordinates in WGS84 • Included information of depth of mooring lines close to rig.
Number of pages:	7
Subject:	Cat-D Moored at Mongstad

Introduction:

Songa Offshore plan to intall a pre-laid anchor spread near Mongstad. The pre-laid anchor spread will be hooked up to the new Cat-D rigs, and used for testing of their POSMOOR-ATA system. The spread shall not hold any envinronmentel loads, and maximum load on rig fairlead is 100Te. See table 1 for mooring spread details.

Note that the rigs location, chain length and anchor positions given in this document are preliminary and may be subject to minor changes.

Figure 1 Songa Endurance

Table 1: Line length and tension

Water depth at rig laocation: approx 530m.

Line no	Chain Length	Chain Dimension + Anchor Size	Max Anchor Load*	Water Depth at Acnhor
1	1160m	84mm + 15Te Anchor	0 Te	450m
2	1350m	84mm + 15Te Anchor	0 Te	400m
3	1250m	84mm + 15Te Anchor	0 Te	125m
4	1260m	84mm + 15Te Anchor	0 Te	150m
5	1260m	84mm + 15Te Anchor	0 Te	150m
6	1260m	84mm + 15Te Anchor	0 Te	150m
7	1250m	84mm + 15Te Anchor	0 Te	100m
8	1270m	84mm + 15Te Anchor	0 Te	200m
9	1330m	84mm + 15Te Anchor	0 Te	350m
10	1370m	84mm + 15Te Anchor	0 Te	450m
11	1108m	84mm + 15Te Anchor	0 Te	350m
12	1130m	84mm + 15Te Anchor	0 Te	400m

***** Max anchor load at 100Te fairlead tension. Due to the weight of the chain, the anchor will not experience any loads.

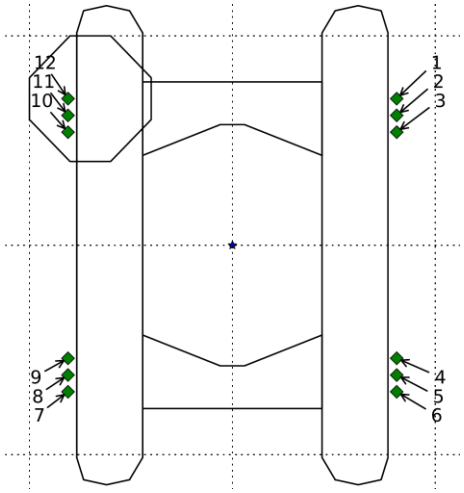
Rig and Anchor Coordinates:

	Reference			
	Datum ED50 UTM Zone 31N		WGS84	
	East	North	Long	Lat
	[m]	[m]	[DMS]	[DMS]
Rig	611480	6745948	5°2'55.74"E	60°49'54.52"N
Line no.				
1	610 611	6 745 572	5°1'57.47"E	60°49'41.24"N
2	610 334	6 745 859	5°1'39.73"E	60°49'50.79"N
3	610 370	6 746 242	5°1'42.90"E	60°50'3.13"N
4	611 186	6 747 058	5°2'38.58"E	60°50'28.67"N
5	611 569	6 747 094	5°3'4.00"E	60°50'29.44"N
6	611 941	6 746 998	5°3'28.43"E	60°50'25.97"N
7	612 530	6 746 409	5°4'6.18"E	60°50'6.34"N
8	612 626	6 746 037	5°4'11.76"E	60°49'54.23"N
9	612 590	6 745 654	5°4'8.58"E	60°49'41.89"N
10	611 888	6 744 841	5°3'20.45"E	60°49'16.37"N
11	611 649	6 745 008	5°3'50.02"E	60°49'22.00"N
12	611 587	6 745 094	5°3'1.07"E	60°49'24.83"N

Fairlead Coordinates:

The reference point for the fairleads X and Y coordinates is the rig center. X is positive fwd. Y is positive SB. The reference point for the fairleads Z-coordinate is the keel. The fairlead coordinates are given in table below.

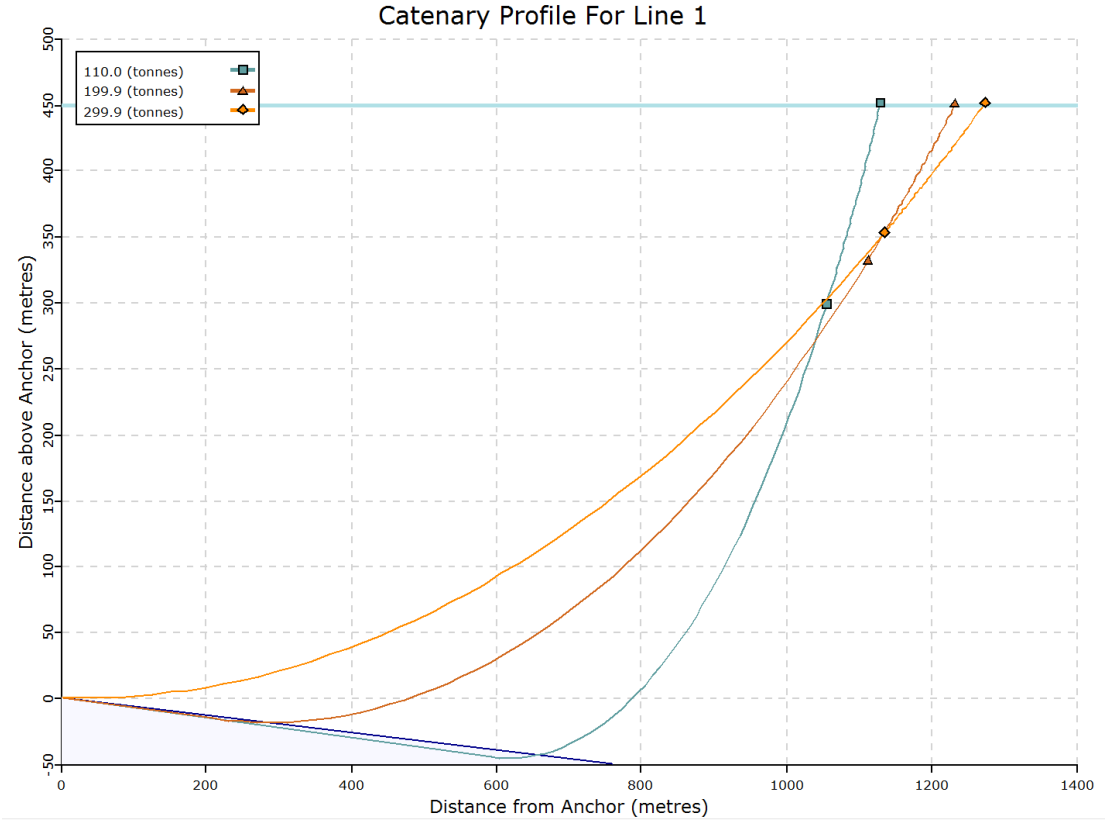
Fairlead no:	Fairlead position [m]:		
	x	y	Z*
1	35	40.5	19.35
2	31	40.5	19.35
3	27	40.5	19.35
4	-27	40.5	19.35
5	-31	40.5	19.35
6	-35	40.5	19.35
7	-35	-40.5	19.35
8	-31	-40.5	19.35
9	-27	-40.5	19.35
10	27	-40.5	19.35
11	31	-40.5	19.35
12	35	-40.5	19.35



Mooring Line at 10m water depth

Due to the weight of the mooring chain and the large water depth, the catenary profile will be relatively steep. See catenary profile for line 1 at different tensions in figure below.

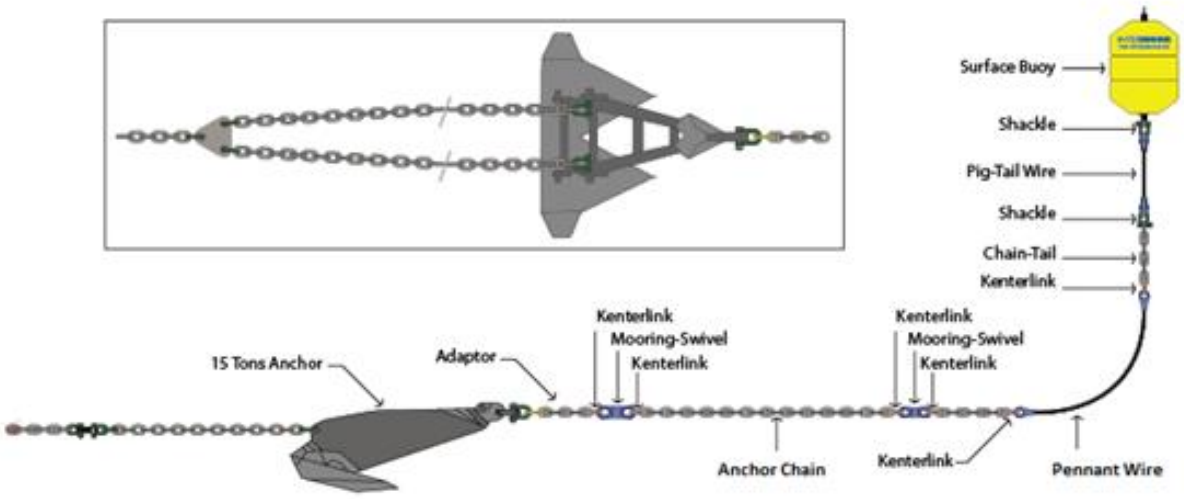
The mooring line will be at a water depth of 10m at a distance 25m from fairlead at 300Te. The distance will decrease with decreasing tension.



Mooring line characteristics:

Component	Diameter [mm]	Immersed weight [t/m]	Minimum Breaking Load [t]	Axial Stiffness, EA [t]
84mm R5 chain	84	0.134	858	$0.706*10^5$

Pre Lay Mooring Line Set Up:



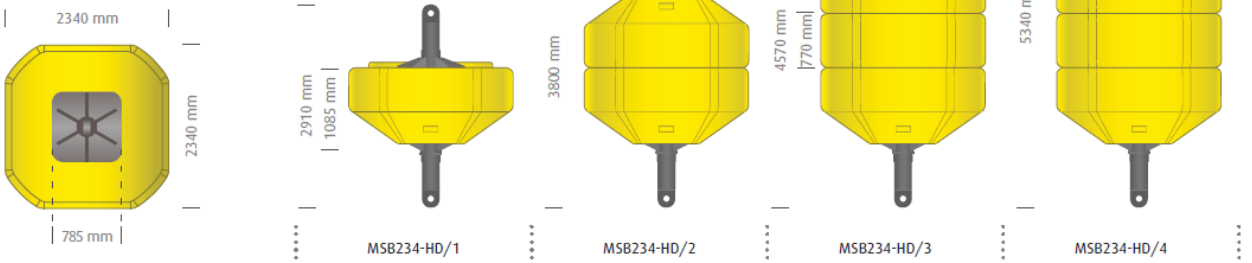
The pre laid mooring spread will be buoyed off with 14Te (13.2Te) surface buoys connected to the bottom chain by a pennant wire. The surface buoys can be installed with a Buoy Gard (AIS). See specifications in appendix A. Tron ML-100 lights are used on the surface buoys. Se dimensions for the surface buoy below.

Modular Support Buoy 234 – Heavy Duty

The MSB 234 series can also be delivered as with a Heavy Duty shell as an option, giving buoys that can survive even more harsh environments and rough handling.

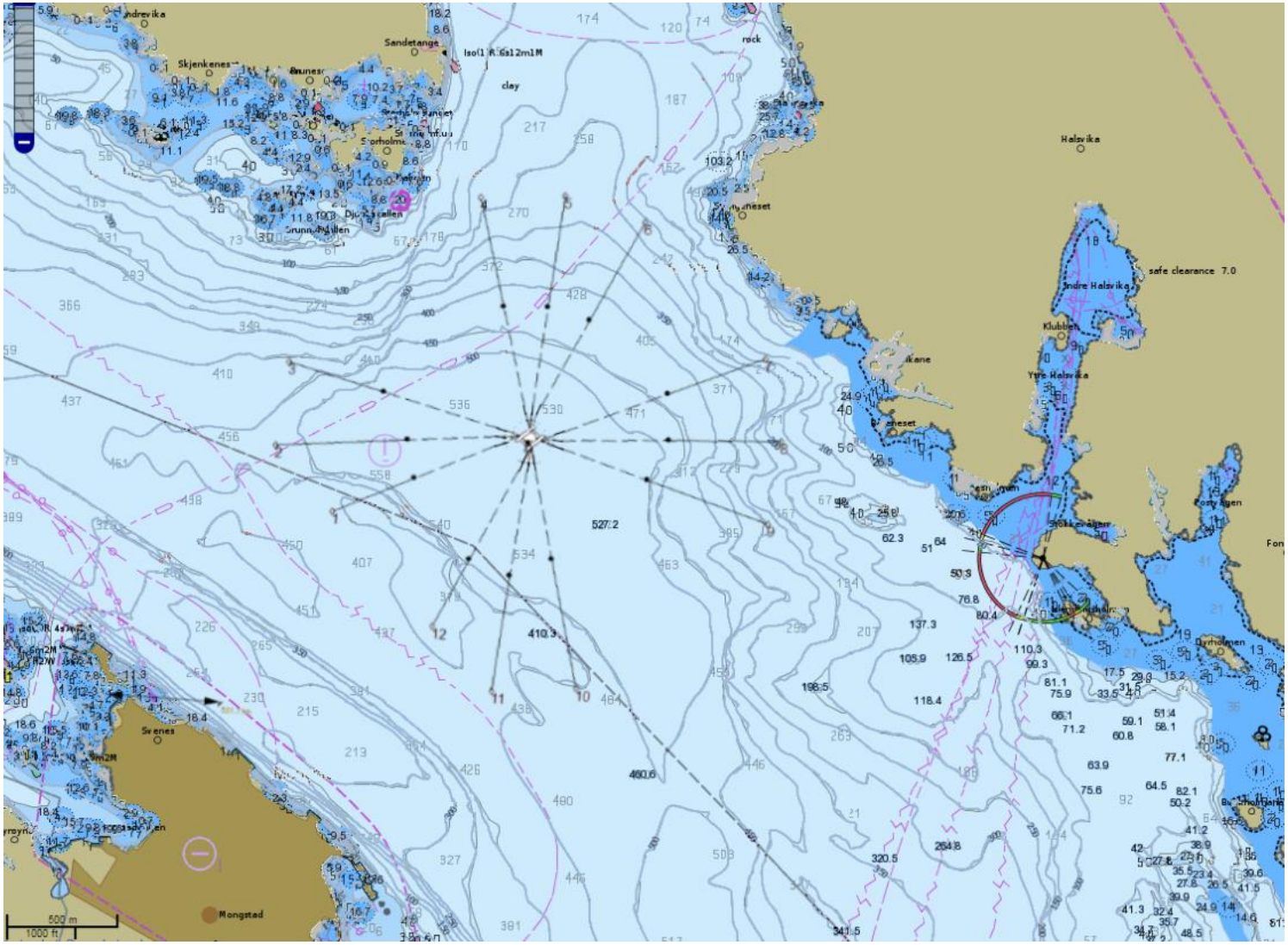
Benefits

Extremely strong and durable, mechanical properties remains even subzero temperatures, suited for arctic conditions, lower repair frequency and hence operational cost reduction, flexible material – high degree of shock absorption, color durability, enviromental protection – reduces spilage of buoyancy core material.



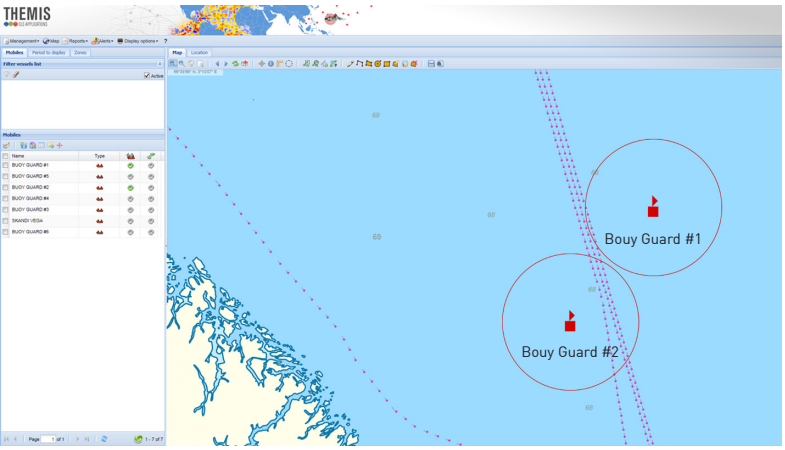
	MSB234-HD/1		MSB234-HD/2		MSB234-HD/3		MSB234-HD/4	
Depth	**Buoyancy**	**Weight**	**Buoyancy**	**Weight**	**Buoyancy**	**Weight**	**Buoyancy**	**Weight**
Surface	3200 (3700)	1210 (640)	6800	1910	10000 (3300)	2600 (590)	13200	3200

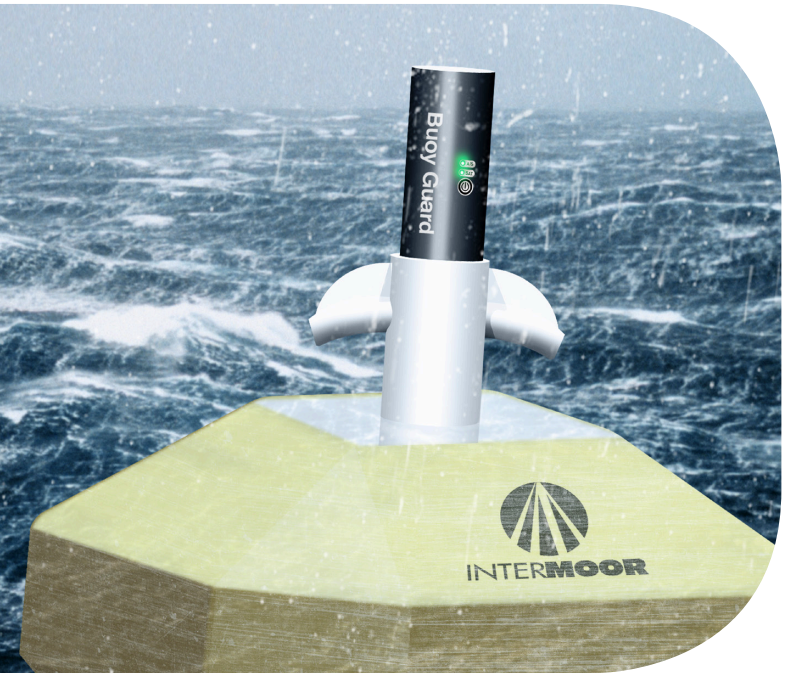
Mooring Spread at Mongstad



Buoy Guard - a Smarter Buoy

AIS Ship Collision Protection with Global Satellite Surveillance





Features

Full AIS "Aid to Navigation" (AtoN) functionality
ARGOS Satellite transmitter
AIS to Satellite Integration Circuitry
Adaptable to all mooring buoys
Visible in Web portal – globally
Watch Circle Protection with Alerts
Client customised AIS message
Ruggedised housing for AHV Operations
No technical expertise required to deploy
Watch Circle breach communicated to ER systems
Detection of nearby vessels transmitted via satellite
Transported in pelicase for storage on vessel

Technical Specs

80 day battery life – extendable if required
17 kgs total weight
128 Ah Lithium Battery
72 cm high
22 cm diameter
-30 to 50 deg C
Battery, Temp and Humidity status transmitted
AIS "Aid to Navigation" functions
ARGOS Satellite trasmitter

Opportunities

Extremely remote location buoy monitoring
Wellhead's not cut, seabed hazards
Environmental monitoring equipment – no ROV
Wave Height Correlation
Option for additional sensors
Verify AIS functional outside VHF range
Collision protection in shipping lanes

INTERMOOR
IOS INTERMOOR AS

E-mail: buoyguard@iosintermoor.no

Phone: (+47) 51 83 66 60

www.intermoor.com