



TECHNICAL SPECIFICATION	Nº: I-ET-3000.00-6600-941-PMU-002
CLIENT: E & P – SERV/US-SUB/ISBM	PAGE: 1 de 48
PROJECT: INSTALLATION OF SUBSEA FACILITIES	
AREA: SUBSEA FACILITIES	
TITLE: PLSV SUNRISE 2000 - TECHNICAL DATA AND RAO CURVES	

### INDEX OF REVISIONS

REV	DESCRIPTION AND/OR AFFECTED PAGES
0	This document substitute ET-3500.00-6500-941-PSE-001 Rev.H
A	Emission for use

	Rev 0	Rev A	Rev B	Rev C	Rev D	Rev E	Rev F	Rev G	Rev H
DATE	31/07/07	31/07/07							
EXECUTED BY	JMLF	JMLF							
CHECKED BY	-	-							
APPROVED BY	João Manoel	João Manoel							



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## 1.0 - LAYING SYSTEM

The complete laying system is composed of 3 (three) independent laying spreads that permit a simultaneous deployment of the 3 (three) lines of a bundle (i.e. production pipe, annulus pipe and control umbilical):

- I. Vertical Laying Spread (VLS);
- II. Horizontal laying Spread (HLS): Composed of 2 (two) distinct laying spreads:
  - A. HORIZONTAL TENSIONER LAYING SPREAD 1 (HLS 1);
  - B. HORIZONTAL TENSIONER LAYING SPREAD 2 (HLS 2);
- III. Umbilical Laying Spread (ULS): Composed of 2 (two) distinct laying spreads:
  - A. UMBILICAL WINCH LAYING SPREAD 1(ULS 1);
  - B. UMBILICAL TENSIONER LAYING SPREAD 2(ULS 2);

See attachment 1 for additional information about VLS and others appurtenances.

### 1.1 – VERTICAL LAYING SPREAD(VLS)

Vertical spread designed for heavy loads and large diameter pipe. Maximum capacity: 270 t. Figures 2,3,6 and 8.The spread is installed on the stern starboard side of the vessel and is composed of 3 (three) stacked elements:

1. Working table, above sea level. The working table is designed to support a maximum catenary load of 270 t. It is composed of movable parts, hydraulically operated, which can clamp the pipe fitting and hold the catenary tension, for a connection in a vertical configuration of 2 (two) pipe segments;
2. 2 (two) modules of 4-belt tensioners (i.e. quad-cartepillars), installed over the table on foundation structure;
3. Top module supporting a pipe deflector, a 10 t service crane and the 270 t winch (i.e. load transfer system).

The VLS system also allows the passage of previously connected and intermediate connections. Table 1 condenses the VLS capacities:

Maximum Pull (kN - t)	2648.7 - 270.0 (See note 1)
Maximum Break Capacity (kN - t)	3678.8 - 375.0 (See note 2)
Laying Speed Range (m/ s)	0 - 16/ 60
Diameter of the Tensioner Passage (m)	1.20
Gutter radius/width(m)	3.00/1.16
Maximum pipe <b>outside</b> diameter (mm - inch)	600 - 23.6
Minimum pipe <b>outside</b> diameter (mm - inch)	150 - 5.90 (See note 3)
Static Friction Coefficient (pipe - belt)	0.10

NOTES :

1. In quad mode, with a 100 t/ m clamping load;
2. In quad mode, with a 150 t/ m clamping load;
3. In quad mode. In a 2-belt mode, the minimum pipe diameter is 80 mm (3.1”).

### 1.2 - HORIZONTAL LAYING SPREAD 1 (HLS 1)

The horizontal laying spread permits handling of flexible pipes from 2.5” up to 4” (nominal diameter). Maximum capacity: 3 x 33.3 = 100t. See Figures 1,2,3 and 6.

The HLS 1 is located on the port side of the vessel, and its track is parallel to the Umbilical Laying Spread 1 (ULS 1).

The spread equipment permits 100T maximum dynamic laying tension. The flexible pipes can be deployed from a stern laying wheel of 6 m diameter and the laying tension is handled by 3 (three) tensioners with a maximum capacity of 33t each , located in a horizontal configuration, on the working deck.

The 1.2 m passage, in fully open position, permits the transfer of large end fittings or connectors. The distance adjacent tensioners is approximately 1.44 m.

The spread has been designed for a maximum pipe diameter of 4” (nominal diameter). However, in order to offer the best facilities during the pipe loading and transfer operations, the tensioners are able to handle a higher diameter pipe (up to 12” - nominal diameter), under reduced tension.

Maximum Pull (kN - t)	981 - 100 (See note 1)
Maximum Break Capacity (kN - t)	1471,5 – 150 (See note 2)
Laying Speed Range (m/min)	0 - 15
Diameter of the passage through tensioner(mm)	1200
Maximum pipe <b>outside</b> diameter (mm - inch)	220 - 8.7 (See note 3)
Minimum pipe <b>outside</b> diameter (mm - inch)	80 - 3.1
Static Friction Coefficient (pipe - belt)	0.10

**NOTES:**

1. \*With a 40 t/ m clamping load;
2. With a 60 t/ m clamping load;
3. Under a 75 t tension load. Under a tensile load of 25 t, the correspondent value is 350 mm (13.8”). In addition, for loading operation on shore or during transfer between storage baskets on board, the correspondent value is 400 mm (15.7”). The maximum pipe outside diameter versus tension is determined by the limit capacity of the safety clamp (pipe diameters < 220 mm) and the limit capacity of the chinese finger (for higher pipe diameters);

### 1.3 - HORIZONTAL LAYING SPREAD 2 (HLS 2)



The horizontal laying spread permits handling of flexible pipes from 2.5” up to 6” (nominal diameter) and Umbilical. Maximum capacity: 2 x 40 = 80T. See Figures 1,2,3 and 6.

The HLS 2 is located on the starboard side of the vessel, and its track is parallel to the Umbilical Laying Spread 1 (ULS 1).

The spread equipment permits 80T maximum dynamic laying tension. The flexible pipes can be deployed from a stern laying wheel of 6 m diameter and the laying tension is handled by 2 (three) tensioners with a maximum capacity of 40T each, located in a horizontal configuration, on the working deck.

The 1.2 m passage, in fully open position, permits the transfer of large end fittings or connectors. The distance adjacent tensioners is approximately 1.44 m.

The pipe is deployed and overboarded from a stern laying wheel with a similar system and methods as used for the HLS 1. The stern laying wheel has similar dimension and groove shape.

The transfer of intermediate connection, or end of line fittings, throughout the tensioner and the subsequent stern wheel overboarding, is performed with the help of a hold back collar fitted onto the connection and connected to a 80T winch, which holds the catenary tension and controls the transfer while the tensioners are opened to let the connection go through. The intermediate connections are performed on the deck area immediately before the tensioners entrance.

:

Maximum Pull (kN - t)	784,4- 80 (See note 1)
Maximum Break Capacity (kN - t)	1128,15 – 115(See note 2)
Laying Speed Range (m/ min)	0 - 15
Diameter of the passage through (mm)	1200
Maximum pipe <b>outside</b> diameter (mm - inch)	220 - 8.7 (See note 3)
Minimum pipe <b>outside</b> diameter (mm - inch)	80 - 3.1
Static Friction Coefficient (pipe - belt)	0.10

**NOTES :**

1. With a 40 t/ m clamping load;
2. With a 60 t/ m clamping load;
3. Under a 75 t tension load. Under a tensile load of 25 t, the correspondent value is 350 mm (13.8”). In addition, for loading operation on shore or during transfer between storage baskets on board, the correspondent value is 400 mm (15.7”). The maximum pipe outside diameter versus tension is determined by the limit capacity of the safety clamp (pipe diameters ≤ 220 mm) and the limit capacity of the chinese finger (for higher pipe diameters);

**1.4 - UMBILICAL WINCH LAYING SPREAD (ULS 1)**

Direct laying from a storage winch (rated for a maximum laying tension of 25 t at its outermost layer). Figures 2,3,6 and 9.

The umbilical is laid directly from the storage winch (see item 2.0 - FLEXIBLE PIPE AND UMBILICAL STORAGE). Table 4 condenses the ULS 1 capacities:

Maximum Pull (kN - t)	245.25 - 25.0
Maximum Break Capacity (kN - t)	318.83 - 32.5
Laying Speed Range (m/ s)	0 - 16/ 60

### 1.5 - UMBILICAL TENSIONER LAYING SPREAD (ULS-2)

Horizontal spread for umbilical. Maximum capacity:  $4 \times 7.5 = 25.0$  t. Figures 2,3,6 and 7.

The system is composed of 4 (four) individual 2-belts tensioners (bi-caterpillars), configured on line, over the working deck of the vessel. It is designed for deploying umbilical diameter from 2" up to 11.8" (outside diameter), with a laying tension up to 25. It can also recover umbilical within a range from 2" up to 11.8" (outside diameter).

The umbilical is laid by means of 4 (four) individual bi-caterpillars. The umbilical is stored into rotative basket 1 (see item 2.0 - FLEXIBLE PIPE AND UMBILICAL STORAGE). Table 5 condenses the ULS 2 capacities.

Maximum Pull (kN - t)	294.30 - 30.0 (See note 1)
Maximum radial clamping load (t/m)	10.0
Minimum radial clamping load (t/m)	5.0
Maximum Break Capacity (kN - t)	318.83 - 32.5
Laying Speed Range (m/ s)	0 - 16/ 60
Diameter of the Tensioner Passage (m)	0.5
Maximum umbilical <b>outside</b> diameter (mm - inch)	300 - 11.8
Minimum umbilical <b>outside</b> diameter (mm - inch)	50 - 2.0
Static Friction Coefficient (pipe - belt)	0.10

#### NOTES:

1. With maximum clamping load;

### 2.0 - FLEXIBLE PIPES AND UMBILICAL STORAGE

Flexible pipes and umbilicals are stored by 3 (three) storage and rotating baskets, and a storage reel (ULS 1). Table 6 condenses the characteristics of the 3 (three) baskets (for flexible pipes and umbilicals). Table 6-A condenses the storage capacity of the vessel (baskets and reel). Figures 1,2,3,4 and 5.

<b>Table 6 - Storage baskets characteristics</b>			
BASKET --->	Basket 1	Baskets 2 and 3 (Internal Partition) (See note 1)	Baskets 2 and 3 (External Partition) (See note 1)
<b>Application</b>	Umbilical up to 60 hoses and flexible pipe up to 4" (nominal diameter)	2.5 and 4" Flexible pipe (nominal diameter)	6" and up to 12" Flexible pipe (nominal diameter)
<b>Maximum Capacity (t)</b>	600	See note 2	
<b>Storage Volume (m<sup>3</sup>)</b>	350	See note 2	
<b>Storage Capacity (m)</b>	20,000(See note 3)	See Table 6-A	See Table 6-A
<b>Outside Storage Diameter (m)</b>	11	7	15
<b>Internal Storage Diameter (m)</b>	3	3	8.5
<b>Storage Height (m)</b>	4	5.5	5.5
<b>Rotation Speed (m/ s)</b>	16/ 60	16/ 60	16/ 60

**NOTES :**

1. Baskets 2 and 3 are divided into 2 (two) storage partitions (internal and external) for best operation and sequence flexibility, each partition being fitted with an individual spooling system;
2. Baskets 2 and 3 have a maximum capacity and a total storage volume of 1,500 t and 833 m<sup>3</sup>;
3. Referred to an umbilical with an outside diameter of 100 mm.

<b>Table 6-A - Storage capacity (m) of the vessel</b>						
Basket/ Winch	Maximum Capacity (t)	12" pipe (nominal diameter)	6" pipe (nominal diameter)	4" pipe (nominal diameter)	2.5" pipe (nominal diameter)	Umbilical (see note3 - Table 6)
<b>1</b>	600	---	---	11,000	20,000	20,000
<b>2 - External</b>	1,500	3,000	9,600	21,000	38,000	---
<b>2- Internal</b>		---	---	6,000	11,000	---
<b>3 - External</b>	1,500	3,000	9,600	21,000	38,000	---
<b>3 - Internal</b>		---	---	6,000	11,000	---
<b>S. Reel (see note 1)</b>	175	---	---	---	---	2 x 3,500

**NOTES:**

1. The storage reel can hold 2 (two) umbilicals segments, and a central separator arrangement is provided to store the two segment first end fittings.

**3.0 - FIGURES**

- FIGURE 1 HLS-1 AND HLS-2 DETAILS  
 FIGURE 2 SUNRISE 2000 TOP VIEW



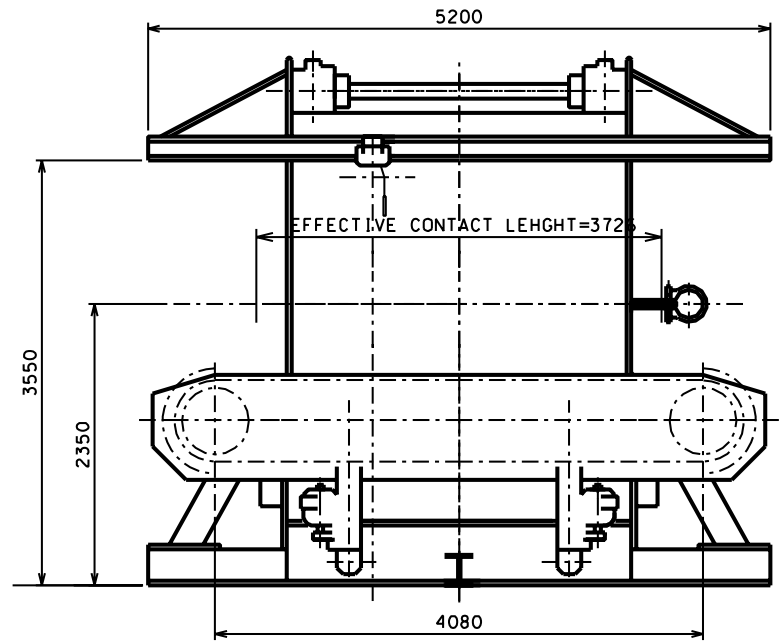
TECHNICAL SPECIFICATION	Nº: I-ET-3000.00-6600-941-PMU-002
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- FIGURE 3 SUNRISE 2000 PROFILE VIEW
- FIGURE 4 BASKET 2 AND 3 FLEXIBLE PIPES STORAGE
- FIGURE 5 BASKET 1 UMBILICALS STORAGE
- FIGURE 6 ULS-2,HLS-1,HL-2 AND VLS TENSIONER SHOES CHARACTERISTS
- FIGURE 7 ULS-2 DETAILS
- FIGURE 8 VLS DETAILS
- FIGURE 9 ULS-1 WINCH DETAILS
- FIGURE 10 FLEXIBLE PIPE AND UMBILICAL STERN LAYING WHEEL

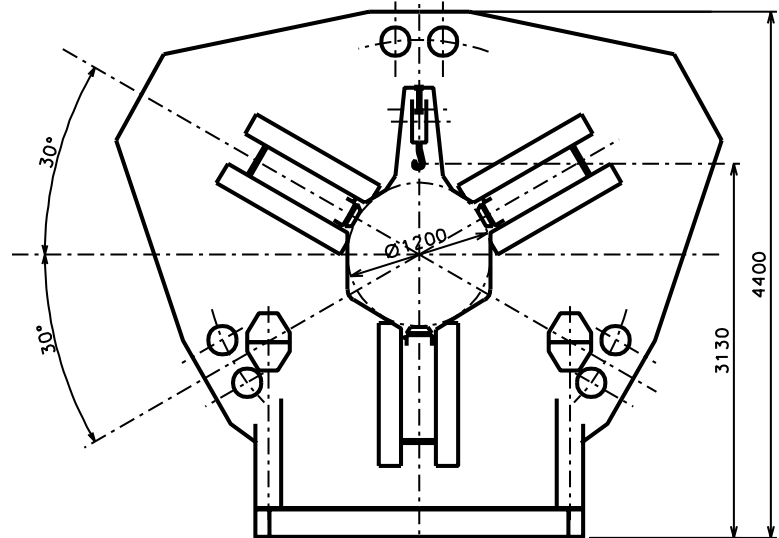
#### 4.0 - ATTACHMENTS

Attachment 1 - NOTA TÉCNICA No B – 065 – Rev 3 DIMENSÕES MÁXIMAS PARA ACESSÓRIOS DE LINHAS A SEREM LANÇADAS PELO PLSV CSO SUNRISE-2000.

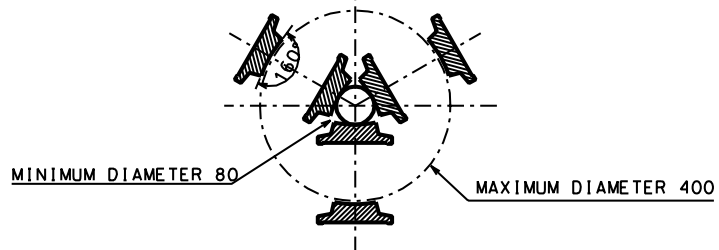




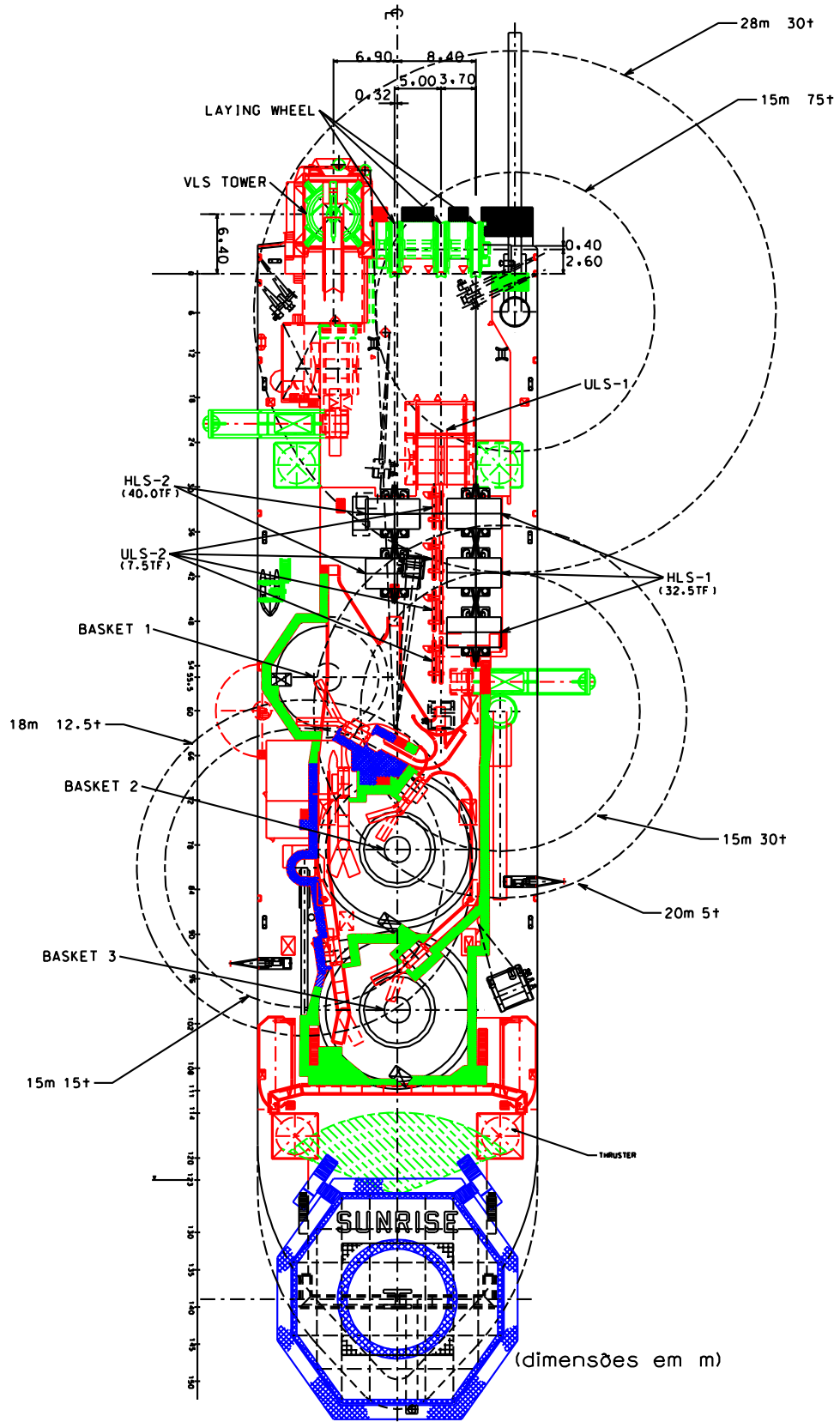
SIDE VIEW  
(dimensions em mm)



FRONT VIEW  
(dimensions em mm)



**FIGURE 1**  
**HLS-1 AND HLS-2 TENSIONER DETAILS**



**FIGURE 2**  
**SUNRISE TOP VIEW**

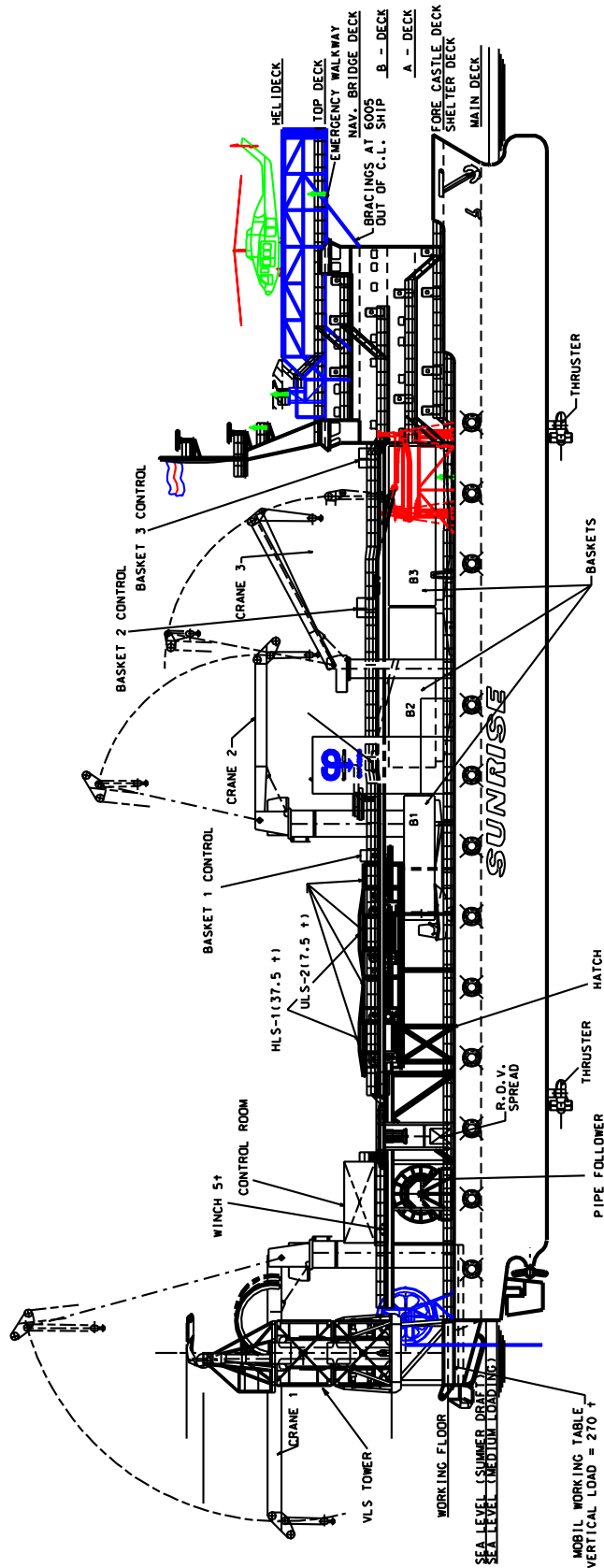
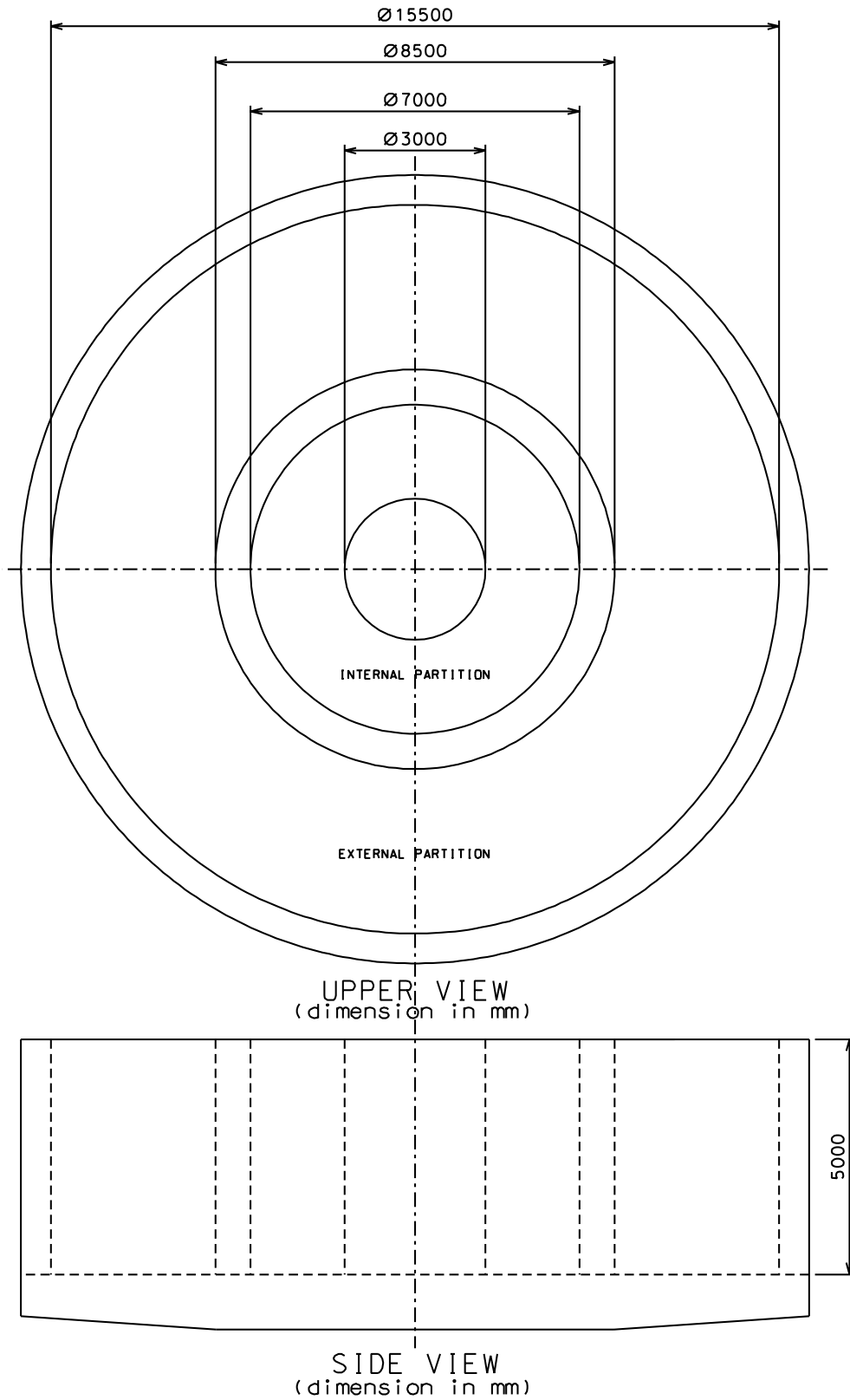
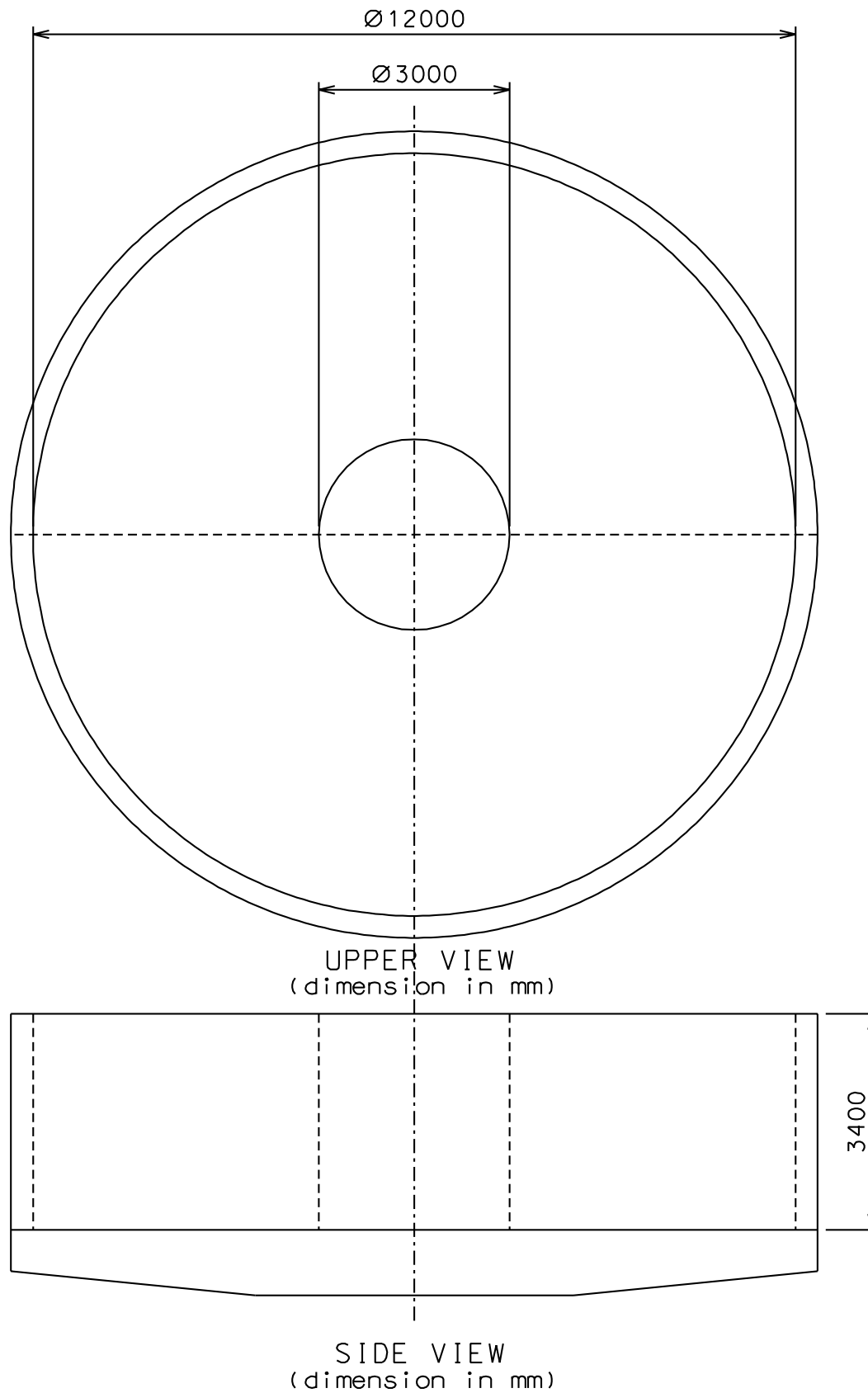


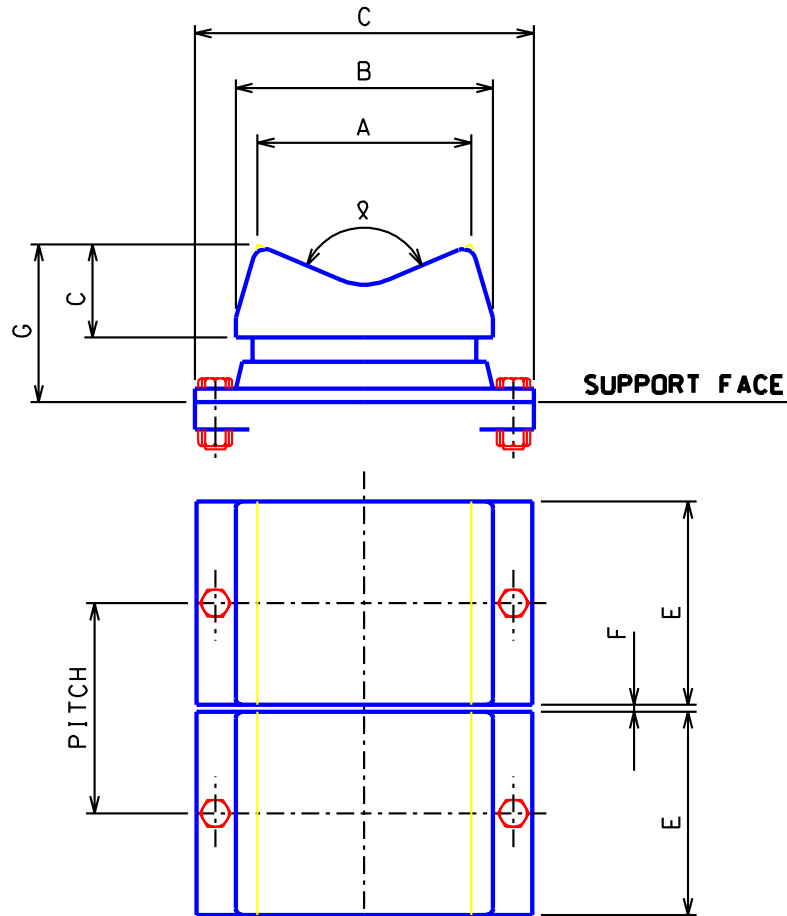
FIGURE 3  
SUNRISE PROFILE VIEW



**FIGURE 4**  
**BASKET 2 AND 3 – FLEXIBLE PIPES STORAGE**



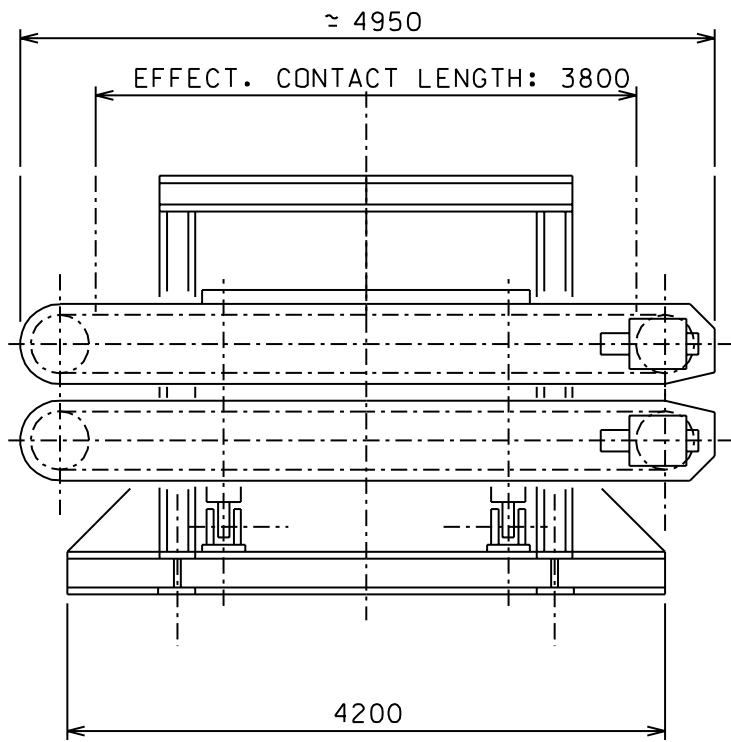
**FIGURE 5**  
**BASKET 1 UMBILICALS STORAGE**



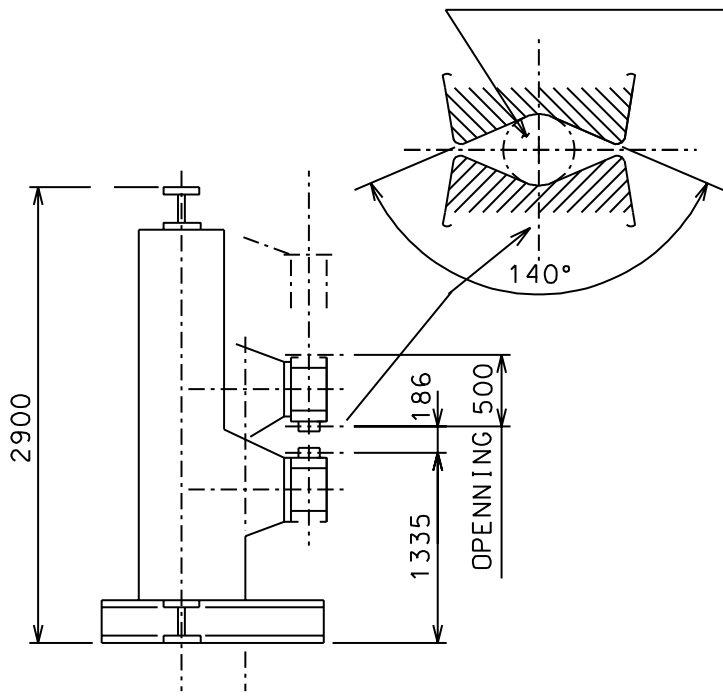
	ULS CATERPILLAR	HLS CATERPILLAR	VLS CATERPILLAR
$\alpha$	140°	160°	160°
A	126	98	128.6
B	134	178	190
C	42.9	58.1	49.5
D	134	160	244
E	73	116	155
F	3.2	4	5
G	71.9	101.1	87.5
PITCH	76.2	120	160
Ø MINI	50	80	80
Ø MAXI	300	400	600
CLAMPING LENGHT	3800	3500	3680
NB OF PADS CLAMPING	50	31	23
MAX CLAMP LOAD PER BELT (+/m)	10	40	100

REFERENCE COFLEXIP CK 50041-4-057 REV. A  
DIMENSIONS IN MILLIMETER

**FIGURE 6**  
**ULS-2,HLS-1,HLS-2 AND VLS TENSIONER SHOES CHARACTERISTS**

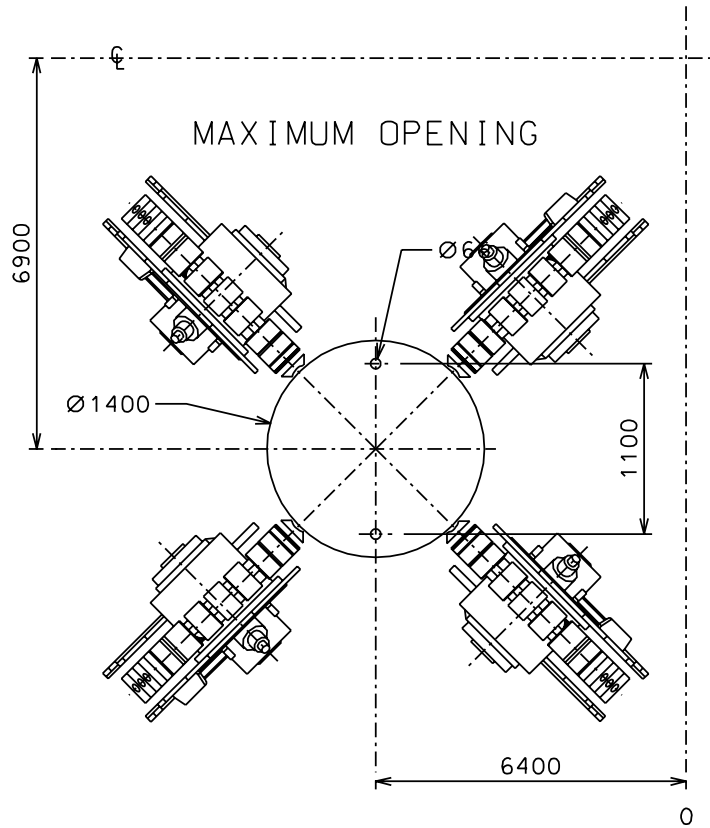


FLEXIBLE MINIMUM DIAM. 50  
 FLEXIBLE MAXIMUM DIAM. 300

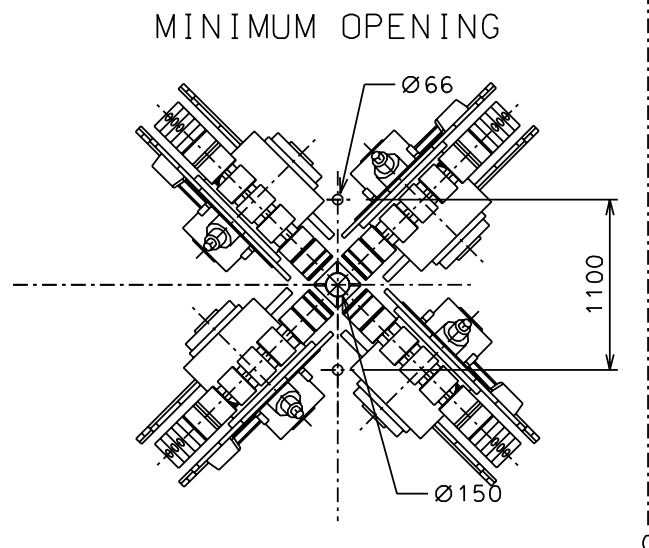


REFERENCE COFLEXIP CK 50041-4-047 REV. 1  
 (dimension in mm)

**FIGURE 7**  
**ULS-2 DETAILS**



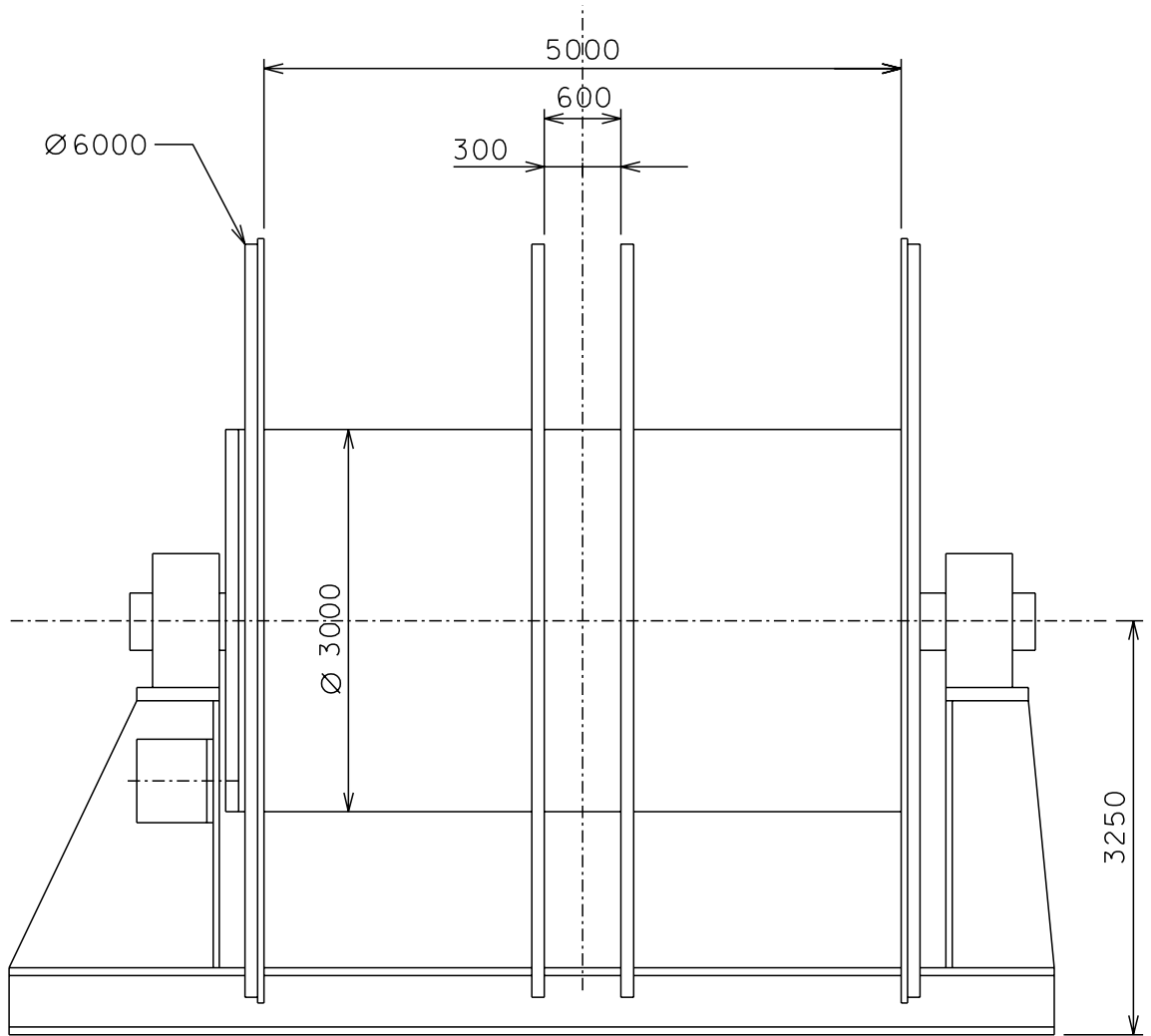
DIMENSIONS IN MILLIMETER  
 REFERENCE COFLEXIP CP 500 41-005 REV. 1



**FIGURE 8**  
**VLS DETAILS**

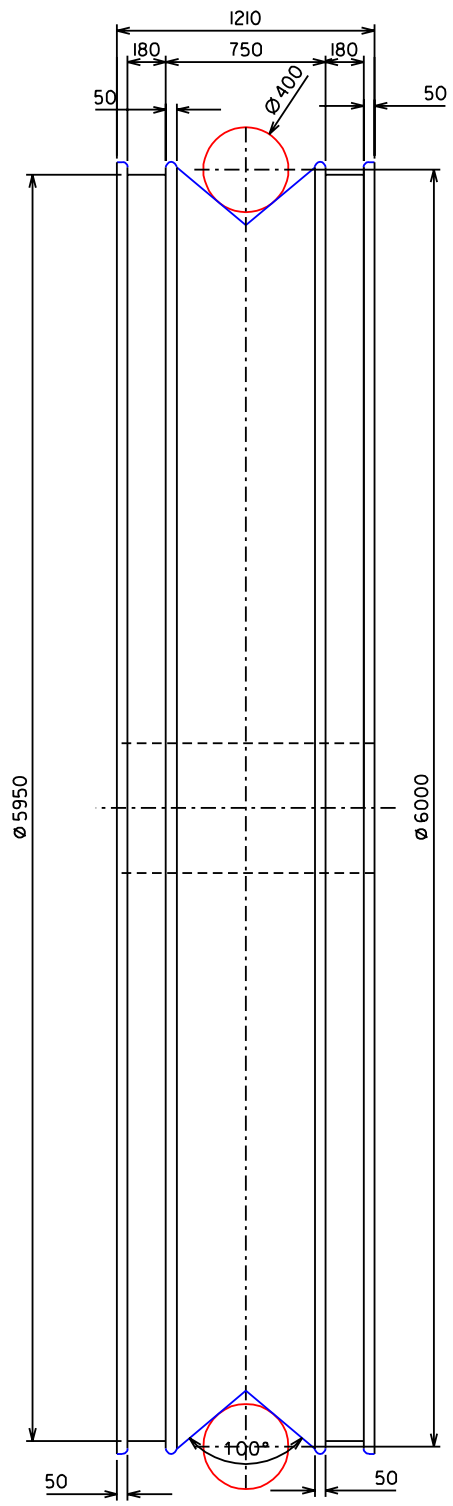


Maximum Pull at outermost layer(kN+TF)	245,25 – 23,00
Maximum Break Capacity(kN+TF)	318,83 – 32,50
Laying Speed Range(m/s)	0 – 16/60



UMBILICAL LAYING WINCH – ULS1 SPREAD  
 REFERENCE COFLEXIP CP 50041.2.036 REV. A  
 DIMENSIONS IN MILLIMETER

**FIGURE 9**  
**ULS-1 WINCH DETAIL**



**FIGURE 10**  
**FLEXIBLE PIPE AND UMBILICAL STERN LAYING WHEEL**

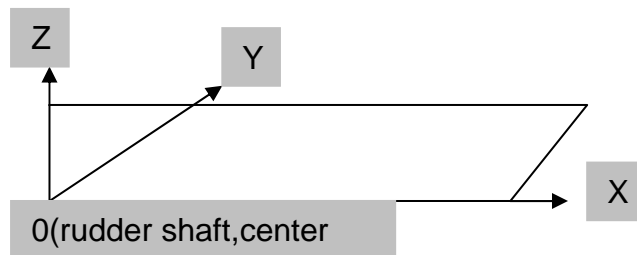
#### 4.0 - RAO AND PHASE ANGLES

RAO and Phase Angles curves attached.


- 1 The movements shown in the tables) are referred to the vessel SUNRISE 2000 at conditions of “Ballast,Arrival” (vessel draft of 5.29 m), and “Operation, Full Load” (vessel draft of 6.28 m), respectively;
- 2 The coordinate system for carrying out the movements has its origin in the vessel center of gravity (CG), which is positioned with the following coordinates:
  - \* Loading Condition 1 (Ballast, Arrival) - Vessel draft of 5.29 m - (57.39 ; 0.01 ; 7.12);
  - \* Loading Condition 2 (Operation, Full load) - Vessel draft of 6.28 m - (57.90 ; -0.14 ;8.75)
  - \* The origin of cartesian reference system is taken as the point situated at the Frame 0 (rudder shaft), at the center line and at the base line (keel), considering the following orientation for the coordinate axis: X is forward, Y is port and Z is upward.
- 3 Other remarkable points coordinates:
  - \* Coordinates of VLS Working Table Deck(to be considered as the top point of riser deployed by theVLS): (-6.40 ; -6.90 ; 10.1)
  - \* Coordinates for stern laying wheels:

Wheel nr. 1 (starboard) (-2.60 ; 8.39 ; 14.80) wheel radius=2.70m  
 Wheel nr. 2 (center)(-2.60 ; 4.70 ; 14.80) wheel radius=2.70m  
 Wheel nr. 3 (portside) (-2.60 ; -0.30 ; 14.80) wheel radius=2.70m

- \* The origin of cartesian reference system is taken as the point situated at the Frame 0 (rudder shaft), at the center line and at the base line (keel), considering the following orientation for the coordinate axis: X is forward, Y is port and Z is upward.



- \* A 0° wave incidence means waves coming from the stern towards the bow of the vessel;
- \* A 180° wave incidence means waves coming from the bow towards the stern of the vessel;

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**Calculation of Shipmotions by Program SEAWAY SUNRISE - calado de 5.29m**

**FREQUENCY CHARACTERISTICS OF BASIC MOTIONS      FORWARD SPEED = .00 kn**

**WAVE DIRECTION = +000 deg off stern**


WAVE	SQRT	ENC	SURGE	SURGE	SWAY	SWAY	HEAVE	HEAVE	ROLL	ROLL	PITCH	PITCH	YAW	YAW
FREQ	SL / WL	FREQ	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE
( r / s )	( - )	( r / s )	(m/m)	(deg)	(m/m)	(deg)	(m/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)
.200	.293	.200	1.107	270.2	.000	.0	.991	360.0	.000	.0	.255	91.5	.000	.0
.233	.331	.233	1.025	270.3	.000	.0	.985	359.9	.000	.0	.323	91.8	.000	.0
.267	.372	.267	.974	270.4	.000	.0	.976	359.8	.000	.0	.406	92.2	.000	.0
.300	.415	.300	.939	270.5	.000	.0	.963	359.7	.000	.0	.502	92.7	.000	.0
.333	.460	.333	.908	270.8	.000	.0	.944	359.5	.000	.0	.610	93.2	.000	.0
.367	.505	.367	.874	271.1	.000	.0	.918	359.3	.000	.0	.726	93.7	.000	.0
.400	.551	.400	.833	271.4	.000	.0	.884	358.9	.000	.0	.845	94.2	.000	.0
.433	.597	.433	.785	271.9	.000	.0	.840	358.5	.000	.0	.965	94.6	.000	.0
.467	.643	.467	.729	272.5	.000	.0	.787	357.8	.000	.0	1.079	95.1	.000	.0
.500	.689	.500	.665	273.2	.000	.0	.722	356.9	.000	.0	1.183	95.5	.000	.0
.533	.735	.533	.592	274.1	.000	.0	.646	355.6	.000	.0	1.268	95.8	.000	.0
.567	.781	.567	.513	275.3	.000	.0	.560	353.8	.000	.0	1.328	96.0	.000	.0
.600	.827	.600	.429	276.7	.000	.0	.463	351.3	.000	.0	1.353	96.1	.000	.0
.633	.873	.633	.342	278.8	.000	.0	.360	47.5	.000	.0	1.337	96.1	.000	.0
.667	.919	.667	.253	281.7	.000	.0	.252	341.0	.000	.0	1.272	96.0	.000	.0
.700	.965	.700	.168	286.8	.000	.0	.148	327.2	.000	.0	1.153	95.9	.000	.0
.733	1.011	.733	.090	298.9	.000	.0	.071	283.8	.000	.0	.980	95.9	.000	.0
.767	1.056	.767	.036	351.7	.000	.0	.090	213.0	.000	.0	.760	96.5	.000	.0
.800	1.102	.800	.062	65.0	.000	.0	.145	188.6	.000	.0	.508	99.5	.000	.0
.833	1.148	.833	.104	81.7	.000	.0	.179	177.6	.000	.0	.257	112.3	.000	.0
.867	1.194	.867	.132	88.5	.000	.0	.181	171.4	.000	.0	.122	180.7	.000	.0
.900	1.240	.900	.145	93.0	.000	.0	.155	168.9	.000	.0	.238	233.1	.000	.0
.933	1.286	.933	.141	96.8	.000	.0	.112	172.2	.000	.0	.343	245.4	.000	.0
.967	1.332	.967	.123	100.7	.000	.0	.069	187.8	.000	.0	.382	253.2	.000	.0
1.000	1.378	1.000	.094	105.6	.000	.0	.045	226.9	.000	.0	.366	262.9	.000	.0
1.033	1.424	1.033	.059	113.7	.000	.0	.047	268.5	.000	.0	.319	276.9	.000	.0
1.067	1.470	1.067	.024	137.8	.000	.0	.051	293.3	.000	.0	.269	296.7	.000	.0



**PETROBRAS**

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1.100	1.516	1.100	.019	240.6	.000	.0	.049	314.8	.000	.0	.234	321.3	.000	.0
1.133	1.562	1.133	.040	271.7	.000	.0	.044	341.7	.000	.0	.216	347.0	.000	.0
1.167	1.608	1.167	.053	282.5	.000	.0	.043	14.6	.000	.0	.202	11.1	.000	.0
1.200	1.654	1.200	.055	290.8	.000	.0	.048	43.6	.000	.0	.182	34.8	.000	.0
1.233	1.700	1.233	.048	299.9	.000	.0	.054	64.0	.000	.0	.155	61.9	.000	.0
1.267	1.745	1.267	.035	312.4	.000	.0	.055	78.8	.000	.0	.133	95.5	.000	.0
1.300	1.791	1.300	.021	332.5	.000	.0	.048	90.8	.000	.0	.131	133.2	.000	.0
1.333	1.837	1.333	.010	8.0	.000	.0	.034	101.4	.000	.0	.145	166.4	.000	.0
1.367	1.883	1.367	.003	88.8	.000	.0	.015	111.5	.000	.0	.160	193.0	.000	.0
1.400	1.929	1.400	.011	211.2	.000	.0	.008	304.1	.000	.0	.165	215.9	.000	.0
1.433	1.975	1.433	.029	238.2	.000	.0	.030	314.0	.000	.0	.158	238.1	.000	.0
1.467	2.021	1.467	.052	251.3	.000	.0	.050	325.1	.000	.0	.141	261.2	.000	.0
1.500	2.067	1.500	.077	259.5	.000	.0	.067	336.3	.000	.0	.119	286.4	.000	.0
1.533	2.113	1.533	.099	265.2	.000	.0	.079	347.1	.000	.0	.094	314.7	.000	.0
1.567	2.159	1.567	.114	269.3	.000	.0	.087	356.7	.000	.0	.070	348.9	.000	.0
1.600	2.205	1.600	.121	272.2	.000	.0	.089	4.4	.000	.0	.054	33.5	.000	.0
1.633	2.251	1.633	.119	274.0	.000	.0	.086	9.6	.000	.0	.053	81.9	.000	.0
1.667	2.297	1.667	.111	275.3	.000	.0	.080	11.7	.000	.0	.060	115.8	.000	.0
1.700	2.343	1.700	.100	276.9	.000	.0	.073	10.9	.000	.0	.059	134.4	.000	.0

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	CLIENT: E & P – SERV/US-SUB/ISBM	PAGE: 22 de 48
	TITLE: PLSV SUNRISE 2000 - TECHNICAL DATA AND RAO CURVES	


Calculation of Shipmotions by Program SEAWAY SUNRISE - calado de 5.29m														
FREQUENCY CHARACTERISTICS OF BASIC MOTIONS FORWARD SPEED = .00 kn														
WAVE DIRECTION = +090 deg off stern														
WAVE	SQRT	ENC	...SURGE	...SURGE	...SWAY	...SWAY	...HEAVE	...HEAVE	...ROLL	...ROLL	...PITCH	...PITCH	...YAW	...YAW
FREQ	SL / WL	FREQ	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE
(r / s)	(-)	(r / s)	(m/m)	(deg)	(m/m)	(deg)	(m/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)
.200	.293	.200	.000	138.9	1.112	270.0	1.001	359.9	.272	266.8	.001	144.1	.007	83.9
.233	.331	.233	.000	134.9	1.033	270.0	1.001	359.9	.351	266.1	.001	142.7	.009	82.9
.267	.372	.267	.000	130.7	.989	270.0	1.001	359.8	.448	265.4	.002	141.5	.011	81.8
.300	.415	.300	.000	126.4	.965	270.0	1.001	359.7	.567	264.7	.002	140.6	.014	80.6
.333	.460	.333	.000	121.0	.949	270.0	1.002	359.5	.709	263.8	.003	140.3	.018	78.9
.367	.505	.367	.000	117.1	.935	270.0	1.002	359.3	.877	262.9	.005	139.3	.023	77.3
.400	.551	.400	.000	113.2	.921	270.0	1.001	359.0	1.075	261.8	.006	138.2	.030	75.5
.433	.597	.433	.000	109.1	.906	270.0	1.000	358.6	1.307	260.6	.008	136.8	.038	73.3
.467	.643	.467	.000	104.1	.889	270.0	.999	358.1	1.585	258.9	.011	135.5	.048	71.4
.500	.689	.500	.000	99.9	.870	270.0	.996	357.5	1.929	257.1	.014	133.6	.064	67.5
.533	.735	.533	.000	95.6	.849	270.0	.992	356.8	2.371	255.0	.019	131.3	.087	63.0
.567	.781	.567	.000	91.3	.822	270.0	.986	355.9	3.001	252.8	.024	128.7	.138	59.3
.600	.827	.600	.000	86.4	.793	269.9	.978	354.8	3.886	248.6	.031	125.4	.195	52.7
.633	.873	.633	.000	81.1	.759	269.7	.968	353.6	5.243	240.6	.038	121.5	.283	41.3
.667	.919	.667	.000	75.2	.714	269.7	.953	352.0	7.228	224.5	.048	116.8	.407	19.1
.700	.965	.700	.000	68.8	.789	269.5	.934	350.1	6.557	204.9	.060	111.2	.514	295.8
.733	1.011	.733	.001	61.1	.839	272.8	.907	347.9	3.661	178.1	.073	104.5	.807	272.6
.767	1.056	.767	.001	52.4	.809	275.6	.872	345.4	2.424	157.8	.087	96.7	.754	270.7
.800	1.102	.800	.001	42.7	.769	276.1	.826	342.7	1.857	158.3	.101	87.7	.664	267.1
.833	1.148	.833	.001	32.0	.707	266.0	.768	340.0	2.917	179.4	.115	77.5	.707	230.4
.867	1.194	.867	.001	20.9	.607	262.5	.700	337.7	3.040	169.2	.124	66.9	.666	205.4
.900	1.240	.900	.001	9.8	.499	264.4	.626	336.2	2.696	155.4	.129	56.3	.550	180.4
.933	1.286	.933	.001	359.5	.439	270.6	.554	335.8	2.092	145.9	.129	46.3	.415	162.8
.967	1.332	.967	.001	350.2	.419	274.4	.488	336.7	1.561	145.4	.124	37.3	.329	159.8



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1.000	1.378	1.000	.001	342.5	.395	278.1	.432	338.5	1.161	145.5	.116	29.8	.258	153.9
1.033	1.424	1.033	.001	336.4	.371	280.7	.386	341.0	.859	149.3	.106	23.7	.209	150.8
1.067	1.470	1.067	.001	331.6	.343	282.2	.348	343.7	.654	156.9	.096	18.8	.186	149.5
1.100	1.516	1.100	.000	328.1	.315	284.0	.315	346.2	.500	168.5	.086	15.1	.161	149.1
1.133	1.562	1.133	.000	325.5	.286	285.7	.285	348.3	.405	184.3	.076	12.4	.141	149.7
1.167	1.608	1.167	.000	323.7	.255	287.3	.256	350.2	.362	201.9	.067	10.3	.125	150.9
1.200	1.654	1.200	.000	322.6	.222	289.0	.228	351.7	.355	217.4	.058	8.8	.116	151.9
1.233	1.700	1.233	.000	322.0	.190	291.1	.200	352.9	.366	229.4	.049	7.8	.105	153.8
1.267	1.745	1.267	.000	321.8	.158	293.9	.173	353.9	.379	238.0	.040	7.4	.095	156.2
1.300	1.791	1.300	.000	322.2	.127	297.6	.145	354.6	.387	243.8	.032	7.4	.087	159.0
1.333	1.837	1.333	.000	323.3	.096	303.2	.118	355.2	.386	247.8	.024	8.1	.081	161.3
1.367	1.883	1.367	.000	325.8	.068	312.8	.092	355.5	.375	250.4	.017	10.2	.074	164.6
1.400	1.929	1.400	.000	332.3	.046	331.6	.066	355.7	.353	252.1	.009	16.3	.068	168.2
1.433	1.975	1.433	.000	8.4	.035	7.3	.042	355.4	.322	252.8	.003	51.9	.062	172.1
1.467	2.021	1.467	.000	111.2	.040	45.2	.020	353.7	.282	252.5	.005	154.2	.057	175.7
1.500	2.067	1.500	.000	126.0	.055	65.4	.001	253.6	.235	251.0	.012	168.4	.052	180.1
1.533	2.113	1.533	.000	130.6	.070	75.6	.019	182.0	.183	247.5	.017	172.4	.048	184.8
1.567	2.159	1.567	.000	133.1	.084	81.4	.034	180.2	.129	239.7	.023	174.2	.044	189.1
1.600	2.205	1.600	.000	134.7	.095	85.1	.047	179.7	.080	220.0	.028	175.2	.040	193.9
1.633	2.251	1.633	.000	136.0	.103	87.7	.058	179.5	.059	171.1	.032	175.8	.037	198.7
1.667	2.297	1.667	.000	137.0	.108	89.6	.066	179.4	.088	129.2	.035	176.2	.034	203.3
1.700	2.343	1.700	.000	137.9	.109	91.1	.071	179.4	.136	113.2	.038	176.5	.030	207.3

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	TITLE: PLSV SUNRISE 2000 - TECHNICAL DATA AND RAO CURVES	

Calculation of Shipmotions by Program SEAWAY SUNRISE - calado de 5.29m														
FREQUENCY CHARACTERISTICS OF BASIC MOTIONS FORWARD SPEED = .00 kn														
WAVE DIRECTION = +120 deg off stern														
WAVE	SQRT	ENC	...SURGE	...SURGE	...SWAY	...SWAY..	..HEAVE	..HEAVE	...ROLL..	...ROLL..	...PITCH..	...PITCH	...YAW..	...YAW
FREQ	SL / WL	FREQ	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE
( r / s )	( - )	( r / s )	( m / m )	( deg )	( m / m )	( deg )	( m / m )	( deg )	( deg / m )	( deg )	( deg / m )	( deg )	( deg / m )	( deg )
.200	.293	.200	.558	89.9	.960	270.1	.998	359.9	.236	264.8	.127	269.3	.119	3.8
.233	.331	.233	.518	89.9	.891	270.1	.997	359.8	.303	263.6	.162	269.1	.142	4.3
.267	.372	.267	.496	89.9	.851	270.1	.995	359.8	.386	262.1	.204	268.9	.172	4.9
.300	.415	.300	.483	89.9	.827	270.2	.992	359.6	.488	260.5	.254	268.6	.210	5.5
.333	.460	.333	.474	89.9	.808	270.2	.987	359.5	.609	258.6	.311	268.2	.255	6.1
.367	.505	.367	.466	90.0	.791	270.3	.980	359.3	.751	256.5	.375	267.7	.306	7.0
.400	.551	.400	.456	90.1	.771	270.4	.971	359.0	.917	254.0	.444	267.1	.361	8.0
.433	.597	.433	.445	90.2	.747	270.5	.959	358.7	1.111	251.2	.519	266.4	.422	9.2
.467	.643	.467	.433	90.3	.720	270.6	.944	358.2	1.341	247.8	.597	265.5	.484	10.6
.500	.689	.500	.419	90.5	.688	270.8	.924	357.7	1.625	243.9	.678	264.4	.557	12.1
.533	.735	.533	.403	90.7	.651	271.0	.900	357.1	1.991	239.3	.761	263.2	.640	13.6
.567	.781	.567	.385	90.9	.602	271.6	.871	356.4	2.542	234.1	.844	261.7	.760	16.5
.600	.827	.600	.366	91.3	.552	272.0	.836	355.6	3.290	226.7	.925	260.0	.874	17.0
.633	.873	.633	.344	91.6	.497	272.5	.795	354.6	4.418	215.2	1.000	258.1	1.005	15.7
.667	.919	.667	.321	92.1	.440	274.2	.748	353.6	5.983	194.6	1.066	255.8	1.120	7.0
.700	.965	.700	.296	92.6	.516	274.5	.694	352.3	4.726	148.9	1.120	253.2	.904	329.7
.733	1.011	.733	.270	93.2	.497	282.7	.632	350.9	4.657	98.4	1.156	250.3	.825	328.5
.767	1.056	.767	.242	93.9	.387	289.9	.563	349.5	4.365	86.6	1.169	247.2	.769	355.8
.800	1.102	.800	.213	94.8	.284	295.6	.489	348.1	3.680	83.7	1.156	243.8	.824	17.8
.833	1.148	.833	.184	95.9	.292	317.0	.409	347.1	3.437	63.8	1.113	240.4	1.173	19.3
.867	1.194	.867	.155	97.3	.331	327.1	.329	347.1	3.166	43.7	1.044	237.3	1.407	15.5






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TITLE:	PLSV SUNRISE 2000 - TECHNICAL DATA AND RAO CURVES	

.900	1.240	.900	.126	99.2	.356	324.7	.252	348.8	2.639	22.2	.953	234.6	1.453	7.2
.933	1.286	.933	.098	101.8	.325	320.4	.185	353.7	2.059	6.0	.847	232.5	1.334	1.8
.967	1.332	.967	.072	106.1	.267	323.3	.131	3.3	1.677	.9	.734	231.1	1.213	2.8
1.000	1.378	1.000	.048	113.5	.212	325.3	.093	19.4	1.335	353.6	.621	230.4	1.068	2.9
1.033	1.424	1.033	.028	129.5	.161	330.7	.072	42.4	1.075	348.6	.512	230.2	.933	4.2
1.067	1.470	1.067	.017	170.3	.125	342.8	.064	67.6	.904	346.5	.409	230.5	.832	6.2
1.100	1.516	1.100	.019	221.3	.094	359.5	.065	88.9	.727	344.9	.315	230.9	.710	8.8
1.133	1.562	1.133	.027	244.0	.076	22.8	.067	104.7	.570	344.8	.228	231.1	.590	1.9
1.167	1.608	1.167	.033	254.6	.073	47.2	.069	116.3	.435	346.6	.149	230.8	.475	5.8
1.200	1.654	1.200	.037	261.3	.078	65.5	.069	125.2	.325	351.8	.079	228.5	.370	21.0
1.233	1.700	1.233	.037	266.8	.082	79.1	.066	132.1	.231	.5	.021	209.5	.269	28.5
1.267	1.745	1.267	.035	272.3	.083	89.2	.060	137.8	.161	14.9	.032	72.8	.181	40.6
1.300	1.791	1.300	.030	278.9	.080	97.4	.051	142.9	.118	36.2	.068	64.0	.115	63.4
1.333	1.837	1.333	.024	287.9	.073	104.7	.040	148.0	.099	60.9	.092	62.0	.087	102.5
1.367	1.883	1.367	.018	301.8	.063	112.9	.028	154.0	.087	82.8	.104	61.3	.096	139.5
1.400	1.929	1.400	.014	324.4	.051	122.8	.016	164.1	.075	102.9	.103	61.0	.115	160.8
1.433	1.975	1.433	.011	356.4	.039	136.5	.006	197.4	.062	127.0	.093	61.1	.129	173.9
1.467	2.021	1.467	.012	26.5	.028	157.4	.007	289.9	.056	160.0	.074	61.9	.131	183.8
1.500	2.067	1.500	.013	47.4	.022	188.3	.013	315.0	.064	193.2	.050	64.1	.124	193.5
1.533	2.113	1.533	.014	62.5	.022	221.1	.017	324.7	.083	213.6	.025	71.6	.109	204.2
1.567	2.159	1.567	.014	76.0	.024	245.4	.018	332.3	.101	224.2	.007	139.1	.091	217.4
1.600	2.205	1.600	.012	90.7	.026	263.1	.016	341.1	.111	229.6	.019	217.9	.073	234.6
1.633	2.251	1.633	.011	109.3	.025	278.0	.013	354.5	.110	232.0	.032	227.3	.060	256.6
1.667	2.297	1.667	.009	133.1	.024	292.9	.010	17.5	.096	232.4	.037	232.2	.052	281.5
1.700	2.343	1.700	.009	158.9	.021	309.9	.009	51.8	.072	230.5	.035	238.0	.047	305.8

 <b>PETROBRAS</b>	TECHNICAL SPECIFICATION	Nº: I-ET-3000.00-6600-941-PMU-002
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	TITLE: PLSV SUNRISE 2000 - TECHNICAL DATA AND RAO CURVES	


Calculation of Shipmotions by Program SEAWAY SUNRISE - calado de 5.29m														
FREQUENCY CHARACTERISTICS OF BASIC MOTIONS FORWARD SPEED = .00 kn														
WAVE DIRECTION = +150 deg off stern														
WAVE	SQRT	ENC	...SURGE	...SURGE	...SWAY	...SWAY	...HEAVE	...HEAVE	...ROLL	...ROLL	...PITCH	...PITCH	...YAW	YAW
FREQ	SL / WL	FREQ	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE
( r / s)	( -)	( r / s)	(m/m)	(deg)	(m/m)	(deg)	(m/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)
.200	.293	.200	.961	89.9	.551	270.1	.994	359.9	.136	263.3	.220	269.0	.118	3.4
.233	.331	.233	.890	89.8	.510	270.2	.989	359.8	.174	261.7	.280	268.7	.140	4.1
.267	.372	.267	.848	89.8	.485	270.2	.983	359.8	.221	259.8	.352	268.4	.170	4.8
.300	.415	.300	.820	89.8	.467	270.3	.972	359.6	.279	257.5	.437	267.9	.206	5.7
.333	.460	.333	.795	89.9	.452	270.4	.958	359.5	.346	255.0	.532	267.3	.248	6.7
.367	.505	.367	.769	90.0	.435	270.4	.938	359.3	.424	252.1	.637	266.6	.294	8.0
.400	.551	.400	.739	90.1	.415	270.5	.912	359.1	.513	248.9	.748	265.8	.342	9.6
.433	.597	.433	.704	90.4	.391	270.5	.879	358.9	.615	245.3	.862	264.8	.391	11.4
.467	.643	.467	.663	90.8	.363	270.3	.838	358.6	.733	241.3	.977	263.6	.438	13.4
.500	.689	.500	.616	91.2	.330	270.1	.788	358.4	.877	236.9	1.089	262.2	.487	15.9
.533	.735	.533	.564	91.9	.292	269.7	.728	358.2	1.060	232.0	1.193	260.6	.536	18.6
.567	.781	.567	.506	92.6	.242	269.0	.659	358.0	1.358	227.7	1.283	258.7	.601	23.7
.600	.827	.600	.444	93.7	.196	267.1	.581	358.2	1.716	221.4	1.353	256.5	.645	25.8
.633	.873	.633	.378	95.1	.151	263.9	.495	358.7	2.214	211.4	1.397	254.0	.679	25.5
.667	.919	.667	.311	97.1	.109	261.4	.402	.3	2.820	191.9	1.408	251.0	.678	19.8
.700	.965	.700	.243	99.9	.123	288.8	.307	3.8	3.268	130.4	1.379	247.6	.620	49.8
.733	1.011	.733	.177	104.6	.064	351.1	.217	12.1	3.979	110.9	1.304	243.8	.589	12.3
.767	1.056	.767	.116	113.2	.090	85.7	.144	31.7	3.264	116.7	1.181	239.5	.586	47.1
.800	1.102	.800	.065	133.6	.153	107.7	.119	67.8	2.592	124.5	1.013	234.9	.617	69.3
.833	1.148	.833	.043	186.4	.244	74.6	.146	96.4	2.695	91.8	.808	229.9	.965	58.3
.867	1.194	.867	.061	231.1	.268	65.2	.182	108.5	2.239	73.0	.582	224.9	1.029	51.9
.900	1.240	.900	.085	247.9	.234	58.3	.205	113.1	1.529	53.7	.353	220.1	.889	43.4
.933	1.286	.933	.102	256.0	.182	62.1	.208	115.0	.850	43.2	.143	215.9	.641	41.0
.967	1.332	.967	.108	261.4	.153	78.1	.192	116.3	.677	63.6	.033	27.3	.418	53.3



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1.000	1.378	1.000	.104	266.2	.132	91.1	.164	118.4	.226	106.8	.164	26.7	.260	73.5
1.033	1.424	1.033	.090	271.4	.116	103.2	.128	122.4	.268	144.4	.248	24.0	.193	110.5
1.067	1.470	1.067	.071	278.7	.101	115.2	.091	129.9	.341	155.2	.287	21.7	.221	114.5
1.100	1.516	1.100	.049	291.3	.081	128.1	.058	144.9	.351	159.6	.289	19.8	.258	164.2
1.133	1.562	1.133	.031	318.1	.060	145.2	.036	176.7	.318	161.4	.260	18.0	.276	176.2
1.167	1.608	1.167	.025	5.6	.043	172.6	.034	221.9	.255	162.3	.210	16.2	.268	185.1
1.200	1.654	1.200	.032	39.5	.039	210.5	.042	249.9	.178	164.3	.147	13.9	.237	193.4
1.233	1.700	1.233	.038	55.6	.043	241.9	.049	263.8	.092	168.7	.080	9.9	.181	203.4
1.267	1.745	1.267	.038	65.4	.049	261.3	.050	272.1	.020	209.7	.018	350.1	.117	219.7
1.300	1.791	1.300	.033	74.0	.050	274.3	.046	278.1	.050	318.4	.038	199.7	.066	258.2
1.333	1.837	1.333	.024	85.6	.045	284.9	.037	284.0	.086	323.8	.075	190.4	.070	318.0
1.367	1.883	1.367	.014	109.2	.035	296.6	.025	292.7	.097	322.6	.096	183.7	.100	346.5
1.400	1.929	1.400	.010	158.8	.021	315.4	.014	314.6	.088	316.4	.099	175.6	.116	359.9
1.433	1.975	1.433	.013	194.8	.012	3.7	.010	10.7	.069	301.6	.089	164.2	.109	9.2
1.467	2.021	1.467	.013	204.9	.014	65.3	.016	42.9	.057	273.9	.072	146.6	.081	19.3
1.500	2.067	1.500	.010	195.9	.019	90.0	.021	47.4	.064	246.8	.057	120.2	.041	40.1
1.533	2.113	1.533	.007	138.0	.019	104.1	.024	41.5	.079	237.0	.052	88.6	.024	135.4
1.567	2.159	1.567	.015	92.6	.013	120.4	.025	29.5	.092	239.9	.051	62.5	.057	177.7
1.600	2.205	1.600	.025	83.1	.006	177.9	.026	14.7	.103	250.5	.048	43.6	.081	189.5
1.633	2.251	1.633	.034	81.6	.012	259.6	.027	.9	.117	264.1	.037	28.2	.086	197.3
1.667	2.297	1.667	.039	82.9	.023	277.1	.028	350.8	.134	276.4	.021	9.5	.073	205.3
1.700	2.343	1.700	.040	85.9	.030	285.4	.028	345.2	.151	285.2	.007	301.7	.046	218.0

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Calculation of Shipmotions by Program SEAWAY SUNRISE - calado de 5.29m														
FREQUENCY CHARACTERISTICS OF BASIC MOTIONS FORWARD SPEED = .00 kn														
WAVE DIRECTION = +180 deg off stern														
WAVE	SQRT	ENC	...SURGE	...SURGE	...SWAY	...SWAY	...HEAVE	...HEAVE	...ROLL	...ROLL	...PITCH	...PITCH	...YAW	...YAW
FREQ	SL / WL	FREQ	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE
( r / s)	( - )	( r / s)	(m/m)	(deg)	(m/m)	(deg)	(m/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)
.200	.293	.200	1.107	89.8	.000	90.2	.991	359.9	.000	82.8	.254	268.8	.000	183.5
.233	.331	.233	1.024	89.8	.000	90.2	.985	359.8	.000	81.0	.323	268.5	.000	184.2
.267	.372	.267	.972	89.8	.000	90.3	.976	359.8	.000	78.9	.405	268.1	.000	185.0
.300	.415	.300	.936	89.8	.000	90.3	.963	359.7	.000	76.5	.502	267.6	.000	186.0
.333	.460	.333	.904	89.9	.000	90.4	.944	359.5	.000	73.7	.610	267.0	.000	187.2
.367	.505	.367	.868	90.0	.000	90.4	.918	359.4	.000	70.6	.727	266.2	.000	188.7
.400	.551	.400	.825	90.2	.000	90.4	.884	359.2	.000	67.2	.850	265.3	.000	190.4
.433	.597	.433	.775	90.5	.000	90.3	.841	359.1	.000	63.5	.973	264.2	.000	192.5
.467	.643	.467	.718	91.1	.000	89.9	.788	358.9	.000	59.5	1.094	262.9	.000	194.8
.500	.689	.500	.653	91.7	.000	89.4	.724	358.8	.000	55.3	1.206	261.3	.000	197.7



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.533	.735	.533	.581	92.6	.000	88.3	.649	358.9	.000	50.9	1.303	259.6	.000	201.0
.567	.781	.567	.503	93.8	.000	85.7	.564	359.3	.000	47.9	1.378	257.5	.000	207.3
.600	.827	.600	.420	95.5	.000	80.7	.471	.4	.000	43.1	1.422	255.1	.000	210.3
.633	.873	.633	.335	98.0	.000	71.2	.370	2.8	.000	35.2	1.429	252.3	.000	211.3
.667	.919	.667	.250	101.8	.000	57.0	.269	8.4	.000	18.4	1.389	249.0	.000	207.2
.700	.965	.700	.170	108.6	.000	128.1	.176	22.2	.000	312.4	1.299	245.3	.000	177.7
.733	1.011	.733	.099	123.9	.000	241.4	.120	55.9	.000	302.5	1.154	241.1	.000	204.2
.767	1.056	.767	.055	167.3	.000	283.1	.136	96.3	.000	315.1	.959	236.3	.000	240.2
.800	1.102	.800	.068	223.0	.000	297.7	.188	114.5	.000	327.3	.722	231.1	.000	265.4
.833	1.148	.833	.101	244.8	.000	272.3	.231	120.4	.000	294.4	.461	225.4	.000	254.0
.867	1.194	.867	.125	254.3	.000	267.1	.250	121.9	.000	282.3	.202	219.4	.000	251.9
.900	1.240	.900	.135	260.2	.000	266.2	.242	121.9	.000	277.6	.031	37.1	.000	251.3
.933	1.286	.933	.131	265.2	.000	274.3	.211	122.1	.000	297.1	.215	29.0	.000	265.0
.967	1.332	.967	.114	270.7	.000	290.3	.164	124.2	.000	330.5	.335	23.6	.000	302.3
1.000	1.378	1.000	.089	278.5	.000	303.0	.113	131.1	.000	342.0	.389	19.0	.000	330.9
1.033	1.424	1.033	.060	292.5	.000	317.2	.068	150.0	.000	346.2	.384	14.9	.000	



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														348.5
1.067	1.470	1.067	.038	323.7	.000	338.4	.048	192.0	.000	348.6	.332	11.4	.000	.1
1.100	1.516	1.100	.035	12.0	.000	8.0	.056	230.3	.000	349.9	.249	8.4	.000	9.4
1.133	1.562	1.133	.045	40.7	.000	43.1	.068	248.1	.000	351.7	.152	5.9	.000	18.9
1.167	1.608	1.167	.051	54.1	.000	70.1	.073	257.6	.000	4.5	.054	5.7	.000	31.8
1.200	1.654	1.200	.050	62.5	.000	87.3	.069	264.7	.000	144.0	.032	170.3	.000	58.8
1.233	1.700	1.233	.040	70.4	.000	100.1	.057	272.2	.000	152.4	.097	171.8	.000	116.9
1.267	1.745	1.267	.027	83.0	.000	111.9	.041	283.9	.000	150.3	.137	167.9	.000	158.1
1.300	1.791	1.300	.016	112.8	.000	127.3	.027	309.1	.000	142.3	.150	162.0	.000	175.1
1.333	1.837	1.333	.015	154.2	.000	162.0	.024	352.7	.000	124.0	.141	153.5	.000	184.9
1.367	1.883	1.367	.018	163.2	.000	230.4	.033	19.6	.000	87.8	.117	140.7	.000	194.0
1.400	1.929	1.400	.022	144.6	.000	265.2	.043	26.9	.000	56.7	.088	120.4	.000	214.2
1.433	1.975	1.433	.032	118.2	.000	283.3	.050	25.2	.000	46.3	.068	90.4	.000	345.8
1.467	2.021	1.467	.050	101.8	.000	338.7	.055	18.7	.000	49.8	.060	58.0	.000	5.7
1.500	2.067	1.500	.072	94.1	.000	85.9	.060	10.1	.000	65.2	.055	33.2	.000	12.3
1.533	2.113	1.533	.092	90.6	.000	97.6	.064	1.9	.000	87.5	.042	14.7	.000	16.7
1.567	2.159	1.567	.108	89.5	.000	102.4	.068	356.0	.000	104.6	.019	353.2	.000	21.0
1.600	2.205	1.600	.116	89.6	.000	105.1	.071	353.4	.000	112.4	.010	214.6	.000	27.6
1.633	2.251	1.633	.118	90.1	.000	106.1	.074	353.9	.000	113.0	.030	182.2	.000	152.8
1.667	2.297	1.667	.113	90.2	.000	105.2	.076	356.1	.000	108.4	.037	171.8	.000	199.8
1.700	2.343	1.700	.105	88.7	.000	101.2	.077	358.1	.000	100.0	.025	168.0	.000	205.5

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	CLIENT: E & P – SERV/US-SUB/ISBM	PAGE: 31 de 48
	TITLE: PLSV SUNRISE 2000 - TECHNICAL DATA AND RAO CURVES	

Calculation of Shipmotions by Program SEAWAY SUNRISE - calado de 6.28m														
FREQUENCY CHARACTERISTICS OF BASIC MOTIONS FORWARD SPEED = .00 kn														
WAVE DIRECTION = +000 deg off stern														
WAVE	SQRT	ENC	...SURGE	...SURGE	...SWAY	...SWAY	...HEAVE	...HEAVE	...ROLL	...ROLL	...PITCH	...PITCH	...YAW	...YAW
FREQ	SL / WL	FREQ	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE
( r / s )	( - )	( r / s )	(m/m)	(deg)	(m/m)	(deg)	(m/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)
.200	.293	.200	1.107	270.6	.000	.0	.991	359.9	.000	.0	.253	91.0	.000	.0
.233	.331	.233	1.024	270.8	.000	.0	.985	359.9	.000	.0	.321	91.3	.000	.0
.267	.372	.267	.974	271.0	.000	.0	.977	359.8	.000	.0	.403	91.6	.000	.0
.300	.415	.300	.940	271.4	.000	.0	.963	359.7	.000	.0	.499	91.9	.000	.0
.333	.460	.333	.911	271.8	.000	.0	.944	359.5	.000	.0	.606	92.3	.000	.0
.367	.505	.367	.877	272.3	.000	.0	.918	359.2	.000	.0	.721	92.6	.000	.0
.400	.551	.400	.837	272.9	.000	.0	.883	358.8	.000	.0	.840	92.9	.000	.0
.433	.597	.433	.789	273.7	.000	.0	.840	358.3	.000	.0	.959	93.1	.000	.0
.467	.643	.467	.734	274.5	.000	.0	.786	357.5	.000	.0	1.073	93.3	.000	.0
.500	.689	.500	.669	275.6	.000	.0	.720	356.6	.000	.0	1.176	93.4	.000	.0
.533	.735	.533	.596	276.9	.000	.0	.643	355.2	.000	.0	1.261	93.3	.000	.0



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.567	.781	.567	.516	278.4	.000	.0	.555	353.4	.000	.0	1.320	93.1	.000	.0
.600	.827	.600	.429	280.4	.000	.0	.456	350.8	.000	.0	1.345	92.7	.000	.0
.633	.873	.633	.340	283.2	.000	.0	.348	346.9	.000	.0	1.328	92.0	.000	.0
.667	.919	.667	.249	287.3	.000	.0	.235	340.5	.000	.0	1.259	91.1	.000	.0
.700	.965	.700	.162	294.5	.000	.0	.124	326.0	.000	.0	1.134	90.0	.000	.0
.733	1.011	.733	.085	312.2	.000	.0	.047	260.0	.000	.0	.951	88.8	.000	.0
.767	1.056	.767	.045	15.8	.000	.0	.100	186.6	.000	.0	.717	88.3	.000	.0
.800	1.102	.800	.079	69.4	.000	.0	.159	169.1	.000	.0	.454	90.9	.000	.0
.833	1.148	.833	.121	84.8	.000	.0	.185	159.3	.000	.0	.207	108.9	.000	.0
.867	1.194	.867	.148	92.3	.000	.0	.172	153.9	.000	.0	.141	187.2	.000	.0
.900	1.240	.900	.158	97.6	.000	.0	.134	153.8	.000	.0	.256	220.3	.000	.0
.933	1.286	.933	.150	102.3	.000	.0	.088	164.0	.000	.0	.325	230.2	.000	.0
.967	1.332	.967	.128	107.7	.000	.0	.058	193.2	.000	.0	.331	238.8	.000	.0
1.000	1.378	1.000	.094	115.0	.000	.0	.053	231.1	.000	.0	.298	251.1	.000	.0
1.033	1.424	1.033	.056	128.6	.000	.0	.056	256.0	.000	.0	.254	268.9	.000	.0
1.067	1.470	1.067	.024	174.7	.000	.0	.053	274.1	.000	.0	.222	292.0	.000	.0
1.100	1.516	1.100	.034	252.7	.000	.0	.044	295.6	.000	.0	.206	316.2	.000	.0
1.133	1.562	1.133	.055	276.2	.000	.0	.035	329.0	.000	.0	.194	338.4	.000	.0
1.167	1.608	1.167	.067	287.9	.000	.0	.036	9.3	.000	.0	.175	359.4	.000	.0
1.200	1.654	1.200	.067	298.1	.000	.0	.044	37.9	.000	.0	.146	22.3	.000	.0






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1.233	1.700	1.233	.056	309.9	.000	.0	.050	55.4	.000	.0	.116	52.0	.000	.0
1.267	1.745	1.267	.039	327.2	.000	.0	.050	67.9	.000	.0	.100	91.1	.000	.0
1.300	1.791	1.300	.023	359.2	.000	.0	.043	78.3	.000	.0	.107	130.2	.000	.0
1.333	1.837	1.333	.016	57.5	.000	.0	.029	87.9	.000	.0	.122	160.5	.000	.0
1.367	1.883	1.367	.018	115.1	.000	.0	.011	95.6	.000	.0	.132	185.0	.000	.0
1.400	1.929	1.400	.023	166.0	.000	.0	.009	295.5	.000	.0	.133	207.6	.000	.0
1.433	1.975	1.433	.035	207.9	.000	.0	.027	303.6	.000	.0	.126	230.5	.000	.0
1.467	2.021	1.467	.056	233.1	.000	.0	.044	314.9	.000	.0	.113	254.2	.000	.0
1.500	2.067	1.500	.080	247.8	.000	.0	.058	326.4	.000	.0	.097	278.6	.000	.0
1.533	2.113	1.533	.099	257.0	.000	.0	.068	337.2	.000	.0	.076	304.2	.000	.0
1.567	2.159	1.567	.110	262.8	.000	.0	.075	346.4	.000	.0	.053	335.4	.000	.0
1.600	2.205	1.600	.111	265.9	.000	.0	.077	353.1	.000	.0	.035	24.5	.000	.0
1.633	2.251	1.633	.103	266.5	.000	.0	.074	356.9	.000	.0	.038	81.5	.000	.0
1.667	2.297	1.667	.092	264.8	.000	.0	.069	357.5	.000	.0	.047	112.8	.000	.0
1.700	2.343	1.700	.081	262.1	.000	.0	.063	355.5	.000	.0	.045	126.4	.000	.0

	TECHNICAL SPECIFICATION	Nº: I-ET-3000.00-6600-941-PMU-002
	CLIENT: E & P – SERV/US-SUB/ISBM	PAGE: 34 de 48
	TITLE: PLSV SUNRISE 2000 - TECHNICAL DATA AND RAO CURVES	

Calculation of Shipmotions by Program SEAWAY SUNRISE - calado de 6.28m														
FREQUENCY CHARACTERISTICS OF BASIC MOTIONS FORWARD SPEED = .00 kn														
WAVE DIRECTION = +090 deg off stern														
WAVE	SQRT	ENC	...SURGE	...SURGE	...SWAY	...SWAY	...HEAVE	...HEAVE	...ROLL	...ROLL	...PITCH...	...PITC	...YAW..	..YAW.
FREQ	SL / WL	FREQ	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHAS E	AMPL	PHAS E
( r / s )	( - )	( r / s )	(m/m)	(deg)	(m/m)	(deg)	(m/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)
.200	.293	.200	.000	258.8	1.113	270.0	1.001	359.9	.275	266.0	.000	265.3	.002	74.9
.233	.331	.233	.000	217.1	1.034	270.0	1.001	359.8	.355	265.2	.000	228.3	.003	76.8
.267	.372	.267	.000	182.4	.990	270.0	1.001	359.8	.456	264.2	.000	196.8	.004	76.7
.300	.415	.300	.000	161.2	.965	270.0	1.001	359.6	.582	263.2	.001	179.1	.006	75.6
.333	.460	.333	.000	145.7	.949	270.0	1.003	359.4	.735	261.9	.002	169.6	.008	73.9
.367	.505	.367	.000	136.0	.936	270.0	1.004	359.1	.920	260.5	.002	163.2	.011	71.5
.400	.551	.400	.000	128.2	.922	270.0	1.004	358.8	1.145	258.7	.004	158.4	.015	68.5
.433	.597	.433	.000	121.3	.907	269.9	1.003	358.3	1.422	256.5	.006	154.6	.020	64.6
.467	.643	.467	.000	114.0	.890	269.9	1.003	357.7	1.773	253.5	.008	151.3	.027	60.7
.500	.689	.500	.000	108.0	.871	269.8	1.002	357.0	2.234	249.3	.011	147.9	.038	53.4
		.533	.000	102.3	.849	269.5	.999	356.1	2.867	242.9	.016		.055	



**PETROBRAS**

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CLIENT: E & P – SERV/US-SUB/ISBM	PAGE: 35 de 48
TITLE: PLSV SUNRISE 2000 - TECHNICAL DATA AND RAO CURVES	

.533	.735											144.3		43.5
.567	.781	.567	.000	96.7	.818	269.2	.996	355.0	3.752	232.3	.021	140.6	.087	32.0
.600	.827	.600	.000	90.5	.779	269.2	.990	353.6	4.837	214.5	.028	136.2	.131	9.2
.633	.873	.633	.000	83.8	.735	270.6	.981	351.8	5.421	187.7	.036	131.1	.173	336.3
.667	.919	.667	.000	76.4	.713	273.0	.968	349.7	4.680	161.2	.047	125.0	.180	302.4
.700	.965	.700	.000	68.1	.708	274.3	.948	346.9	3.544	144.3	.060	117.6	.180	273.9
.733	1.011	.733	.001	58.1	.692	274.8	.918	343.7	2.583	135.8	.075	108.6	.163	258.3
.767	1.056	.767	.001	46.5	.671	275.1	.873	340.0	1.920	132.5	.090	98.0	.149	247.3
.800	1.102	.800	.001	33.5	.645	275.5	.811	336.0	1.458	132.3	.105	85.8	.138	237.8
.833	1.148	.833	.001	19.4	.614	275.7	.729	332.1	1.151	133.7	.116	72.2	.125	222.9
.867	1.194	.867	.001	5.4	.583	276.1	.637	329.5	.895	137.0	.121	58.8	.121	213.4
.900	1.240	.900	.001	352.4	.552	276.5	.546	328.7	.691	142.2	.118	46.4	.117	205.6
.933	1.286	.933	.001	341.4	.519	277.1	.466	329.9	.524	149.9	.110	35.7	.113	199.8
.967	1.332	.967	.001	332.4	.488	277.9	.402	332.9	.370	162.3	.098	27.0	.098	199.8
1.000	1.378	1.000	.000	325.8	.455	278.6	.356	336.7	.289	181.9	.087	20.6	.093	197.2
1.033	1.424	1.033	.000	321.1	.421	279.2	.320	340.6	.263	205.8	.075	16.0	.088	195.6
1.067	1.470	1.067	.000	317.9	.386	279.8	.291	344.2	.283	227.4	.065		.085	



**PETROBRAS**

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TITLE:	PLSV SUNRISE 2000 - TECHNICAL DATA AND RAO CURVES	


												12.8		196.8
1.100	1.516	1.100	.000	316.0	.351	280.4	.266	347.2	.323	241.2	.055	10.8	.081	197.4
1.133	1.562	1.133	.000	315.0	.216	281.1	.242	349.5	.365	249.8	.047	9.7	.078	198.6
1.167	1.608	1.167	.000	314.8	.280	281.8	.219	351.3	.401	255.3	.039	9.3	.076	200.2
1.200	1.654	1.200	.000	315.5	.244	282.6	.195	352.8	.428	259.0	.031	9.7	.074	202.5
1.233	1.700	1.233	.000	317.2	.208	283.5	.170	353.9	.444	261.5	.024	11.1	.072	204.9
1.267	1.745	1.267	.000	320.5	.173	284.7	.146	354.7	.448	263.2	.017	14.2	.071	207.6
1.300	1.791	1.300	.000	328.0	.139	286.3	.121	355.3	.442	264.3	.011	21.3	.069	210.5
1.333	1.837	1.333	.000	351.4	.106	288.7	.097	355.8	.425	265.1	.005	44.3	.068	213.5
1.367	1.883	1.367	.000	67.5	.075	292.7	.073	356.0	.398	265.5	.004	120.0	.066	216.7
1.400	1.929	1.400	.000	103.4	.047	301.0	.051	356.0	.362	265.5	.009	155.5	.065	219.9
1.433	1.975	1.433	.000	113.7	.024	325.0	.029	355.3	.319	265.3	.013	165.3	.064	223.2
1.467	2.021	1.467	.000	118.6	.019	33.3	.010	351.0	.270	264.5	.018	169.5	.063	226.3
1.500	2.067	1.500	.000	121.5	.034	69.6	.008	186.8	.216	263.1	.023	171.9	.061	229.3
1.533	2.113	1.533	.000	123.6	.050	80.7	.023	181.2	.159	260.3	.026	173.3	.059	232.3
1.567	2.159	1.567	.000	125.4	.065	85.6	.036	180.2	.101	253.9	.029	174.4	.057	235.1
1.600	2.205	1.600	.000	126.9	.076	88.3	.047	179.9	.048	232.2	.032		.055	



**PETROBRAS**

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CLIENT: E & P – SERV/US-SUB/ISBM	PAGE: 37 de 48
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												175.1		237.7
1.633	2.251	1.633	.000	128.2	.084	90.1	.056	179.7	.037	146.9	.034	175.7	.053	240.2
1.667	2.297	1.667	.000	129.4	.089	91.3	.061	179.7	.081	113.1	.035	176.2	.050	242.4
1.700	2.343	1.700	.000	130.5	.091	92.2	.065	179.6	.128	104.7	.035	176.6	.046	244.5

	TECHNICAL SPECIFICATION	Nº: I-ET-3000.00-6600-941-PMU-002
	CLIENT: E & P – SERV/US-SUB/ISBM	PAGE: 38 de 48
	TITLE: PLSV SUNRISE 2000 - TECHNICAL DATA AND RAO CURVES	

Calculation of Shipmotions by Program SEAWAY SUNRISE - calado de 6.28m														
FREQUENCY CHARACTERISTICS OF BASIC MOTIONS FORWARD SPEED = .00 kn														
WAVE DIRECTION = +120 deg off stern														
WAVE	SQRT	ENC	...SURGE	...SURGE	..SWAY.	..SWAY..	...HEAVE	...HEAVE	...ROLL.	...ROLL.	...PITCH..	...PITCH	...YAW..	..YAW.
FREQ	SL / WL	FREQ	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE
( r / s )	( - )	( r / s )	(m/m)	(deg)	(m/m)	(deg)	(m/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)
.200	.293	.200	.557	89.7	.961	270.0	.999	359.9	.237	264.1	.127	269.7	.118	1.1
.233	.331	.233	.517	89.7	.892	270.0	.997	359.8	.306	262.7	.162	269.6	.140	1.5
.267	.372	.267	.494	89.6	.852	270.0	.995	359.7	.393	261.0	.204	269.3	.170	1.9
.300	.415	.300	.481	89.5	.828	270.1	.992	359.6	.500	259.1	.255	269.1	.206	2.3
.333	.460	.333	.470	89.5	.810	270.1	.988	359.4	.629	256.9	.312	268.7	.249	2.7
.367	.505	.367	.461	89.5	.793	270.1	.982	359.1	.783	254.3	.376	268.2	.297	3.1
.400	.551	.400	.450	89.5	.775	270.1	.973	358.8	.968	251.2	.446	267.6	.349	3.6
.433	.597	.433	.438	89.5	.753	270.1	.961	358.4	1.193	247.4	.521	266.8	.404	4.2
.467	.643	.467	.424	89.6	.727	270.0	.946	357.8	1.472	242.6	.600	265.9	.461	4.9
.500	.689	.500	.408	89.8	.698	269.9	.927	357.2	1.834	236.3	.683	264.8	.523	5.6
		.533	.391	90.0	.663		.903	356.4	2.322	227.5	.767	263.5	.592	6.1



**PETROBRAS**

TECHNICAL SPECIFICATION		Nº: I-ET-3000.00-6600-941-PMU-002	
CLIENT:	E & P – SERV/US-SUB/ISBM	PAGE:	39 de 48
TITLE:	PLSV SUNRISE 2000 - TECHNICAL DATA AND RAO CURVES		

.533	.735					269.8								
.567	.781	.567	.372	90.3	.616	269.7	.875	355.4	3.009	214.2	.852	261.8	.672	6.6
.600	.827	.600	.351	90.6	.563	270.3	.840	354.3	3.820	193.0	.934	259.9	.752	4.1
.633	.873	.633	.328	91.0	.512	272.9	.798	352.9	4.203	162.0	1.010	257.7	.783	359.2
.667	.919	.667	.304	91.6	.483	275.9	.749	351.2	3.556	130.1	1.077	255.0	.145	357.6
.700	.965	.700	.279	92.2	.457	277.4	.692	349.2	2.660	104.7	1.128	251.8	.721	.6
.733	1.011	.733	.252	92.9	.418	278.1	.626	347.0	1.923	87.8	1.158	248.2	.735	5.2
.767	1.056	.767	.225	93.8	.373	278.9	.549	344.5	1.426	74.3	1.158	244.3	.760	8.8
.800	1.102	.800	.197	94.9	.327	280.1	.464	342.2	1.087	61.8	1.125	240.3	.785	11.1
.833	1.148	.833	.168	96.2	.286	282.3	.374	340.6	.848	45.4	1.056	236.4	.817	11.3
.867	1.194	.867	.140	97.9	.242	285.1	.287	341.0	.717	30.3	.956	233.2	.832	11.9
.900	1.240	.900	.113	100.3	.199	288.6	.210	344.8	.638	16.4	.846	231.0	.833	12.5
.933	1.286	.933	.087	103.8	.157	292.7	.151	353.0	.574	4.8	.727	230.2	.813	13.0
.967	1.332	.967	.062	109.4	.114	294.2	.110	6.2	.468	354.4	.613	230.8	.745	13.7
1.000	1.378	1.000	.041	119.4	.076	300.6	.083	23.2	.412	345.6	.510	232.4	.688	14.4
1.033	1.424	1.033	.025	140.3	.043	314.6	.067	42.9	.357	338.8	.420	234.9	.620	15.4
1.067	1.470	1.067	.018	182.1	.019	4.9	.058	63.9	.290	334.4	.339	237.8	.538	



**PETROBRAS**

TECHNICAL SPECIFICATION		Nº: I-ET-3000.00-6600-941-PMU-002
CLIENT:	E & P – SERV/US-SUB/ISBM	PAGE: 40 de 48
TITLE:	PLSV SUNRISE 2000 - TECHNICAL DATA AND RAO CURVES	

														17.1
1.100	1.516	1.100	.021	221.1	.029	70.6	.053	85.0	.227	331.2	.266	240.7	.453	18.9
1.133	1.562	1.133	.027	240.6	.048	89.2	.053	103.8	.166	330.2	.199	243.6	.365	21.4
1.167	1.608	1.167	.031	251.0	.062	97.0	.053	118.9	.109	333.1	.136	246.6	.276	24.8
1.200	1.654	1.200	.033	258.3	.071	101.8	.054	130.4	.059	348.4	.080	250.4	.192	30.7
1.233	1.700	1.233	.032	264.4	.074	105.7	.052	139.2	.035	36.2	.030	260.2	.117	41.7
1.267	1.745	1.267	.029	270.8	.072	109.6	.048	146.3	.048	80.5	.015	40.1	.060	71.0
1.300	1.791	1.300	.025	278.5	.066	113.8	.042	152.4	.065	94.1	.046	60.7	.050	36.1
1.333	1.837	1.333	.020	289.2	.056	119.1	.034	158.5	.074	98.3	.067	64.9	.078	70.0
1.367	1.883	1.367	.015	305.4	.044	126.4	.024	165.8	.070	99.5	.078	67.3	.103	83.6
1.400	1.929	1.400	.011	330.6	.031	138.1	.015	177.8	.056	99.5	.079	69.5	.117	92.2
1.433	1.975	1.433	.010	2.6	.020	159.6	.007	208.9	.035	99.1	.071	72.4	.118	199.6
1.467	2.021	1.467	.010	30.2	.015	198.5	.006	280.3	.010	101.6	.057	76.9	.110	207.5
1.500	2.067	1.500	.011	50.1	.016	239.0	.010	314.5	.016	271.5	.040	85.6	.096	217.5
1.533	2.113	1.533	.011	65.9	.020	263.5	.012	328.9	.038	272.0	.024	106.7	.079	230.7
1.567	2.159	1.567	.011	81.3	.022	279.5	.013	340.0	.055	270.8	.016	157.1	.063	248.9
+														
1.600	2.205	1.600	.010	98.9	.022	293.2	.012	352.9	.062	269.4	.022	198.8	.052	






**PETROBRAS**

TECHNICAL SPECIFICATION	Nº: I-ET-3000.00-6600-941-PMU-002
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TITLE: PLSV SUNRISE 2000 - TECHNICAL DATA AND RAO CURVES	

														<b>272.3</b>
<b>1.633</b>	<b>2.251</b>	<b>1.633</b>	<b>.009</b>	<b>120.3</b>	<b>.021</b>	<b>307.5</b>	<b>.010</b>	<b>11.9</b>	<b>.061</b>	<b>268.1</b>	<b>.027</b>	<b>215.9</b>	<b>.046</b>	<b>297.8</b>
<b>1.667</b>	<b>2.297</b>	<b>1.667</b>	<b>.008</b>	<b>143.9</b>	<b>.019</b>	<b>324.0</b>	<b>.009</b>	<b>39.7</b>	<b>.051</b>	<b>267.0</b>	<b>.029</b>	<b>226.0</b>	<b>.043</b>	<b>321.7</b>
<b>1.700</b>	<b>2.343</b>	<b>1.700</b>	<b>.008</b>	<b>166.0</b>	<b>.018</b>	<b>343.1</b>	<b>.009</b>	<b>69.4</b>	<b>.034</b>	<b>267.0</b>	<b>.025</b>	<b>236.4</b>	<b>.040</b>	<b>343.8</b>

 <b>PETROBRAS</b>	TECHNICAL SPECIFICATION	Nº: I-ET-3000.00-6600-941-PMU-002	
	CLIENT:	E & P – SERV/US-SUB/ISBM	PAGE: 42 de 48
	TITLE:	PLSV SUNRISE 2000 - TECHNICAL DATA AND RAO CURVES	

**Calculation of Shipmotions by Program SEAWAY SUNRISE - calado de 6.28m**

**FREQUENCY CHARACTERISTICS OF BASIC MOTIONS**      **FORWARD SPEED = .00 kn**

**WAVE DIRECTION = +150 deg off stern**

WAVE	SQRT	ENC	...SURGE	...SURGE	..SWAY.	..SWAY.	...HEAVE	...HEAVE	...ROLL.	...ROLL.	...PITCH..	...PITCH..	...YAW..	...YAW..
FREQ	SL / WL	FREQ	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE
( r / s )	( - )	( r / s )	(m/m)	(deg)	(m/m)	(deg)	(m/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)
.200	.293	.200	.960	89.5	.553	270.0	.994	359.9	.136	262.7	.220	269.4	.118	1.1
.233	.331	.233	.888	89.4	.511	270.1	.989	359.8	.176	260.9	.280	269.2	.139	1.5
.267	.372	.267	.844	89.3	.486	270.1	.983	359.7	.225	258.7	.352	268.9	.168	1.9
.300	.415	.300	.813	89.2	.469	270.1	.973	359.6	.284	256.2	.436	268.5	.203	2.3
.333	.460	.333	.786	89.1	.455	270.1	.958	359.4	.355	253.3	.532	268.0	.244	2.8
.367	.505	.367	.757	89.1	.439	270.1	.938	359.2	.437	249.9	.637	267.4	.288	3.4
.400	.551	.400	.723	89.2	.421	270.0	.912	358.9	.532	245.9	.749	266.6	.333	4.1
.433	.597	.433	.684	89.3	.400	270.0	.878	358.6	.644	241.1	.864	265.7	.379	4.9
.467	.643	.467	.639	89.8	.374	269.7	.837	358.2	.777	235.4	.980	264.5	.423	5.8
.500	.689	.500	.589	90.3	.345	269.5	.786	357.7	.941	228.1	1.092	263.2	.466	6.7



**PETROBRAS**

TECHNICAL SPECIFICATION		Nº: I-ET-3000.00-6600-941-PMU-002
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TITLE:	PLSV SUNRISE 2000 - TECHNICAL DATA AND RAO CURVES	


.533	.735	.533	.534	91.0	.310	269.1	.725	357.3	1.153	218.2	1.197	261.5	.506	7.7
.567	.781	.567	.474	92.0	.268	268.4	.654	356.8	1.439	204.6	1.288	259.6	.540	9.1
.600	.827	.600	.411	93.4	.224	268.5	.573	356.5	1.738	182.8	1.359	257.3	.565	8.4
.633	.873	.633	.346	95.4	.182	270.6	.483	356.6	1.799	151.4	1.402	254.6	.555	7.1
.667	.919	.667	.281	98.2	.148	272.6	.386	357.6	1.419	119.2	1.409	251.4	.516	9.1
.700	.965	.700	.216	102.3	.110	273.3	.285	.7	1.055	93.8	1.374	247.6	.497	14.6
.733	1.011	.733	.155	109.1	.071	270.1	.190	10.0	.693	79.5	1.288	243.3	.478	19.5
.767	1.056	.767	.102	121.8	.034	259.7	.121	35.8	.435	70.4	1.149	238.6	.451	23.4
.800	1.102	.800	.064	148.8	.011	176.5	.116	77.5	.250	63.1	.962	233.6	.414	26.4
.833	1.148	.833	.054	194.2	.029	103.2	.155	99.3	.154	32.5	.739	228.6	.387	26.7
.867	1.194	.867	.069	226.3	.054	99.4	.188	106.2	.078	13.0	.503	224.6	.331	29.8
.900	1.240	.900	.086	241.8	.073	100.0	.199	108.5	.018	307.9	.280	223.4	.260	34.7
.933	1.286	.933	.096	250.8	.084	102.2	.189	110.1	.063	205.7	.095	236.0	.178	43.6
.967	1.332	.967	.097	257.5	.083	106.2	.164	112.7	.132	203.1	.070	354.9	.085	63.4
1.000	1.378	1.000	.089	263.9	.079	108.7	.133	117.5	.155	192.7	.160	14.1	.059	131.6
1.033	1.424	1.033	.075	271.7	.069	111.9	.102	125.1	.162	183.6	.213	18.3	.106	172.0
1.067	1.470	1.067	.056	283.4	.053	116.7	.073	136.7	.154	176.3	.233	21.1	.152	185.1
1.100	1.516	1.100	.039	304.0	.034	124.7	.050	154.6	.130	167.9	.228	23.7	.179	191.1
1.133	1.562	1.133	.030	338.8	.016	148.2	.034	183.4	.096	157.4	.205	26.4	.183	195.0



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1.167	1.608	1.167	.032	13.9	.012	233.0	.029	222.3	.059	140.5	.167	28.9	.165	198.4
1.200	1.654	1.200	.037	35.3	.024	268.2	.033	254.0	.030	99.9	.121	31.5	.129	202.5
1.233	1.700	1.233	.038	48.0	.034	277.9	.037	273.0	.031	31.2	.071	34.9	.080	208.9
1.267	1.745	1.267	.034	57.9	.037	282.7	.039	284.7	.044	359.9	.022	48.2	.030	231.9
1.300	1.791	1.300	.026	69.1	.035	286.0	.037	292.8	.049	341.3	.023	190.0	.029	346.8
1.333	1.837	1.333	.017	89.0	.027	288.9	.031	299.8	.045	320.5	.054	198.9	.063	8.1
1.367	1.883	1.367	.011	136.0	.016	292.2	.023	308.1	.039	289.6	.072	197.5	.082	14.2
1.400	1.929	1.400	.013	181.9	.004	303.8	.013	325.0	.042	254.0	.075	192.4	.082	17.9
1.433	1.975	1.433	.017	197.8	.007	106.8	.008	11.7	.053	232.3	.067	182.8	.063	21.2
1.467	2.021	1.467	.016	199.6	.013	112.1	.011	54.0	.062	224.7	.053	165.6	.033	26.6
1.500	2.067	1.500	.012	186.8	.015	115.6	.015	62.1	.063	228.5	.042	136.6	.005	152.2
1.533	2.113	1.533	.010	140.8	.011	120.4	.017	56.2	.060	244.3	.041	103.0	.036	198.0
1.567	2.159	1.567	.016	99.7	.004	141.8	.019	42.6	.066	269.1	.044	79.4	.058	202.6
1.600	2.205	1.600	.024	87.9	.007	281.0	.021	26.2	.084	289.1	.043	65.2	.065	205.8
1.633	2.251	1.633	.031	86.1	.016	291.4	.023	12.3	.108	299.3	.034	56.0	.058	209.1
1.667	2.297	1.667	.034	88.5	.022	295.3	.025	3.3	.126	303.2	.019	49.7	.040	213.8
1.700	2.343	1.700	.034	93.9	.024	298.0	.025	359.2	.136	303.1	.003	48.5	.016	225.5

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Calculation of Shipmotions by Program SEAWAY SUNRISE - calado de 6.28m														
FREQUENCY CHARACTERISTICS OF BASIC MOTIONS FORWARD SPEED = .00 kn														
WAVE DIRECTION = +180 deg off stern														
WAVE	SQRT	ENC	...SURGE	...SURGE	..SWAY.	..SWAY.	...HEAVE	...HEAVE	...ROLL.	...ROLL.	...PITCH..	...PITCH	...YAW..	..YAW.
FREQ	SL / WL	FREQ	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE	AMPL	PHASE
( r / s )	( - )	( r / s )	(m/m)	(deg)	(m/m)	(deg)	(m/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)	(deg/m)	(deg)
.200	.293	.200	1.105	89.5	.000	90.1	.991	359.9	.000	82.2	.254	269.3	.000	181.2
.233	.331	.233	1.020	89.3	.000	90.1	.985	359.8	.000	80.2	.322	269.0	.000	181.6
.267	.372	.267	.967	89.2	.000	90.1	.976	359.7	.000	77.9	.405	268.7	.000	182.0
.300	.415	.300	.928	89.1	.000	90.1	.963	359.6	.000	75.2	.501	268.3	.000	182.5
.333	.460	.333	.891	89.0	.000	90.1	.944	359.4	.000	72.0	.610	267.7	.000	183.0
.367	.505	.367	.851	89.0	.000	90.1	.917	359.2	.000	68.3	.727	267.0	.000	183.6
.400	.551	.400	.804	89.1	.000	90.0	.883	359.0	.000	64.0	.850	266.2	.000	184.4
.433	.597	.433	.750	89.4	.000	89.9	.839	358.7	.000	59.0	.974	265.2	.000	185.2
.467	.643	.467	.688	90.0	.000	89.5	.785	358.4	.000	53.0	1.096	263.9	.000	186.2
.500	.689	.500	.619	90.8	.000	89.1	.719	358.1	.000	45.5	1.208	262.5	.000	187.3
		.533	.544	91.9	.000	88.5	.643	357.9	.000	35.6	1.305	260.7	.000	



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.533	.735													188.5
.567	.781	.567	.465	93.5	.000	87.2	.555	357.9	.000	22.5	1.381	258.6	.000	190.2
.600	.827	.600	.383	95.9	.000	86.4	.458	358.5	.000	1.4	1.424	256.2	.000	190.3
.633	.873	.633	.300	99.4	.000	87.0	.353	.4	.000	331.1	1.428	253.2	.000	190.1
.667	.919	.667	.221	105.2	.000	86.2	.245	5.7	.000	301.0	1.384	249.8	.000	193.0
.700	.965	.700	.148	115.5	.000	80.2	.148	21.9	.000	279.3	1.286	245.8	.000	199.1
.733	1.011	.733	.091	137.5	.000	40.3	.103	66.9	.000	274.2	1.129	241.2	.000	204.3
.767	1.056	.767	.067	180.8	.000	319.7	.144	105.6	.000	290.0	.918	236.1	.000	208.8
.800	1.102	.800	.082	219.3	.000	300.6	.204	116.8	.000	344.6	.666	230.8	.000	213.2
.833	1.148	.833	.105	238.2	.000	289.1	.242	118.6	.000	23.5	.396	226.1	.000	215.7
.867	1.194	.867	.119	248.5	.000	287.4	.249	117.8	.000	22.7	.142	227.2	.000	225.7
.900	1.240	.900	.122	255.9	.000	288.4	.226	117.0	.000	16.7	.079	10.4	.000	253.4
.933	1.286	.933	.113	262.9	.000	291.1	.185	118.0	.000	11.5	.227	19.1	.000	318.8
.967	1.332	.967	.094	271.5	.000	294.2	.135	122.7	.000	10.9	.310	17.6	.000	357.2
1.000	1.378	1.000	.071	284.8	.000	299.2	.090	134.4	.000	4.0	.334	16.3	.000	7.6
1.033	1.424	1.033	.050	308.6	.000	309.9	.057	158.8	.000	355.6	.313	16.0	.000	12.7
1.067	1.470	1.067	.042	345.3	.000	351.5	.045	197.8	.000		.261	16.9	.000	



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										345.0				17.0
1.100	1.516	1.100	.046	16.3	.000	72.3	.048	231.2	.000	318.0	.193	19.5	.000	20.4
1.133	1.562	1.133	.052	33.8	.000	92.1	.055	251.6	.000	242.1	.120	25.1	.000	24.5
1.167	1.608	1.167	.051	44.7	.000	98.7	.057	265.3	.000	199.4	.052	43.5	.000	30.0
1.200	1.654	1.200	.043	54.0	.000	102.2	.054	276.3	.000	181.1	.032	137.1	.000	120.1
1.233	1.700	1.233	.029	67.1	.000	103.8	.047	286.6	.000	165.2	.072	171.3	.000	183.7
1.267	1.745	1.267	.017	99.7	.000	104.0	.037	299.2	.000	140.1	.102	176.5	.000	191.1
1.300	1.791	1.300	.017	155.2	.000	99.3	.026	319.9	.000	97.5	.114	175.3	.000	193.5
1.333	1.837	1.333	.024	174.8	.000	305.5	.021	355.5	.000	63.2	.109	169.9	.000	193.7
1.367	1.883	1.367	.028	171.2	.000	294.1	.025	26.9	.000	49.7	.091	158.8	.000	188.9
1.400	1.929	1.400	.030	152.5	.000	291.2	.033	38.7	.000	48.7	.071	139.0	.000	49.9
1.433	1.975	1.433	.037	126.6	.000	281.6	.040	38.6	.000	59.0	.058	109.4	.000	27.2
1.467	2.021	1.467	.051	108.0	.000	124.4	.045	32.4	.000	82.3	.055	79.9	.000	24.5
1.500	2.067	1.500	.068	99.0	.000	118.2	.051	23.5	.000	107.3	.053	59.3	.000	23.1
1.533	2.113	1.533	.083	95.9	.000	116.5	.057	15.0	.000	121.1	.042	45.8	.000	21.4
1.567	2.159	1.567	.093	96.5	.000	115.2	.062	8.9	.000	125.4	.022	35.6	.000	17.5
1.600	2.205	1.600	.098	99.4	.000	113.8	.066	6.0	.000		.002	226.6	.000	



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										124.2				354.8
1.633	2.251	1.633	.099	103.3	.000	111.7	.068	6.1	.000	119.4	.021	205.7	.000	231.1
1.667	2.297	1.667	.097	106.5	.000	108.4	.068	8.2	.000	112.3	.030	202.5	.000	219.0
1.700	2.343	1.700	.092	107.0	.000	103.1	.067	10.6	.000	104.3	.023	209.8	.000	217.3