

Kongsberg Underwater Technologies
Lynnwodd, WA,

98110 Lynnwood

Attn.: Ned Eliassen

YOUR REF.:

OUR REF.:

0404143-05000436

DATE:

Stavanger, 11 March 2005

DIMENSIONAL SURVEY.

R/V KILO MOANA.

**EM120 TX/RX, EM1002, EA-500, HPR POSITION, WATERLINE, IMU,
GRANITE BLOCK, ANTENNAS, REFERENCE POINTS.
SURVEYED IN BRISBANE, WEEK 9 - 2005.**

Please find enclosed our report concerning the subject above.

In the report we have given a recommendation that the point number markings for the coordinate reference points in the sonar room should be refreshed.

We suggest that You too should highlight that for the ship owners
These reference marks can be very useful in the future.

Yours sincerely
for Blom Maritime AS

Odd Rune Olden

Encl. : Dimensional survey report, doc. No. 0404143-005000261

DOCUMENT TITLE DIMENSIONAL SURVEY <u>R/V KILO MOANA.</u> EM120 TX/RX, EM1002, EA-500, HPR POSITION, WATERLINE, IMU, GRANITE BLOCK, ANTENNAS, REFERENCE POINTS. SURVEYED IN BRISBANE, WEEK 9 – 2005.		DOCUMENT REFERENCE 0404143-05000261
CLIENT Kongsberg Underwater Technologies	PURCHASE ORDER NO.	PAGE 1 of 4

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SURVEY RESULTS

TRANSDUCERS, IMU, GRANITE BLOCK, ANTENNAS, DRAFT MARKS

ENCLOSURE 2

SURVEY RESULTS

COORDINATE REFERENCE POINTS

0	FOR USE	05000261	10-Feb-05	ORO	EIF	KA
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1. GENERAL

The purpose of the visit onboard R/V Kilo Moana while it was dry docked in Brisbane week 9 – 2005, was to carry out some measurements of the transducers onboard.

The following objects and tasks were surveyed, performed and are reported herein :

- Position, flatness, heading, pitch, roll of the EM120-TX frame as installed.
- Position, heading, pitch, roll of the former installed 120-RX module array.
- Position of EA-500/38kHz, EA-500/12kHz, EA-500/200kHz, hole for HPR.
- Position, pitch, roll of EM1002.
- Position, heading, pitch, roll of the IMU sensor in the sonar room at port pontoon.
- Position, heading, pitch, roll of the Granite block in the sonar room at port pontoon.
- Position of 7 different antennas.
- Heading between the two GPS antennas at top fore mast.
- Elevation of the draft marks on hull related to the reference plane under the pontoons.
- Set out and marking of coordinate reference points onboard for future use.
- Establishment of a common coordinate reference system onboard the ship.

2. PERSONNEL

The survey work were performed by Senior Surveyor Odd Rune Olden with assistance from from Kongsberg Underwater Technologies representatives on site.

3. EQUIPMENT

The following equipment were used:

Leica TDM5005 Totalstation, serial No. 438355
Fabricator's Certificate expiry date: 18 January 2007.

Various minor survey equipment (e.g. receiver prism, targets, rulers, steel tape, etc.)

4. WORK PROCEDURE

The ship was supported on blocks under the pontoons in the drydock during the survey.

Generally, all positions of points are obtained by measuring bearings and distances from the Totalstation(the measuring instrument) to a receiver prism placed onto the point.

This was done from several set ups with the Totalstation, measuring to many common points from each set up which make it possible to transform all measurements from one set up over to another set up.

DIMENSIONAL SURVEY. R/V KILO MOANA, SURVEY OF EM120 TX/RX, EM1002, EA-500, HPR POSITION, WATERLINE, IMU, GRANITE BLOCK, ANTENNAS, REFERENCE POINTS. SURVEYED IN BRISBANE, WEEK 9 – 2005.				
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The connection between points at “outside” of the ship and the points in the sonar room was obtained through the hole in the bottom on the port pontoon where the new ADCP transducer should come.

Afterwards, all measured points were calculated into one common coordinate reference system for the ship. The reference plane was determined by levelling many points spread around under the pontoons, as this is the design baseline.

All reported positions in this report are therefore related to the same coordinate reference point and to the same reference axis.

Therefore, the common coordinate reference system onboard is defined as follow ;

- **The reference plane is the best fit plane under the pontoons.**
- **Positive X-axis is pointing forward.**
- **Positive Y-axis is pointing towards starboard.**
- **Positive Z-axis is pointing up.**
- **X=0 is on aft side of the hull at the stern.**
- **Y=0 is on best fit centreline between the two pontoons.**
- **Z=0 is in level with the best fit plane under the two pontoons.**

5. SURVEY RESULTS

See the attached enclosures no. 1 and no. 2.

From our point of view, there is no big inclinations of the transducers under the ship or of the IMU sensor in the sonar room.

During our stay we received some “Accuracy Control Condition Reports”, obviously issued by the yard but with no information concerning report number, time for survey, description of references or similar actual information.

According to the positions reported in those, it seem so that our X=0 reference(which is on aft side of hull at stern) is a few centimeter further aft than the zero-reference they have used. The Y-reference seem to be equal to them within 2 centimeters. The Z-reference seem to be equal to them within 1 centimeter.

Our general survey accuracy for positions is +/- 2 millimeter.

6. COMMENTS

The survey temperature during the survey was +30 degrees Celsius. That is also the reporting temperature, no scaling to another reference temperature has been done.

The coordinate reference points in the sonar room at port pontoon are established with reflex targets and the belonging number to each point is painted onto the bulkheads/ceiling with a permanent marker.

DIMENSIONAL SURVEY. R/V KILO MOANA, SURVEY OF EM120 TX/RX, EM1002, EA-500, HPR POSITION, WATERLINE, IMU, GRANITE BLOCK, ANTENNAS, REFERENCE POINTS. SURVEYED IN BRISBANE, WEEK 9 – 2005.				
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Still, the day this was done was a day with relative high humidity so the markings did not show very well.

Therefore we recommend, as soon as possible, somebody onboard the Kilo Moana to go down and refresh the point numbers. The points are identified with numbers from no. 201 to no. 214 written beside each reflex targets.

The granite block in the sonar room which is supposed to be a reference for future installations will, in our opinion, give too short base lines for accurate measurement. We suggest that the coordinate reference points that we established in the sonar room is a better reference for such purposes.

The new ADCP transducer under port pontoon was not installed during our stay.

No further comments to the results.

DIMENSIONAL SURVEY. R/V KILO MOANA, SURVEY OF EM120 TX/RX, EM1002, EA-500, HPR POSITION, WATERLINE, IMU, GRANITE BLOCK, ANTENNAS, REFERENCE POINTS. SURVEYED IN BRISBANE, WEEK 9 – 2005.				
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ENCLOSURE 1
SURVEY RESULTS

TRANSDUCERS, IMU, GRANITE BLOCK,
ANTENNAS, DRAFT MARKS

General comments

General survey accuracy for a random position is
+/- 2mm.

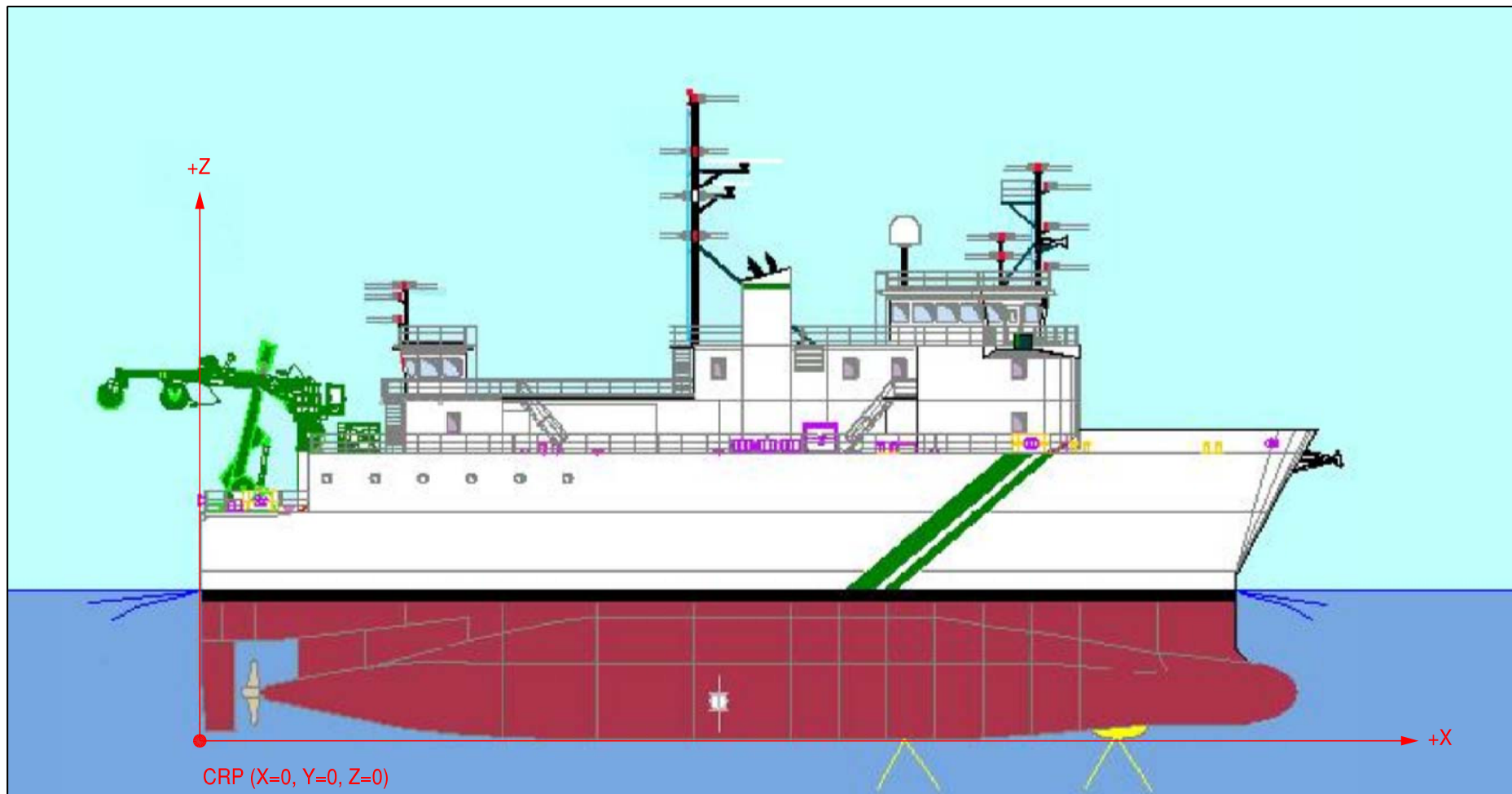
Probable survey accuracy for pitch, roll and heading for
the IMU and the Granite block is +/- 0.05 deg.

Probable survey accuracy for pitch, roll and heading of
Transducers is generally +/- 0.02 deg. but for the EM1002
it is +/- 0.1 deg.

All coordinates and dimensions are in meter U.N.O.

All angles/bearings are in degrees(360 deg. system)

Reporting temperature is +30 degrees Celsius.



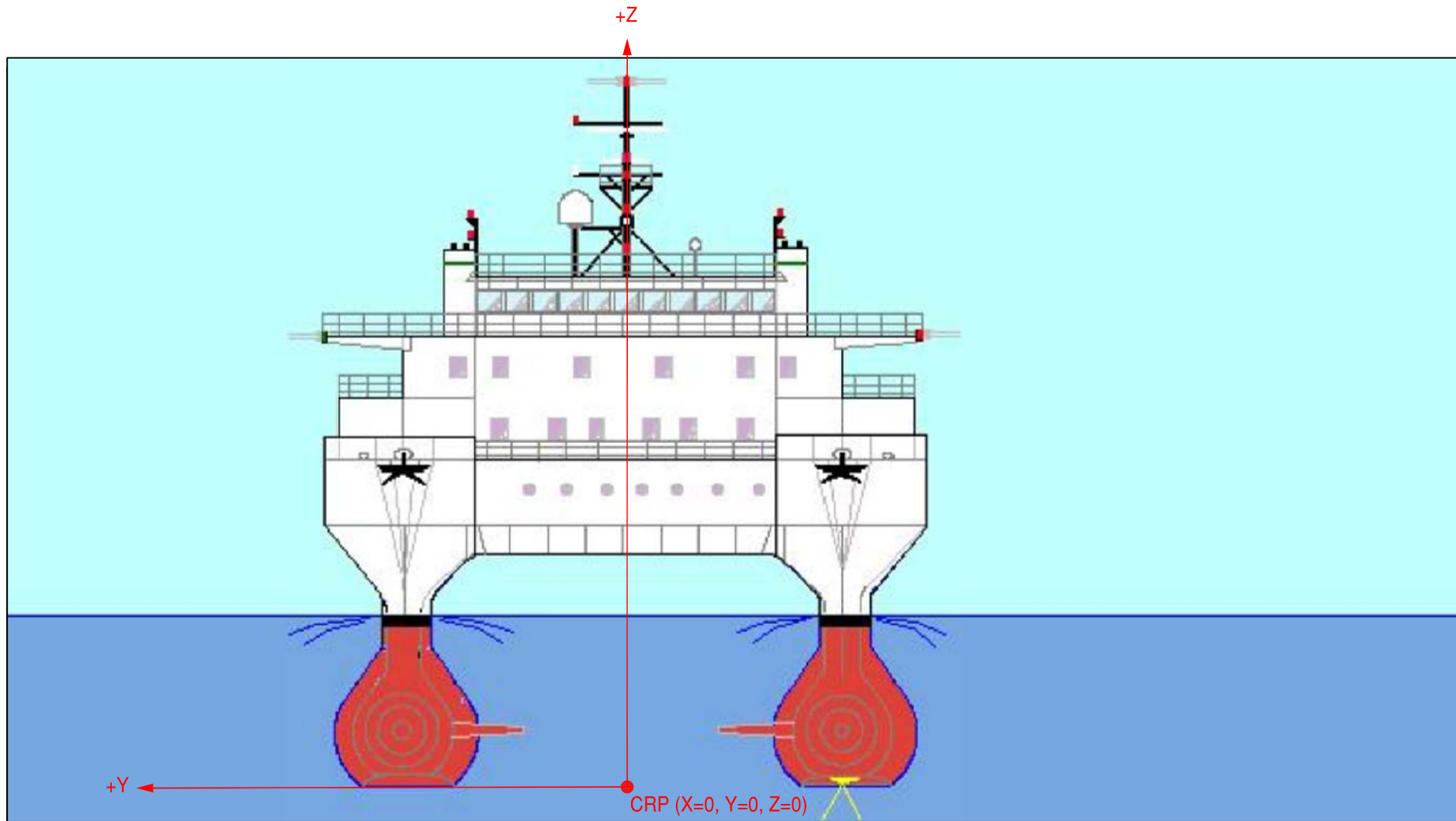
DIMENSIONAL CONTROL

NOTE:

- SURVEY TEMPERATURE IS 30° CELSIUS

CLIENT	KONGSBERG UNDERWATER TECHNOLOGIES	DOCUMENT REFERENCE	0404143-05000261/ENCL.1	PAGE	1 of 15
PROJECT	R/V KILO MOANA	CONTRACT NO.		WO/CALL OFF NO.	
LOCATION	BRISBANE, AUSTRALIA	REF. DRAWING NO.		REV.	
TITLE	SIDEVIEW				

0	FOR USE/INFO	05000261	00261011	08.03.05	TH	ORO	EIF	KA
REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED



NOTE:

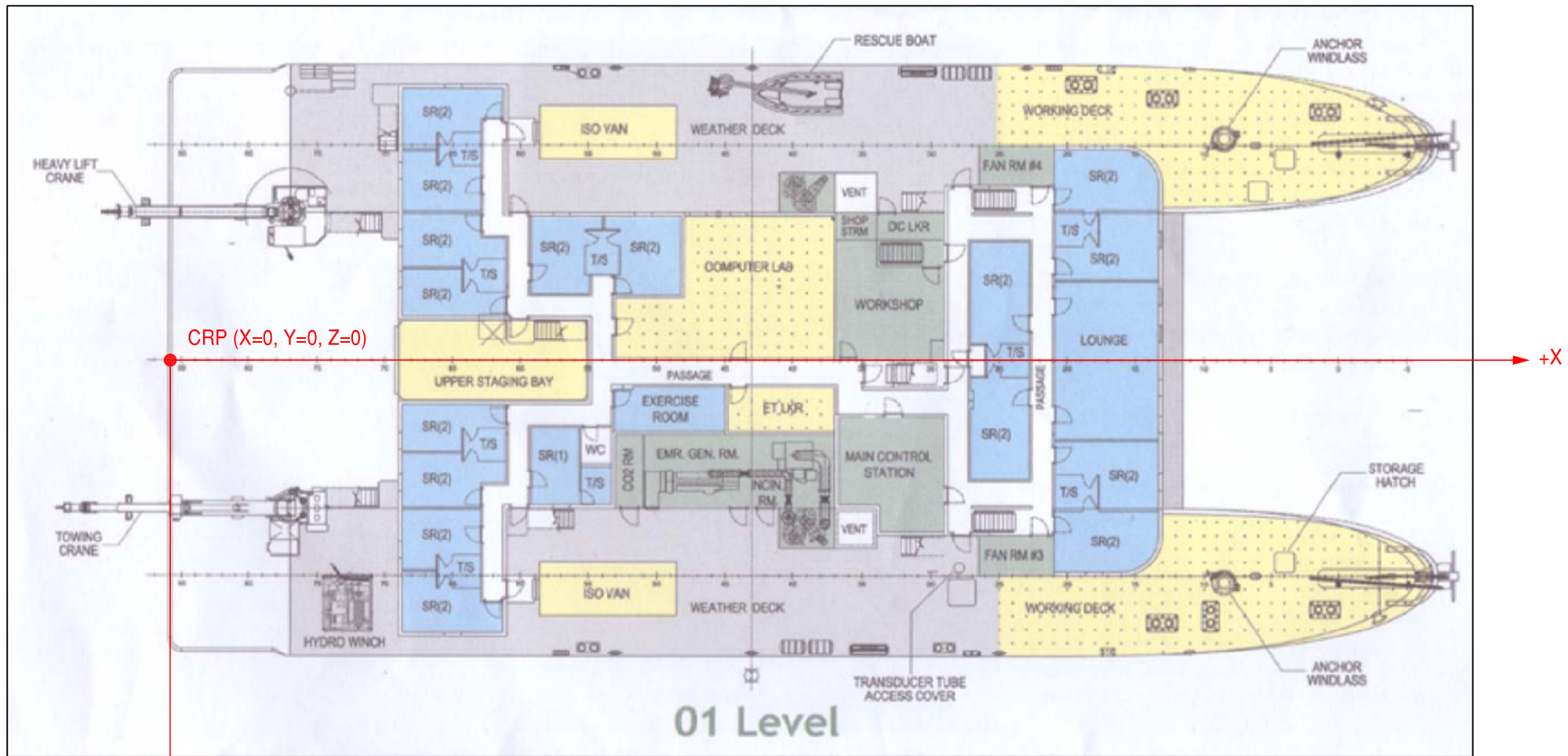
- SURVEY TEMPERATURE IS 30° CELSIUS



DIMENSIONAL CONTROL

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LOCATION	BRISBANE, AUSTRALIA	REF. DRAWING NO.		REV.	
TITLE	FRONT VIEW				

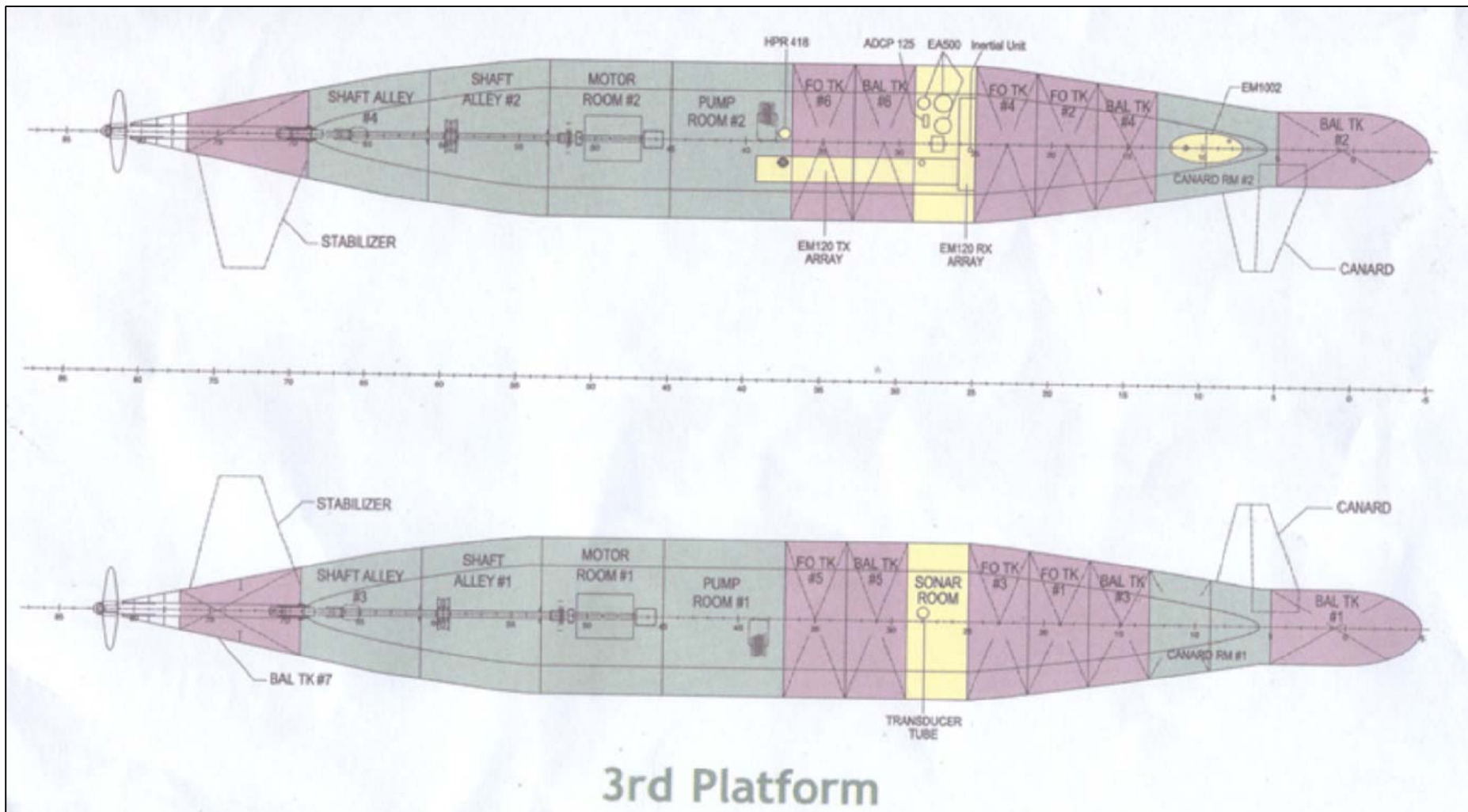
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REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED



NOTE:
- SURVEY TEMPERATURE IS 30° CELSIUS

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LOCATION	BRISBANE, AUSTRALIA	REF. DRAWING NO.		REV.	
TITLE	LEVEL 01				

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NOTE:

- SURVEY TEMPERATURE IS 30° CELSIUS



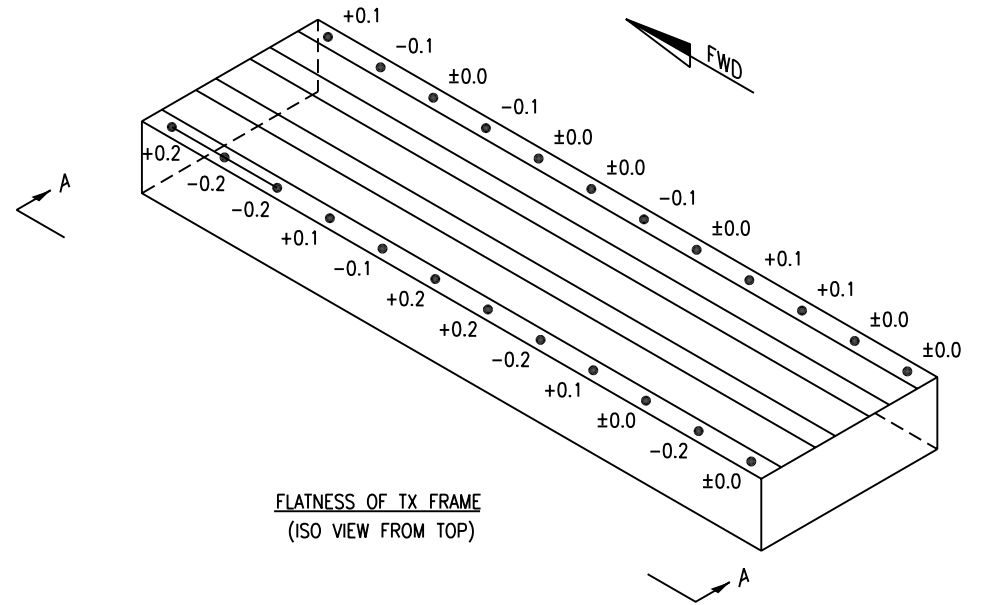
DIMENSIONAL CONTROL

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PROJECT	R/V KILO MOANA	CONTRACT NO.		WO/CALL OFF NO.	
LOCATION	BRISBANE, AUSTRALIA	REF. DRAWING NO.		REV.	
TITLE	3rd PLATFORM				

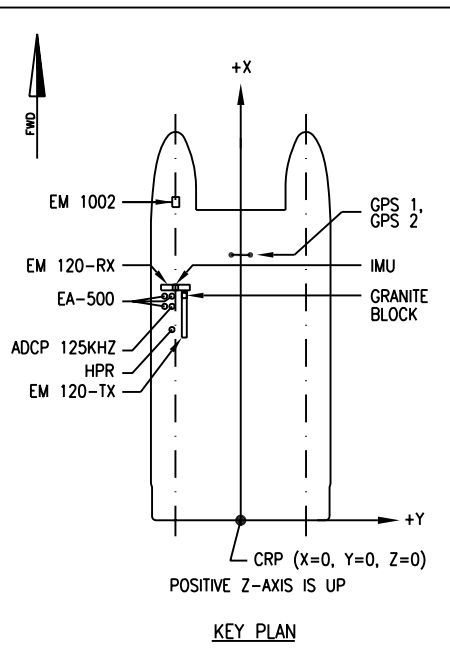
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REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED



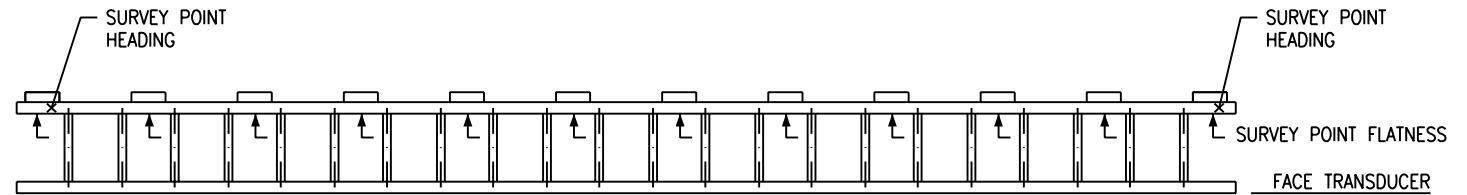
LOOKING FWD/UP



FLATNESS OF TX FRAME
(ISO VIEW FROM TOP)



KEY PLAN



SECTION A - A
(TYP. SIDEVIEW OF FRAME)

NOTES:

- ALL DIMENSIONS IN MM FROM A BEST FIT PLANE (DISREGARDING TRUE PLANE)
- MEAN OF ALL POINTS IS SET TO ZERO
- + IS A HIGH POINT, - IS A LOWER
- • / ↑ SURVEY POINT FLATNESS
- PROBABLE SURVEY ACCURACY FOR FRAME FLATNESS ± 0.1 MM
- SURVEY TEMPERATURE IS +30° CELSIUS



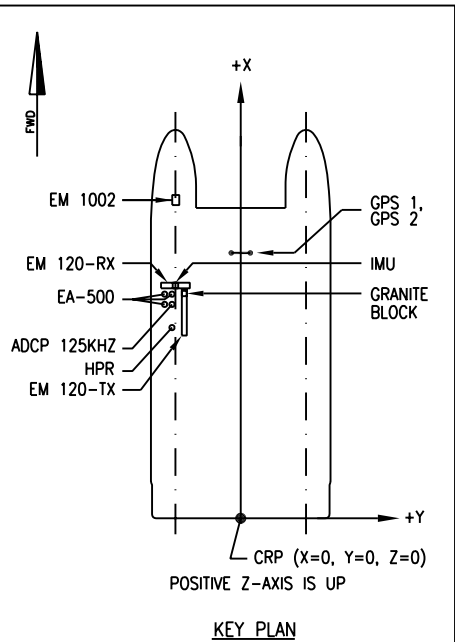
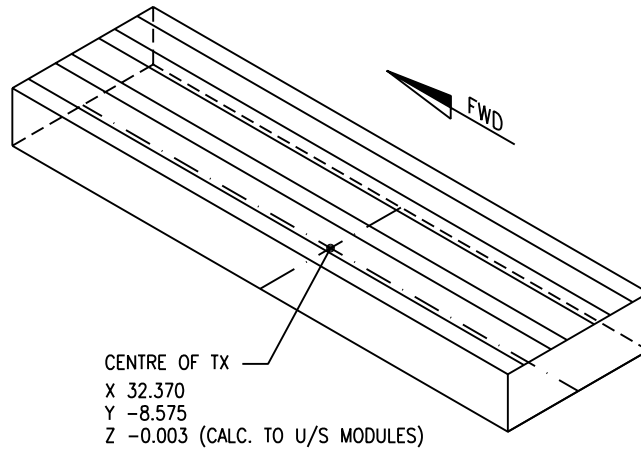
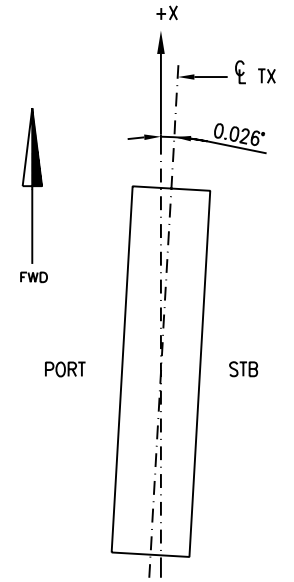
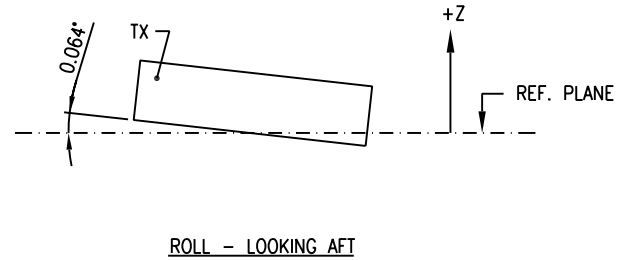
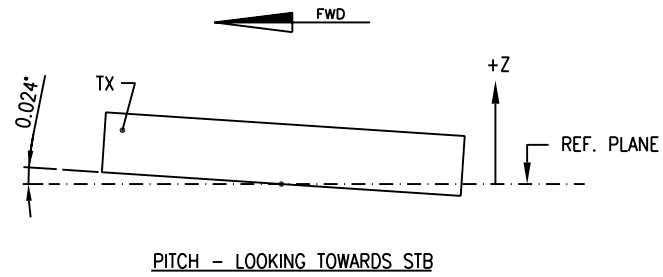
DIMENSIONAL CONTROL

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LOCATION	BRISBANE, AUSTRALIA	REF. DRAWING NO.		REV.	
TITLE	EM 120 - TX, FLATNESS OF FRAME AFTER FINAL ADJUSTMENT				

0	FOR USE/INFO	05000261	00261051	08.03.05	TH	ORO	EIF	KA
REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED



LOOKING FWD/UP



NOTES:

- COORDINATES IN METER
- ANGLES IN DEGREES
- PROBABLE SURVEY ACCURACY $\pm 0.02^\circ$
- SURVEY TEMPERATURE IS $+30^\circ$ CELSIUS



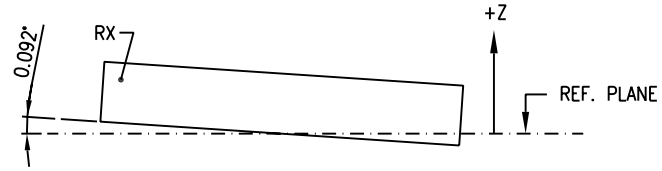
DIMENSIONAL CONTROL

CLIENT	KONGSBERG UNDERWATER TECHNOLOGIES	DOCUMENT REFERENCE	0404143-05000261/ENCL.1	PAGE	6 of 15
PROJECT	R/V KILO MOANA	CONTRACT NO.		WO/CALL OFF NO.	
LOCATION	BRISBANE, AUSTRALIA	REF. DRAWING NO.		REV.	
TITLE	EM 120 - TX, POSITION, HEADING, ROLL, PITCH OF FRAME				

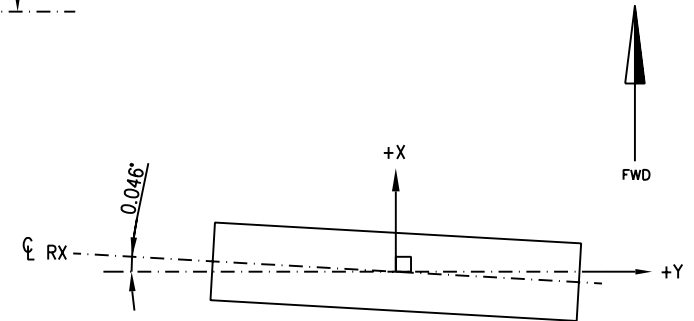
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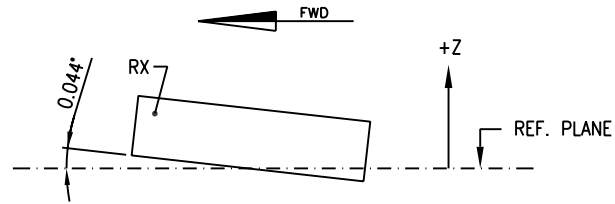
EM 120-RX LOOKING FWD/UP



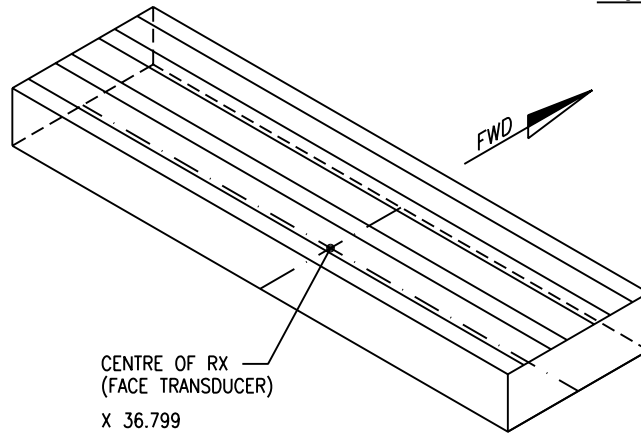
ROLL - LOOKING AFT



HEADING - PLAN VIEW



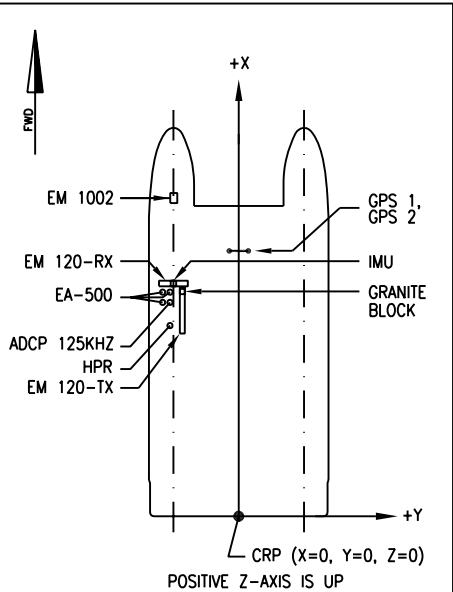
PITCH - LOOKING TOWARDS STB



CENTRE OF RX
(FACE TRANSDUCER)

X 36.799
Y -9.747
Z -0.004

POSITION OF RX



KEY PLAN

NOTES:

- COORDINATES IN METER
- ANGLES IN DEGREES
- PROBABLE SURVEY ACCURACY $\pm 0.02^\circ$
- SURVEY TEMPERATURE IS $+30^\circ$ CELSIUS



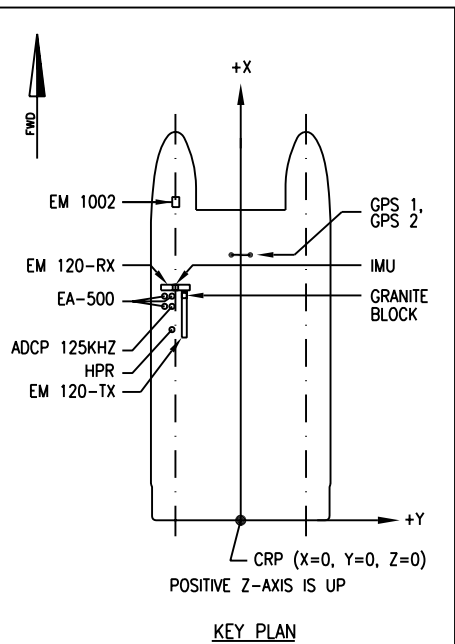
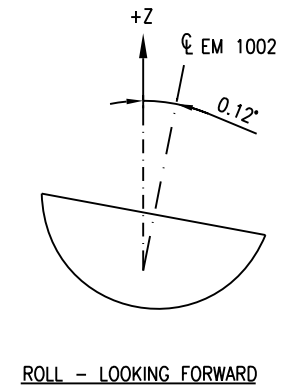
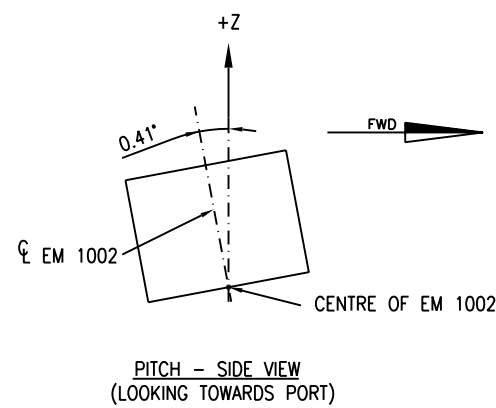
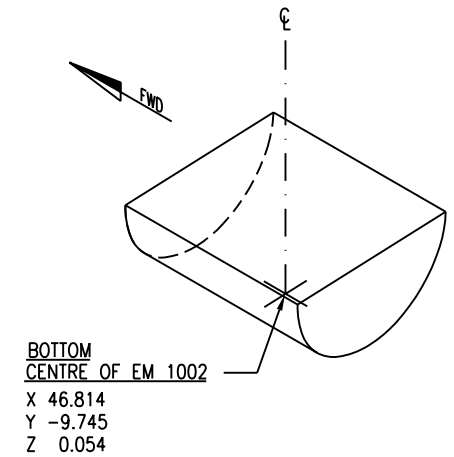
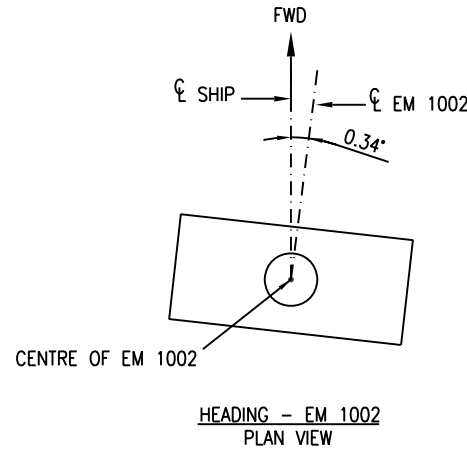
DIMENSIONAL CONTROL

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PROJECT	R/V KILO MOANA	CONTRACT NO.		WO/CALL OFF NO.	
LOCATION	BRISBANE, AUSTRALIA	REF. DRAWING NO.		REV.	
TITLE	EM 120 - RX, POSITION, HEADING, ROLL PITCH U/S MODULES				

0	FOR USE/INFO	05000261	00261071	08.03.05	TH	ORO	EIF	KA
REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED



LOOKING TOWARDS PORT



NOTES:

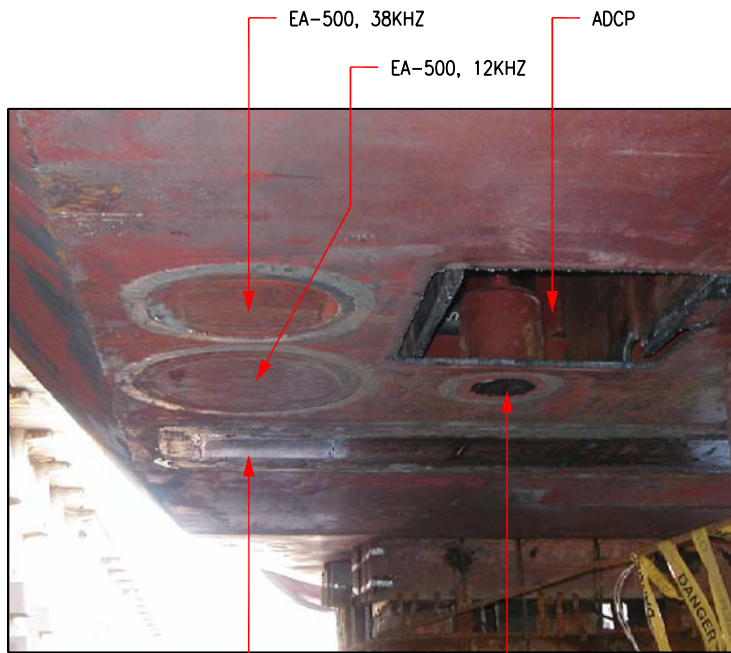
- COORDINATES IN METER
- ANGLES IN DEGREES
- PROBABLE SURVEY ACCURACY $\pm 0.1'$
- SURVEY TEMPERATURE IS $+30'$ CELSIUS



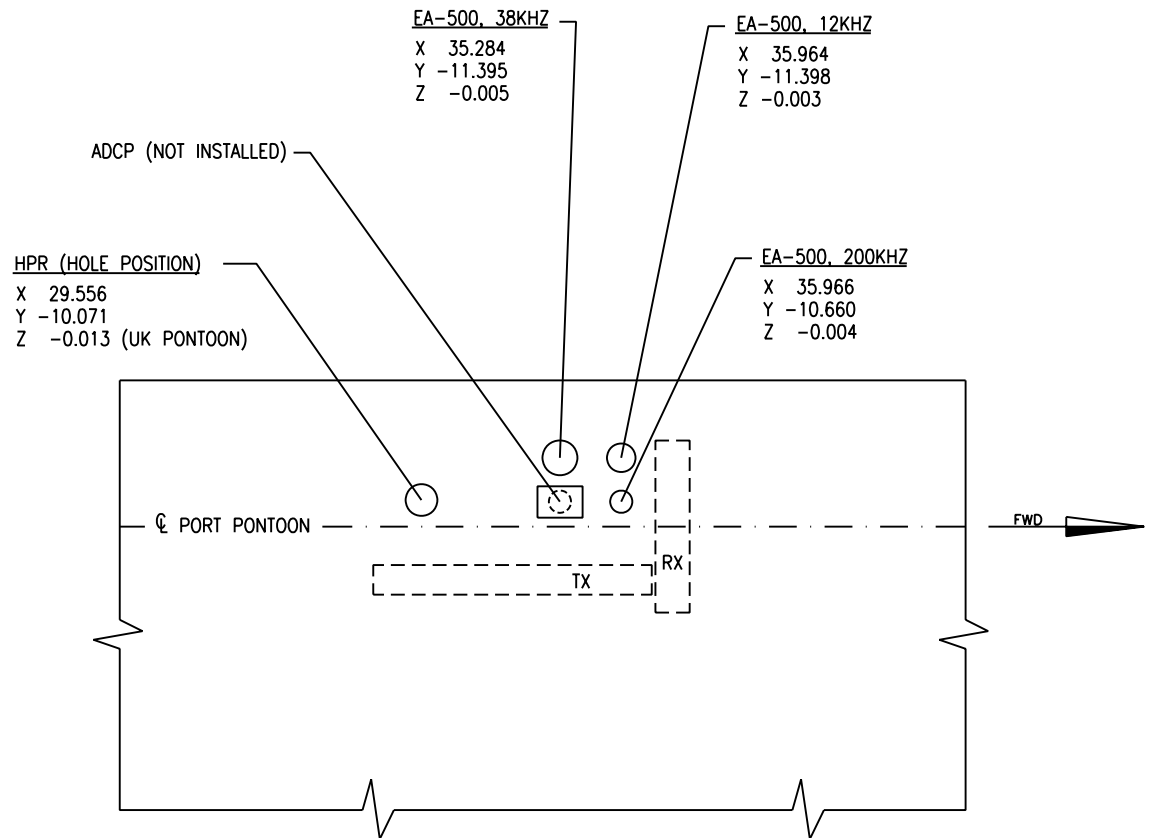
DIMENSIONAL CONTROL

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PROJECT R/V KILO MOANA	CONTRACT NO.	WO/CALL OFF NO.
LOCATION BRISBANE, AUSTRALIA	REF. DRAWING NO.	REV.
TITLE EM 1002 - POSITION, HEADING, PITCH, ROLL		

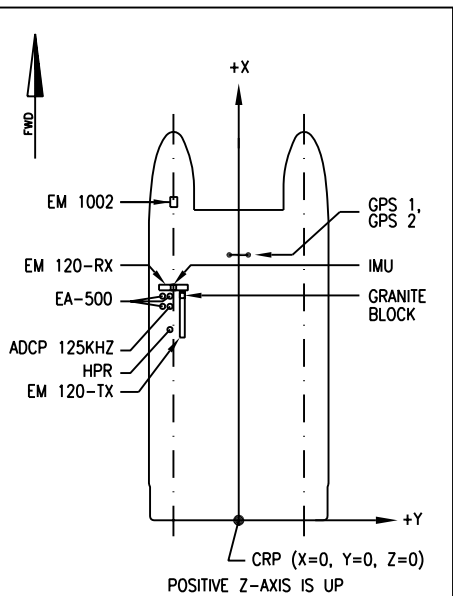
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REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED



EM 120-RX LOOKING FWD/UP EA-500, 200KHZ



PLAN VIEW



KEY PLAN

NOTES:

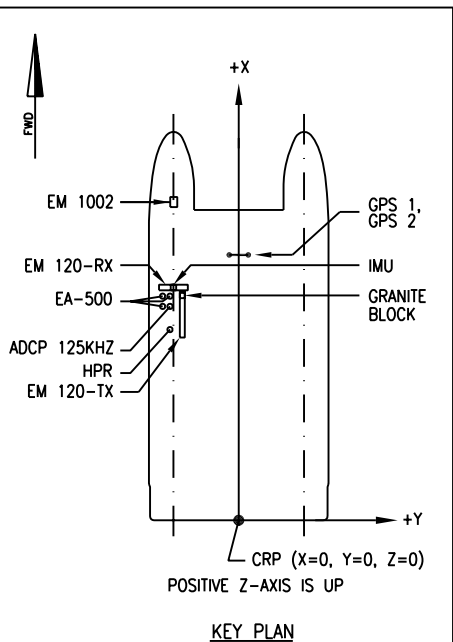
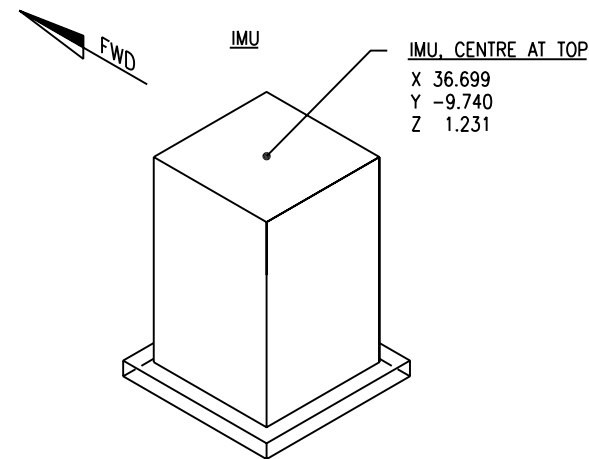
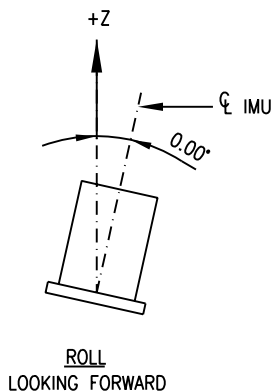
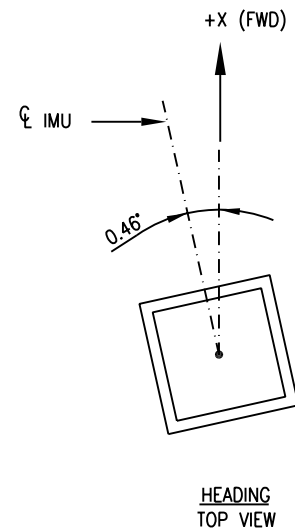
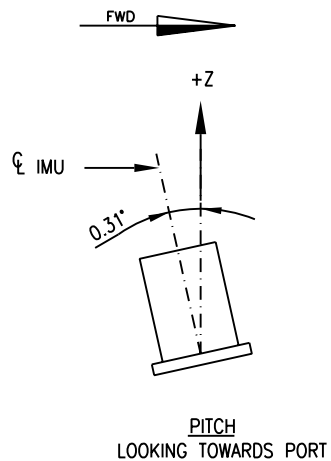
- COORDINATES IN METER
- ANGLES IN DEGREES
- SURVEY TEMPERATURE IS +30° CELSIUS
- SURVEY ACCURACY ±2MM



DIMENSIONAL CONTROL

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LOCATION BRISBANE, AUSTRALIA	REF. DRAWING NO.	REV.
TITLE POSITION OF TRANSDUCERS, UNDERSIDE PORT PONTOON		

0	FOR USE/INFO	05000261	00261091	08.03.05	TH	ORO	EIF	KA
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NOTES:

- COORDINATES IN METER
- ANGLES IN DEGREES
- PROBABLE SURVEY ACCURACY $\pm 0.05^\circ$
- SURVEY TEMPERATURE IS $+30^\circ$ CELSIUS



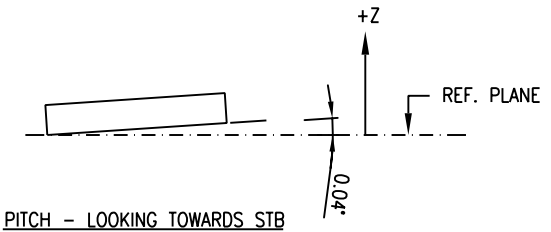
DIMENSIONAL CONTROL

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PROJECT	R/V KILO MOANA	CONTRACT NO.		WO/CALL OFF NO.	
LOCATION	BRISBANE, AUSTRALIA	REF. DRAWING NO.		REV.	
TITLE	IMU - POSITION, HEADING, PITCH, ROLL				

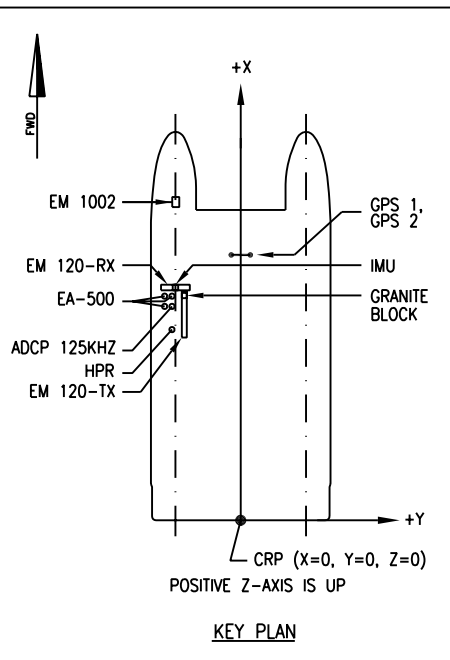
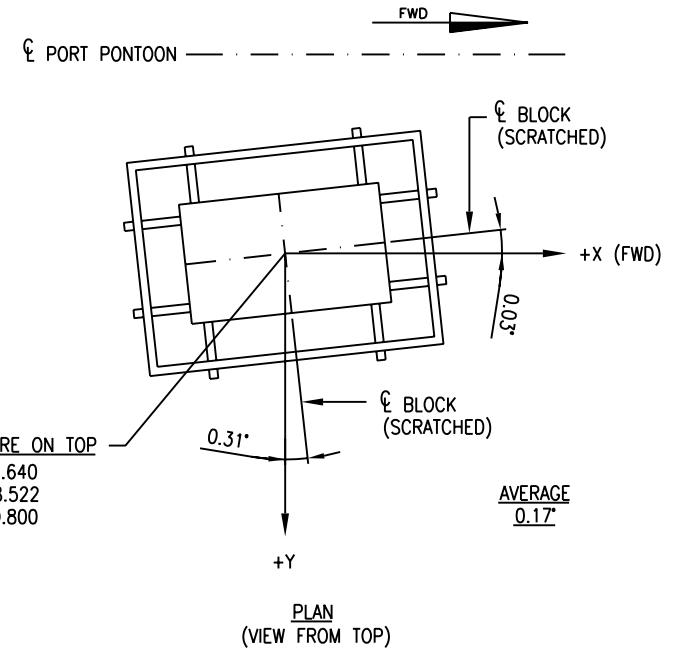
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REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED



ROLL - LOOKING AFT



PITCH - LOOKING TOWARDS STB



KEY PLAN

NOTES:

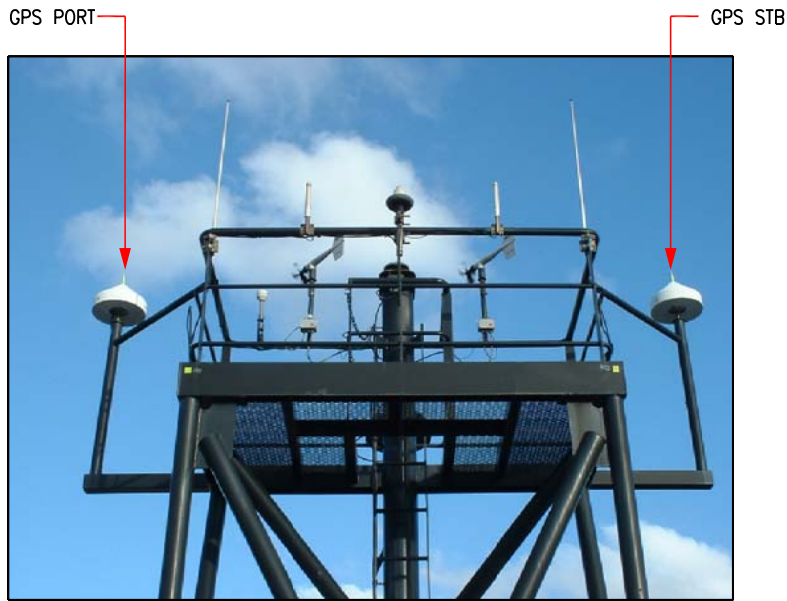
- COORDINATES IN METER
- ANGLES IN DEGREES
- PROBABLE SURVEY ACCURACY ±0.05°
- SURVEY TEMPERATURE IS +30° CELSIUS



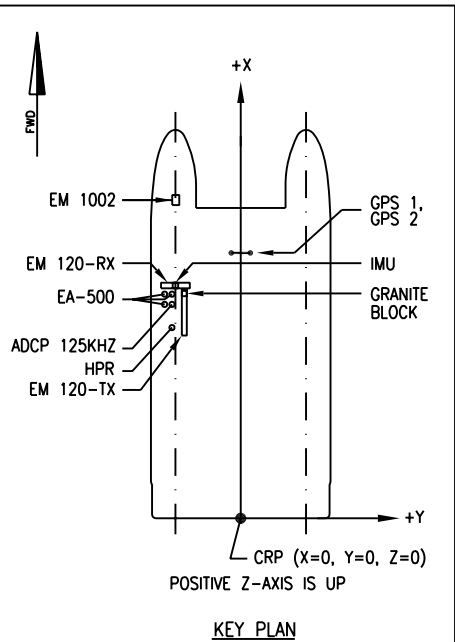
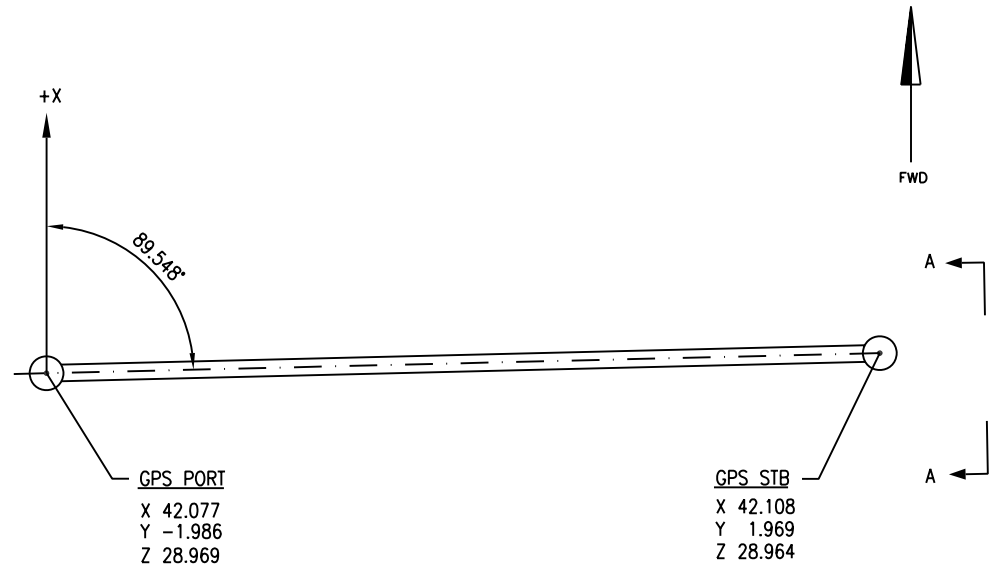
DIMENSIONAL CONTROL

CLIENT	KONGSBERG UNDERWATER TECHNOLOGIES	DOCUMENT REFERENCE	0404143-05000261/ENCL.1	PAGE	11 of 15
PROJECT	R/V KILO MOANA	CONTRACT NO.		WO/CALL OFF NO.	
LOCATION	BRISBANE, AUSTRALIA	REF. DRAWING NO.		REV.	
TITLE	GRANITE BLOCK IN SONAR ROOM, PORT PONTOON				

0	FOR USE/INFO	05000261	00261111	08.03.05	TH	ORO	EIF	KA
REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED

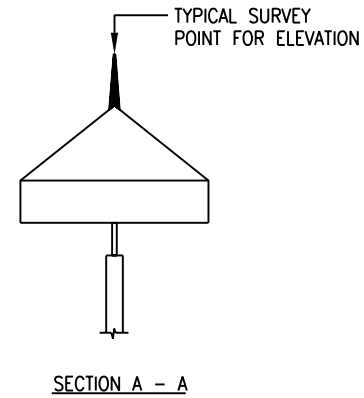


TOP FORE MAST
(LOOKING FWD)



NOTES:

- COORDINATES IN METER
- ANGLES IN DEGREES
- PROBABLE SURVEY ACCURACY $\pm 0.05^\circ$
- SURVEY TEMPERATURE IS $+30^\circ$ CELSIUS



DIMENSIONAL CONTROL

CLIENT	KONGSBERG UNDERWATER TECHNOLOGIES	DOCUMENT REFERENCE	0404143-05000261/ENCL.1	PAGE	12 of 15
PROJECT	R/V KILO MOANA	CONTRACT NO.		WO/CALL OFF NO.	
LOCATION	BRISBANE, AUSTRALIA	REF. DRAWING NO.		REV.	
TITLE	GPS ANTENNAS, TOP FORE MAST				

0	FOR USE/INFO	05000261	00261121	08.03.05	TH	ORO	EIF	KA
REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED

ASHTECH
X 39.382
Y -4.564
Z 24.143

ASHTECH
X 42.896
Y -4.559
Z 24.132

ASHTECH
X 42.893
Y -3.353
Z 24.125

TRUETIME
X 42.942
Y -1.564
Z 24.103

ASHTECH
X 42.897
Y -5.781
Z 24.133



PORT SIDE WHEELHOUSE ROOF
(LOOKING FWD)

NOTES:

- COORDINATES IN METER
- PROBABLE SURVEY ACCURACY ± 2 MM
- SURVEY TEMPERATURE IS $+30^{\circ}$ CELSIUS



DIMENSIONAL CONTROL

CLIENT KONGSBERG UNDERWATER TECHNOLOGIES	DOCUMENT REFERENCE 0404143-05000261/ENCL.1	PAGE 13 of 15
PROJECT R/V KILO MOANA	CONTRACT NO.	WO/CALL OFF NO.
LOCATION BRISBANE, AUSTRALIA	REF. DRAWING NO.	REV.
TITLE ANTENNAS, PORT SIDE TOP WHEELHOUSE		

0	FOR USE/INFO	05000261	00261131	08.03.05	TH	ORO	EIF	KA
REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED

P-CODE
 X 42.883
 Y 2.555
 Z 24.261

"UNKNOWN"
 X 42.977
 Y 5.015
 Z 24.164



STB SIDE WHEELHOUSE ROOF
 (LOOKING FWD)

NOTES:

- COORDINATES IN METER
- PROBABLE SURVEY ACCURACY ±2MM
- SURVEY TEMPERATURE IS +30° CELSIUS



DIMENSIONAL CONTROL

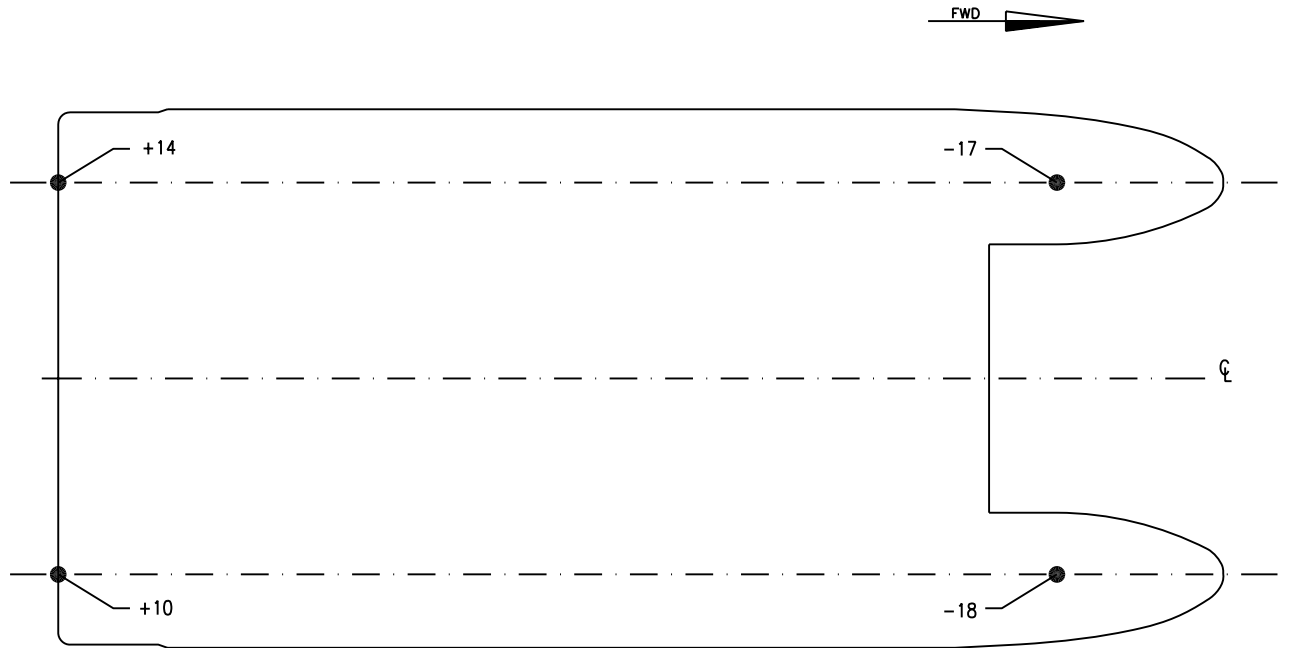
CLIENT KONGSBERG UNDERWATER TECHNOLOGIES	DOCUMENT REFERENCE 0404143-05000261/ENCL.1	PAGE 14 of 15
PROJECT R/V KILO MOANA	CONTRACT NO.	WO/CALL OFF NO.
LOCATION BRISBANE, AUSTRALIA	REF. DRAWING NO.	REV.
TITLE ANTENNAS, STB SIDE TOP WHEELHOUSE		

0	FOR USE/INFO	05000261	00261141	08.03.05	TH	ORO	EIF	KA
REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED

REF. AT UNDERSIDE FIGURES
(NOT THE PAINTED BORDER)



PORT BOW
(LOOKING TOWARDS PORT)



ELEVATION DEVIATIONS RELATED TO BEST FIT REFERENCE
PLANE AT U/S PONTOONS (BASELINE)

NOTES:

- DIMENSIONS IN MM
- SURVEY ACCURACY ± 2 MM
- SURVEY TEMPERATURE IS +30° CELSIUS
- FIGURES SHOW DEVIATION FROM THEORETICAL ELEVATION.
MINUS MEANS THE MARK IS TOO LOW, PLUS MEAN
IT IS TOO HIGH RELATED TO U/S PONTOONS



DIMENSIONAL CONTROL

CLIENT KONGSBERG UNDERWATER TECHNOLOGIES	DOCUMENT REFERENCE 0404143-05000261/ENCL.1	PAGE 15 of 15
PROJECT R/V KILO MOANA	CONTRACT NO.	WO/CALL OFF NO.
LOCATION BRISBANE, AUSTRALIA	REF. DRAWING NO.	REV.
TITLE ELEVATION DEVIATIONS ON THE 25 FEET DRAFT MARKS		

0	FOR USE/INFO	05000261	00261151	08.03.05	TH	ORO	EIF	KA
REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED

ENCLOSURE 2

SURVEY RESULTS

COORDINATE REFERENCE POINTS

General comments

General survey accuracy for a random position is
+/- 2mm.

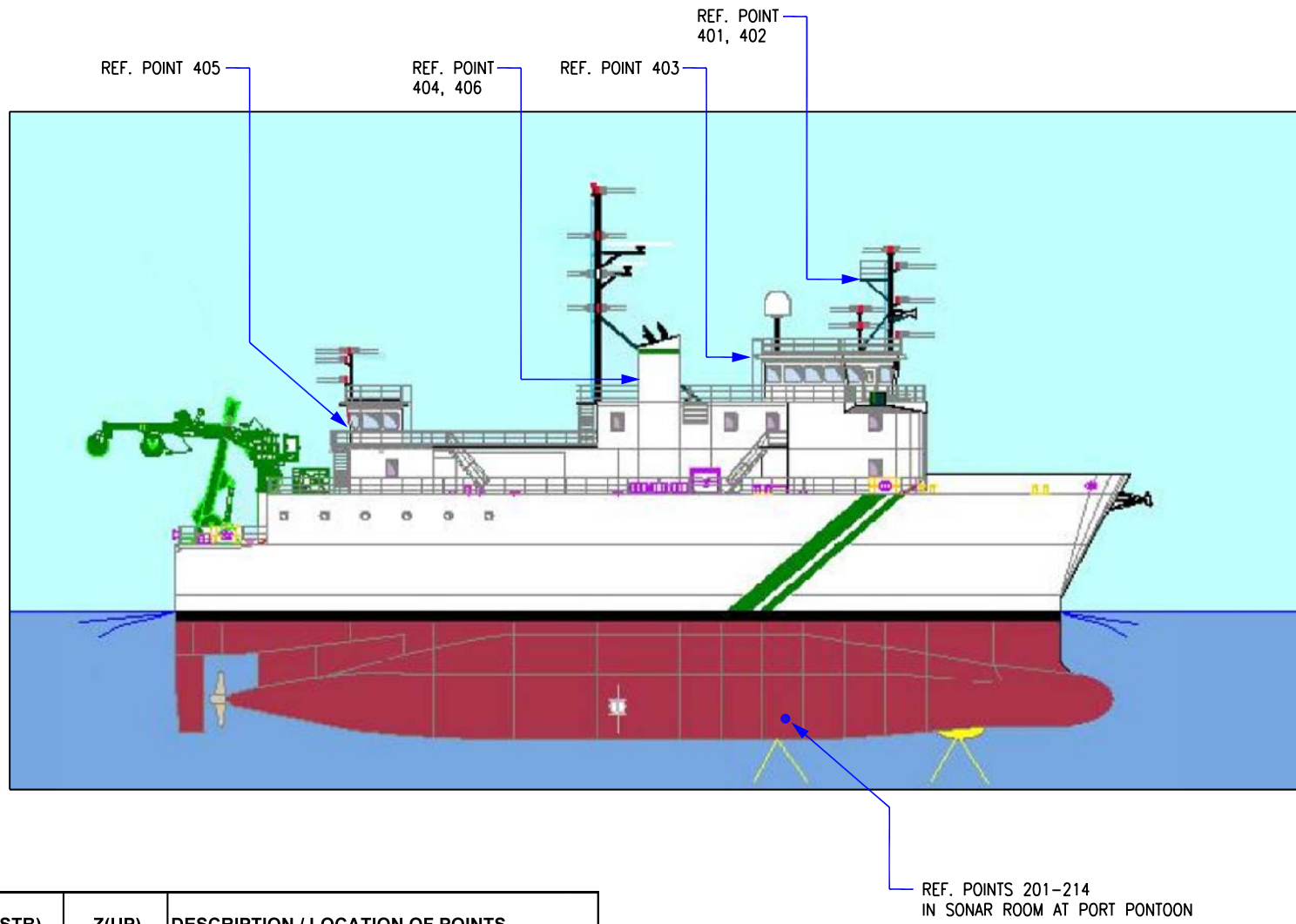
Probable survey accuracy for pitch, roll and heading for
the IMU and the Granite block is +/- 0.05 deg.

Probable survey accuracy for pitch, roll and heading of
Transducers is generally +/- 0.02 deg. but for the EM1002
it is +/- 0.1 deg.

All coordinates and dimensions are in meter U.N.O.

All angles/bearings are in degrees(360 deg. system)

Reporting temperature is +30 degrees Celsius.



POINT	X(FWD) m	Y(STB) m	Z(UP) m	DESCRIPTION / LOCATION OF POINTS
401	40,700	-1,178	27,422	REFLEX TARGET. AFT SIDE TOP FORE MAST
402	40,725	1,172	27,414	REFLEX TARGET. AFT SIDE TOP FORE MAST
403	34,357	-3,719	22,528	REFLEX TARGET. AFT SIDE WHEELHOUSE ROOF
404	27,440	-6,767	21,544	REFLEX TARGET. AFT SIDE PORT CHIMNEY
405	10,409	-1,851	18,286	REFLEX TARGET. AFT SIDE CRANE HOUSE
406	27,416	6,731	21,569	REFLEX TARGET. AFT SIDE STB CHIMNEY

REF. POINTS 201-214
IN SONAR ROOM AT PORT PONTOON



DIMENSIONAL CONTROL

NOTE:

- SURVEY TEMPERATURE IS +30° CELSIUS

CLIENT KONGSBERG UNDERWATER TECHNOLOGIES	DOCUMENT REFERENCE 0404143-05000261/ENCL. 2	PAGE 1 of 7
PROJECT R/V KILO MOANA	CONTRACT NO.	WO/CALL OFF NO.
LOCATION BRISBANE, AUSTRALIA	REF. DRAWING NO.	REV.
TITLE LOCATION OF COORDINATE REFERENCE POINTS		

0	FOR USE/INFO	05000261	00261012	08.03.05	TH	ORO	EIF	KA
REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED



CLIENT KONGSBERG UNDERWATER TECHNOLOGIES	DOCUMENT REFERENCE 0404143-05000261/ENCL. 2	PAGE 2 of 7
PROJECT R/V KILO MOANA	CONTRACT NO.	WO/CALL OFF NO.
LOCATION BRISBANE, AUSTRALIA	REF. DRAWING NO.	REV.
TITLE REFERENCE POINT 401 AND 402		

REF. POINT 401

X 40.700
Y -1.178
Z 27.422

REF. POINT 402

X 40.724
Y 1.172
Z 27.414



FORE MAST ON TOP WHEELHOUSE
(LOOKING FWD)

0	FOR USE/INFO	05000261	00261022	08.03.05	TH	ORO	EIF	KA
REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED



CLIENT KONGSBERG UNDERWATER TECHNOLOGIES	DOCUMENT REFERENCE 0404143-05000261/ENCL. 2	PAGE 3 of 7
PROJECT R/V KILO MOANA	CONTRACT NO.	WO/CALL OFF NO.
LOCATION BRISBANE, AUSTRALIA	REF. DRAWING NO.	REV.
TITLE REFERENCE POINT 403		

REF. POINT 403

X 34.357
Y -3.719
Z 22.528



AFT SIDE WHEELHOUSE ROOF
(LOOKING FWD)

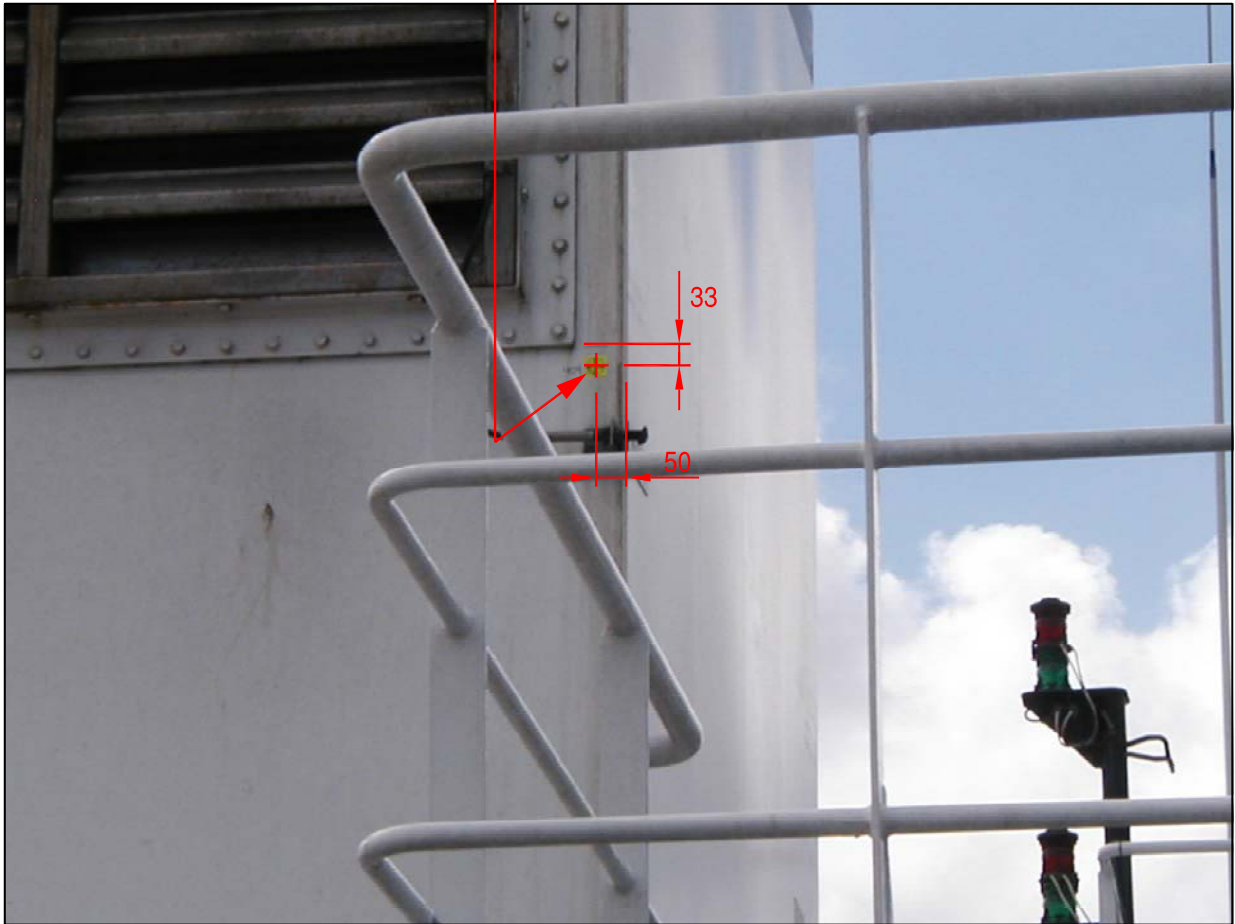
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REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED



CLIENT KONGSBERG UNDERWATER TECHNOLOGIES	DOCUMENT REFERENCE 0404143-05000261/ENCL. 2	PAGE 4 of 7
PROJECT R/V KILO MOANA	CONTRACT NO.	WO/CALL OFF NO.
LOCATION BRISBANE, AUSTRALIA	REF. DRAWING NO.	REV.
TITLE REFERENCE POINT 404		

REF. POINT 404

X 27.440
Y -6.767
Z 21.544



AFT SIDE PORT CHIMNEY
(LOOKING FWD)

0	FOR USE/INFO	05000261	00261042	08.03.05	TH	ORO	EIF	KA
REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED



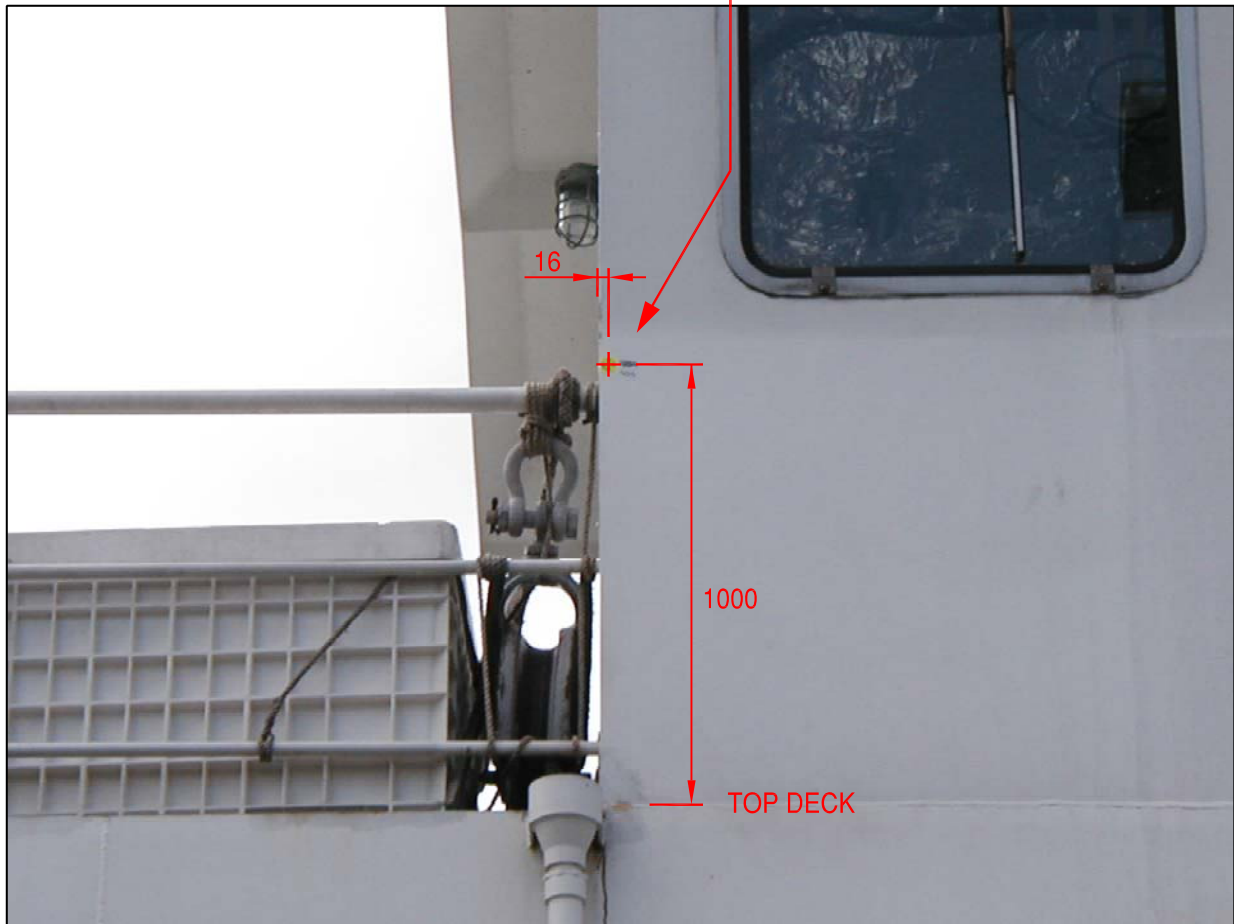
CLIENT KONGSBERG UNDERWATER TECHNOLOGIES	DOCUMENT REFERENCE 0404143-05000261/ENCL. 2	PAGE 5 of 7
PROJECT R/V KILO MOANA	CONTRACT NO.	WO/CALL OFF NO.
LOCATION BRISBANE, AUSTRALIA	REF. DRAWING NO.	REV.
TITLE REFERENCE POINT 405		

REF. POINT 405

X 10.409

Y -1.851

Z 18.286



AFT SIDE CRANE HOUSE
(LOOKING FWD)

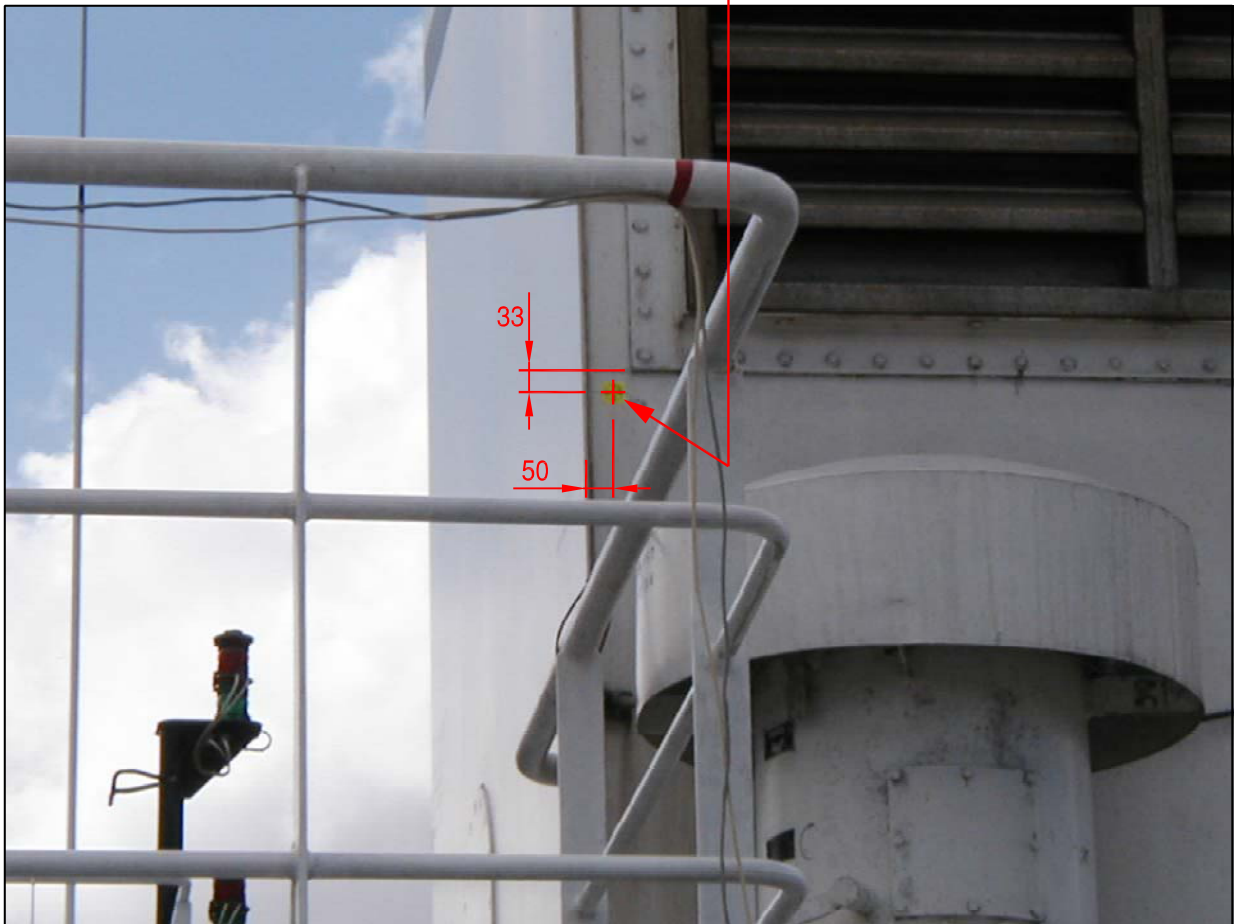
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REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED



CLIENT KONGSBERG UNDERWATER TECHNOLOGIES	DOCUMENT REFERENCE 0404143-05000261/ENCL. 2	PAGE 6 of 7
PROJECT R/V KILO MOANA	CONTRACT NO.	WO/CALL OFF NO.
LOCATION BRISBANE, AUSTRALIA	REF. DRAWING NO.	REV.
TITLE REFERENCE POINT 406		

REF. POINT 406

X 27.416
Y 6.731
Z 21.569



AFT SIDE STB CHIMNEY
(LOOKING FWD)

0	FOR USE/INFO	05000261	00261062	08.03.05	TH	ORO	EIF	KA
REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED



CLIENT KONGSBERG UNDERWATER TECHNOLOGIES	DOCUMENT REFERENCE 0404143-05000261/ENCL. 2	PAGE 7 of 7
PROJECT R/V KILO MOANA	CONTRACT NO.	WO/CALL OFF NO.
LOCATION BRISBANE, AUSTRALIA	REF. DRAWING NO.	REV.
TITLE COORDINATE REFERENCE POINTS, SONAR ROOM PORT PONTOON		

POINT no.	X(FWD) m	Y(STB) m	Z(UP) m	DESCRIPTION / LOCATION OF POINT
201	37,145	-12,794	3,229	REFLEX TARGET ON BULKEAD/CEILING
202	37,101	-12,328	3,683	REFLEX TARGET ON BULKEAD/CEILING
203	36,992	-11,861	4,573	REFLEX TARGET ON BULKEAD/CEILING
204	35,655	-12,345	3,661	REFLEX TARGET ON BULKEAD/CEILING
205	35,541	-11,892	4,582	REFLEX TARGET ON BULKEAD/CEILING
206	35,352	-11,119	4,480	REFLEX TARGET ON BULKEAD/CEILING
207	35,375	-10,230	4,478	REFLEX TARGET ON BULKEAD/CEILING
208	36,117	-10,267	4,580	REFLEX TARGET ON BULKEAD/CEILING
209	35,016	-10,744	4,580	REFLEX TARGET ON BULKEAD/CEILING
210	36,920	-9,667	4,374	REFLEX TARGET ON BULKEAD/CEILING
211	36,817	-10,917	4,575	REFLEX TARGET ON BULKEAD/CEILING
212	36,452	-11,435	4,580	REFLEX TARGET ON BULKEAD/CEILING
213	36,920	-9,695	2,609	REFLEX TARGET ON BULKEAD/CEILING
214	36,530	-9,164	4,473	REFLEX TARGET ON BULKEAD/CEILING

NOTES:

THE REFERENCE POINTS ARE REFLEX TARGETS WITH NUMBERS ON BULKHEADS/CEILING, MOSTLY AT THE PORT PART OF THE ROOM.

0	FOR USE/INFO	05000261	00261072	08.03.05	TH	ORO	EIF	KA
REV. NO.	REASON FOR ISSUE	DOC. NO.	FILE NO.	REV. DATE	DRAWN	PREPARED	CHECKED	APPROVED