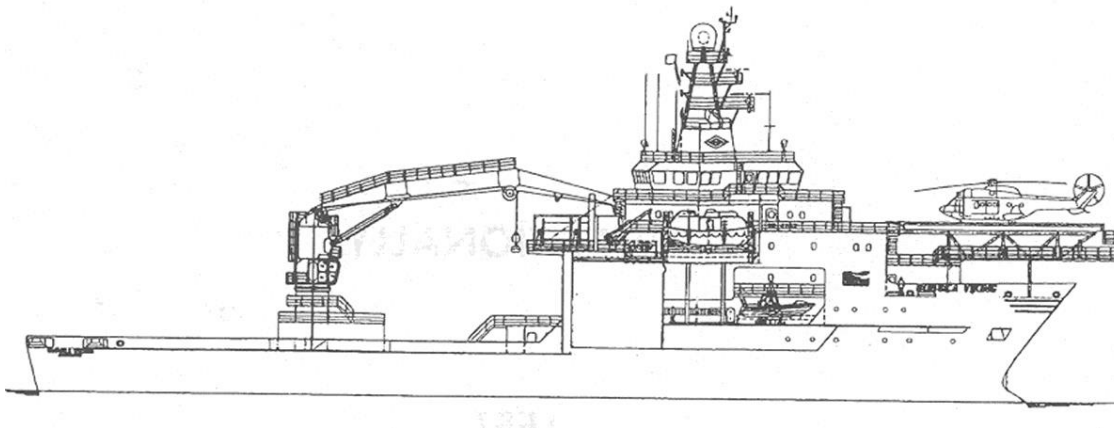




Standard Measuring Equipment
for
Helideck Monitoring System (HMS)
and
Weather Data

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1. Purpose and intentions

The purpose of this document is to ensure uniformity of readings/registration of helideck movement and weather conditions.

These standards are valid on NCS as mandated by the Norog helideck manual managed in agreement between Norog and the Helicopter operators.

Further intentions are to establish National and International standards based on contents of this document.

2. Definitions

Moving helidecks

A helideck mounted on a floating unit such as a Vessel, Floating Production Unit, Semi-Submersible Rig, floating Jack Up Rig, and other helidecks shall be considered to be an unstable/moving landing area if:

- the pitch or roll exceed 1 degree, and;
- the heave amplitude of the helideck exceeds 2 meters, and/or;
- the heave rate exceed 0.3 m/ second.

Pitch and Roll (P/R)

Pitch and Roll angels relative to absolute horizon. The roll axes is parallel with the helideck heading.

Helideck Inclination (Inc)

Is the angle between the absolute horizon and the plane of the helideck.

Heave Amplitude (HA)

The vertical movement of the helideck.

Significant Heave Rate (SHR)

The average of the one-third highest values of instantaneous heave rate recorded the previous 20 minute monitoring period. This can more conveniently be calculated by:

$$\text{Significant Heave Rate (m/sec)} = 2 \times \text{rms (Root Mean Square)} \\ \text{of the instantaneous heave rate.}$$

3. Classification of helidecks

There is no official classification method available for this purpose. The proposed classification contains three categories based on the actual floating unit's size, configuration and motion characteristics. Limitations are defined by helideck pitch, roll and inclination and by helideck heave rate. A prime requirement is that the installations have measuring and monitoring equipment installed, and functional, in accordance with this document. Those installations which would normally fall into Category 1 or 2, but which either do not have the appropriate measuring or monitoring equipment installed, or whose equipment is inoperative, are automatically downgraded by one category (e.g. a Category 1 deck with inoperative equipment becomes a Category 2 deck). The category will be entered on the individual vessel/rig information plate in the North Sea Airway Manual or rig plate and the Company Helideck Limitation List(HLL).

Category 1

Semi-submersibles including floating jack ups and all large vessels including FPSOs and tankers.

Category 2

Small vessels, e.g. DSVs and seismic vessels, with a helideck that offers good visual cues. This would normally be a stern or amidships deck offering a view of the structure of the vessel through at least 90° (assuming the vessel is seaming approximately into wind).

Category 3

Small vessels with poor visual cues, such as a bow deck or a deck mounted above the bridge superstructure with the landing direction facing forwards (bow deck) or abeam (high deck).

Note: Small vessels will be categorized 2 or 3 on inspection and their helideck documentation will reflect this (except that small vessels with amidships decks will always be Category 2).

In addition, aircraft are divided into two types – heavy and medium. The heavy types are the AS332 series, EC225, AW189 and S92. The medium types are the EC155, EC175, AW139, S76 series, and Bell 525.

Note: This does not constitute a helideck approval for a specific helicopter type on a specific helideck.

4. Operational Limitations

The classification is defined in this table:

AIRCRAFT CATEGORY		HELIDECK CATEGORY											
		1				2				3			
		P/R	INC	HR	HA	P/R	INC	HR	HA	P/R	INC	HR	HA
HEAVY	DAY	±3	3.5	1.3	5.0	±2	2.5	1.0	3.0	±2	2.5	1.0	3.0
	NT	±2 *	2,5 *	1.0	4.0	±2	2.5	0.5	1.5	±1	1.5	0.5	1.5
MEDIUM	DAY	±4	4.5	1.3	5.0	±3	3.5	1.0	3.0	±3	3.5	1.0	3.0
	NT	±3	3.5	1.0	4.0	±2	2.5	0.5	1.5	±1.5	2.0	0.5	1.5

P/R = Pitch and Roll (deg);

INC = Helideck Inclination (deg);

HR = Significant Heave Rate (m/s);

HA = Heave Amplitude (m)

(*) Semi Submersibles Category 1 helidecks is at night limited to P/R: +/- 3.0° and inclination: +/-3.5°.

Notes:

- a) Category 3 vessels (Bow mounted helideck) operating with the helideck downwind are automatically upgraded to Category 2.
- b) Category 2 vessels (Stern helideck) operating with the helideck upwind are automatically downgraded to Category 3.
- c) Vessels with Midships helidecks are normally Category 2.
- d) Where Heave rate is available and within limits, HA is for information only, and is not part of the calculations regarding helideck availability.
- e) The table above is not applicable for operations to and from single point mooring buoys (SPMs). These are considered fixed installations. Limitations are given on Helideck Information Plate.
- f) Night landing on Category 2 and 3 helidecks that are moving position (for example seismic or towing) should be avoided. If night landings are unavoidable the following applies:
 - Minimum weather requirement is visibility of 5000 meter.
 - The ship shall be maneuvered out of wind by 30 degrees to improve visual cues in the landing.
 - Further risk mitigation may be imposed by the helicopter operator.

5. Principles

Basic requirements are contained in:

- Norwegian Requirements in BSL D5-1.8.2.
- ISO 19901-1: 2015 Petroleum and natural gas industries -- Specific requirements for offshore structures -- Part 1: Metocean design and operating considerations
- NORSOK C-004 Helicopter deck on offshore installations
- NORSOK T-100 Telecom subsystems

The measuring equipment shall provide sufficient information to the operator to complete all sections of the standard "Helideck Report", provided for by the helicopter operators. The last page of the helideck manual contains the helideck report template.

Measuring equipment sensors for helideck movement, wind and weather data shall be located in optimum positions in order to provide relevant information relating to the helideck.

Helideck heave data shall be representative for the center of the helideck. It is recommended to locate the motion sensor within 4 meters from helideck center for new designs in order to meet a possible future requirement for measurement of Motion Severity Index (MSI).

All information shall be numerically displayed in relevant locations on the vessel or rig for easy communication with helicopters in flight and the helicopter land base operations. The system shall facilitate transmittal of electronic data to the helicopter land base operation, which in turn can eliminate the need for a separate Helideck Report to be submitted.

6. Accuracy of Measurement

The HMS shall at all times comply with the system accuracy requirements given below. The system shall be properly maintained and a record of all certificates, verification reports and maintenance history shall be available to appointed Helideck Inspectors on request.

System accuracy

The dynamic accuracy of the data produced by the Helideck Monitoring System concerning motion shall be:

Pitch / Roll / Inclination: $< \pm 0.1^\circ$ RMS (Root Mean Square) in the range 0 to $3,5^\circ$ and Heave Rate: $< \pm 0.1$ m/s RMS (Root Mean Square) in the range 0 to 1.3 m/s

The accuracy concerning the meteorological data shall be in compliance with:

- ISO 19901-1: 2015 Petroleum and natural gas industries -- Specific requirements for offshore structures -- Part 1: Metocean design and operating considerations

Any temporary deviation from above, due to performance degradation or equipment failure shall be reported to the helicopter operator with a plan for corrective actions.

Verification

The HMS should undergo initial and periodic in field verifications in accordance with the system manufacturer's procedures and recommended intervals.

The complete HMS (sensors and programs) shall be checked and verified. A qualified field service engineer, trained and certified, shall perform the system verification.

All test instruments, including the Motion Measurement Verification Equipment located at the centre of the helideck during the test, shall have traceable calibration certificates with details included in the verification report.

Recommendations from the motion sensor manufacturer should be incorporated in the system test procedures. Motion measurement verification intervals should be in accordance with the sensor's manufacturer's procedure, but at least every 3 years.

The motion range measured during the verification tests shall be relevant to the typical operational conditions for the installation and a minimum of 5 test periods of minimum 20 minutes duration shall be conducted.

A verification report documenting the correctness of the system shall be issued to the owner of the installation and to the helicopter operators. This should be done after initial installation, replacement of motion sensor, and after each periodic control. The results should be displayed in an unambiguous way (graphical or other visual display) to allow easy interpretation.

The owner/ operator of the installation shall ensure storage of the verification data for a minimum of 3 years, to enable traceability.

Maintenance

All parts of the HMS shall undergo periodic inspections and preventive maintenance as defined by the HMS manufacturer, including sensor swap out with factory overhauled or calibrated units. Periodic maintenance shall only be conducted by trained personnel.

7. Measuring helideck motion

All helideck motion parameters shall be reported to one decimal place.

Maximum Pitch

The equipment shall be capable of measuring helideck pitch in degrees up and down from zero, with zero being the absolute horizontal level. It shall be possible to read the historic maximum angles over the past 20 minutes, direct and, if possible, graphically. The graphical presentation shall cover 20 minutes of data and alternatively 3 hours for trend determination. The graph and the associated maximum value over the last 20 minutes shall be updated at least at 1-minute intervals. In maritime terms maximum pitch consists of trim + pitch.

Maximum Roll

The equipment shall be capable of measuring helideck roll in degrees right/starboard and left/port, with zero being the absolute horizontal level. It shall be possible to read the historic maximum angles over the past 20 minutes, direct and, if possible, graphically. The graphical presentation shall cover 20 minutes of data and include 3 hours for trend determination. The graph and the associated maximum value over the last 20 minutes shall be updated at least at 1-minute intervals. In maritime terms maximum roll consists of list + roll.

Maximum Helideck Inclination

The equipment shall be capable of measuring the maximum helideck inclination in degrees to the absolute horizon over the past 20 minutes, direct and, if possible, graphically. The graphical presentation shall cover 20 minutes of data and alternatively 3 hours for trend determination. The graph and the associated maximum value over the last 20 minutes shall be updated at least at 1-minute intervals.

Maximum Heave Amplitude

The equipment shall be capable of measuring vertical helideck movement from top to bottom, with readings in meters. The maximum heave (total vertical movement) of the helideck is the maximum top to bottom value in one cycle (one movement curve) over the past 20 minutes.

It shall be possible to read the historic maximum value over the past 20 minutes direct and graphically. The graphical presentation shall cover 20 minutes of data and alternatively 3 hours for trend determination. The graph and the associated maximum value over the last 20 minutes shall be updated at least at 1-minute intervals.

Heave Period

The equipment shall be capable of measuring the time between helideck movement summits in seconds (i.e. based on a wave curve the measurement starts and ends in the zero up crossing point). The graphical presentation shall

cover 20 minutes of data and alternatively 3 hours for trend determination. The graph and the associated maximum value over the last 20 minutes shall be updated at least at 1-minute intervals.

Significant Heave Rate (SHR)

The equipment shall be capable of measuring the vertical movement rate of the helideck in meters per second.

The significant heave rate shall be updated at least at 1-minute intervals, using a moving 20-minute window. The SHR value is calculated directly from the instantaneous heave velocities sampled at 2Hz intervals or more in accordance with the following formula:

$$2 \times \text{RMS (Root Mean Square) of the instantaneous heave rate}$$

It shall be possible to read the historic maximum value for the past 20 minutes direct and graphically. The graphical presentation shall cover 20 minutes of data and alternatively 3 hours for trend determination. The graph and the associated maximum value over the last 20 minutes shall be updated at least at 1 minute intervals.

8. Heading and Position Data

The heading of the helideck and the vessel shall be stated in degrees relative to magnetic North. Vessel position shall be reported in WGS84 coordinates on the following format: "deg° min' sec" N/S/E/W". The HMS shall be connected to a gyro and a position monitoring system if the parameters are a variable. Manual setting of magnetic declination are possible, but shall be checked after vessel/rig movement.

9. Weather Data

Data for this section may be assessed by the use of other equipment than the HMS system, but must be of a standard that has a possibility to deliver data to the HMS system (Ref. Chap. 6, Norsok standards N-002 and C-004).

Wind Direction

Wind direction shall be stated in degrees relative to magnetic North.

Displayed wind direction shall have the options to show real time wind direction, 2-minute mean wind direction and 10-minute mean wind direction.

Wind Speed

Wind speed shall be stated in knots.

Displayed wind shall be easily selectable to show real time wind, 2-minute mean wind with gusts exceeding ten knots of the mean wind, and 10-minute mean wind with gusts exceeding 10 knots for 3 seconds or more of the mean 10 minute wind.

Visibility

Horizontal visibility shall be stated in meters.

Temperature/Dewpoint

Temperature/dew point temperature shall be stated in degrees Celsius.

Air Pressure

Air pressure shall be stated in hPa as QNH, meaning; altitude adjusted for height and temperature relative to Mean Sea Level.

Cloud

Cloud shall be stated as few/scattered/broken/overcast (FEW/SCT/BKN/OVC) in feet above the sea surface.

Logging system

The system should be able to log all data for 30 days. The historic data should be available by configuring the date and time to the period of interest.

10. Helideck Movement and Weather data display

Data Display layouts shall be approved by the Helicopter Operators. The display must indicate which HMS standard the complete system is compliant to (e.g. HMS Rev 9.2.No).

The user of the display must be able to control the setting of the following configuration parameters: night/day, large/medium aircraft and helideck category 1/2/3 (for those with variable classification).

It is important to use the notification SHR for all HR data on the display to avoid ambiguity with historic calculation methods.

Traffic light on display

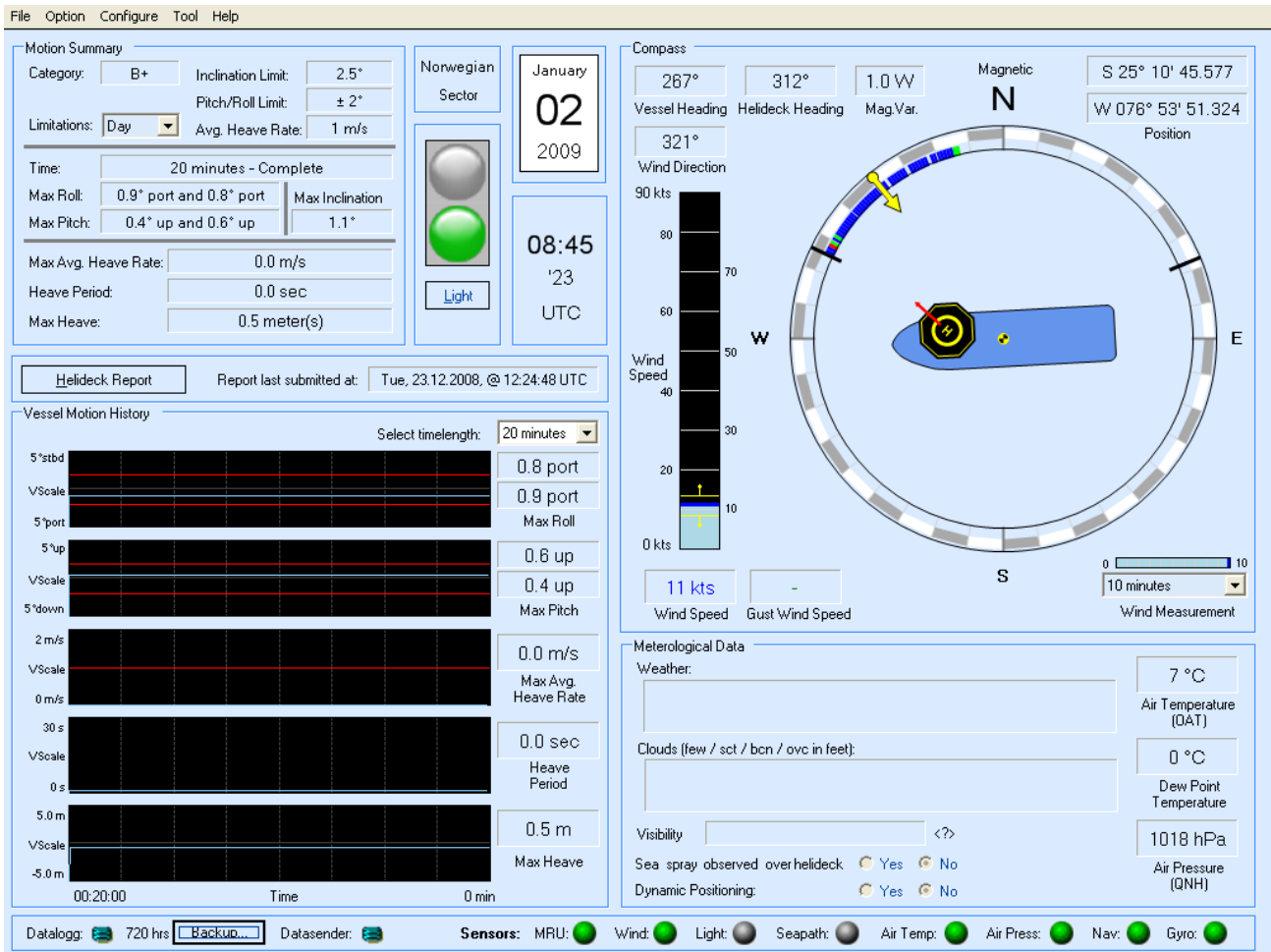
The “traffic light” on the display indicates when one of the following parameters have reached a threshold: Roll, Pitch, Inclination, or SHR. As long as all the measured parameters are within or on limits it should show a green light, and when a limit is exceeded it should show a red light.

Due to the nature of the SHR signal, the following trigger logic should be applied to the SHR input to the helideck motion status:

- The helideck motion status becomes RED if:
 - The HR limit is exceeded; and
 - all of the records in the previous 2 minutes have also exceeded the HR limit (or equivalently, the minimum SHR in the previous 2 minutes exceeds the HR limit).

- Once the deck motion status is RED, it becomes GREEN again only if:
 - The SHR falls below 95% of the HR limit, and
 - the mean of the records in the previous 10 minutes is below the HR limit.

Typical layout:



11. Logistics Information display

Data Display layouts shall be approved by the Helicopter Operators. The layout shall as a minimum include all data from the *Standard Helideck report* used on the NCS (OLFver1) that is not already covered by the *Helideck Movement and Weather data display*