

Wet bell

Handling system



Ordering information

Wet bell handling system

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The IHC Hytech Wet bell is an open wet bell handling system, that allows three divers to work at a depth of up to 100 metres. It is designed for intermitterend operations for undefined periods. It comprises the following main equipment:

- Skid base frame with hydraulic power pack, A-frame Wet bell handling system, and top frame with winches for the bell and the clump weight
- IHC Hytech open Wet bell with steel dome and viewport, onboard life support gas and communication system

When making the comparison with a wet bell diving system that can accommodate two divers it is vital to compare the Return on Investment of both systems. A diving school can educate an extra diver per session which means a capacity increase of 100% and consequently more revenues per session / class.

The wet bell could be integrated with an IHC Hytech dive control panel located in a container. The system can be completed with a containerized decompression chamber (20ft container) and various diving materials such as hot water suits, a hot water supply unit, diving suits, diving

helmets and various underwater tools. This can be quoted for separately.

The complete system of the Wet bell will be certified by DNV GL. The following guidance codes and standards are used for the design and manufacturing of the Wet bell:

- IMCA D014: International Code of Practice for Offshore Diving
- IMCA D023: DESIGN - Diving Equipment Systems Inspection Guidance Note for Surface Orientated (Air) Diving Systems (Rev. I - January 2014)
- IMCA D030: Surface Supplied Mixed Gas Diving Operations
- IMCA D037: Design for Surface Supplied Mixed Gas Diving Equipment



Specifications

- Capacity Designed to accommodate 3 persons: 2 divers and 1 standby diver (bell man)
- Conditions
 - Sea state: 4-5
 - Wind speed: 5-6 Beaufort
 - Design temperature¹: -10 °C to +35 °C
 - Sea water temperature: Min. +2 °C
 - Weather conditions: Wet bell operations should be stopped at heavy snow/ arctic conditions
- Depth / length of wires
 - Max. working depth: ± 100 msw
 - Wet bell lifting: ± 110 msw
 - Clump lifting: ± 220 metre
- Safe working load
 - Wet bell: ± 2,230 kg (per diver 150 kg)
 - Bell winch: ± 3,345 kg continuous
 - Clump winch: ± 1,415 kg continuous (twofold purchase 2,830 kg)
- Fail safe brake rating
 - Bell winch: ± 3,345 kg continuous
 - Clump winch: ± 2,120 kg continuous (twofold purchase 4,240 kg)
- Power supply
 - Main power supply: 18 kW ; 400 VAC 50 Hz 3PH 63A
 - Standby power supply: 18 kW ; 400 VAC 50 Hz 3PH 63A
- Dimensions Wet bell
 - Inside diameter: ± 1,500 mm
 - Clear openings (W x H) ± 900 x 1,150 mm
 - Bell weight in air ± 1,780 kg
- Dimensions Wet bell & skid
 - Length (transport): ± 6,000 mm
 - Length (operation): ± 6,750 mm
 - Width: ± 2,440 mm
 - Height: ± 4,227 mm
 - Weight: ± 11,300 kg
 - Wet bell base frame skid: 20 Ft footprint (similar to 20 ft container)
 - Centerline Wet bell from frame: 2,155 mm
- Brakes
 - The bell and clump winch are equipped with 3 brakes for man rider purposes. As soon pressure drops in the hydraulic circuit and / or stopping these brakes will apply, and are releasable by hydraulic pressure (about 13 bar). These 3 brakes are:
 - 1) Main brake, band brake type spring acting fitted on drum
 - 2) Multiple disc brake, spring acting failsafe / parking type mounted between planet drive and hydraulic motor
 - 3) Pressure assisted over centre valve or counter balance valve, fitted on hydraulic motor
- Hydraulic piping
 - All hydraulic pipe work is of mild steel construction and cadmium plated fittings. The pipe work is securely fitted to the frame using pipe clamps
 - All flexible connections and interconnects are kept to a minimum and are mainly between the control station and the winch position
 - All hydraulic pipe work will be painted and the manifolds / control valves will covered with grease impregnated Denzo- tape
 - All hose fittings pipe crimping ferrules and other hydraulic fittings will be of the O-ring type (Multiseal) to minimize the chance of leakages
 - Heavy duty pipe clamps are used throughout to clamp all pipe runs to the skid. 2-Wire hydraulic hose will be used exclusively on all relevant flexible areas on the skid
- Safety
 - A safety chain is provided across the sea side of the A-frame platform and is clipped in position after launching. A safety rail is provided on the inside of the rams to prevent accidental damage from recovering the Wet bell
- Paint
 - The framework is shot blasted and painted to a marine grade paint specification
 - RAL number is to be discussed

Standard items



Skid frame

20 Ft skid frame on which the A-Frame, top frame, bell winch, clump winch, umbilical power sheave (option), and the umbilical basket are installed. Rugged steel base frame-work with stiffening gussets and sacrificial deck fastening positions. The working area is decked with open mesh floor grating to ensure safe non-slip operation and to reduce water entrapment.



Retractable platform

A retractable divers entry and exit platform is installed on the base frame, allowing the divers to easily enter / exit the Wet bell. So, it is not necessary to bring in the A-frame onboard of the ship after every dive, which saves time when the divers have to leave the Wet bell to enter the DDC. This platform is manually operated and can be extended up to 1,440 mm.



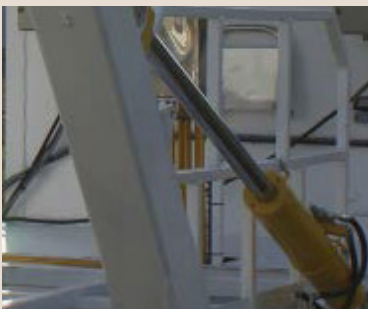
Umbilical basket

The umbilical basket is integrated on the aft of the skid frame and is used to store the main Wet bell umbilical. However, in case the umbilical winch (see pos. 3) is chosen, this item becomes redundant.



A-frame

A rugged A-frame is provided to launch the Wet bell over the ship's side. It is designed to be rigid in operation and handle the required design loading as specified in DNV GL requirements for offshore structures. It takes around 32 seconds to get the A-frame from inboard to outboard position and around 22 seconds to get it from outboard to inboard position.



Hydraulic rams

Hydraulic rams are supplied with stainless steel shafts as a standard to provide trouble free operation in the marine environment. The rams are used to position the A-frame in either the inboard / storage position or outboard position. Flow dividers are provided to ensure simultaneous extension of the rams. Hydraulic rams are made for man rider purposes. As an additional safety feature the A-frame is provided a safety sling should a failure in the rams or hydraulics occur.



Wire sheaves

On top of the A-frame wire sheaves are fitted, through which the nonrotating steel wire is routed. The sheaves have been designed for minimum friction losses. A special bush is used for easy and safe mounting of the sheave bearings.



Bell winch

The Wet bell is lifted to and from the working depth using an IHC Hytech designed hydraulic man rider bell winch, provided with a non-rotating steel wire, as the primary means of recovery. The winch specifications are as follows:

- Nominal lift capability: 2,230 kg
- Maximum lifting speed: operator controllable 0 to 15 metre per minute (250 mm p.sec)
- Wire length capability: 110 metre
- Wire diameter 16 mm
- Grooved drum
- Drive system: Direct hydraulic (Open loop circuit)



Clump winch

The guide wire system (with seawater resistant bronze bushings) of the clump winch provides a means of guiding the Wet bell on both sides to the sea bed, maintaining the Wet bell in a set orientation and perpendicular position to the vessel. This reduces the effect of strong currents and vessel movements. The guide wire system also serves as backup means of recovery. Therefore, the clump winch is also rated as man rider winch. It has a twofold purchase and is installed on the winch support frame.

The winch is rated for 30 metre per minute ascent speed (15 metre per minute actual twofold purchase), to provide adequate speed during work where surface decompression is required and the distance from sea level to the system is high. The clump weight supplied with the system is provided with dual sheave wheels and is provided with finger guard protection, etc.



Clump weight & tool basket

The clump weight weighs approximately 600 kg and is designed for strong currents. The clump is equipped with 2 sheaves and a weld on toolbox. If required additional weights can be dropped. The clump weight will be caught in the opening at the bottom side of the Bell (for storage purposes or for emergency recovery).



Hydraulic power pack

The hydraulic power pack is integrated in the skid frame, with 2 pcs. independent working electrically driven hydraulic pumps. The IHC Hytech hydraulic power pack is situated on the top frame. It consists of a primary power pack pressure compensated piston pump and motor. The primary and secondary power pack have similar specifications, namely:

- 15 kW with a flow of 42 litre per minute at 200 bar
- 400 VAC 50 Hz 3PH+PE 63A with IP56 rating AC heating
- 250 litre oil reservoir, with inspection hatch
- Filler and breather
- Sight glass with level switch alarm signal
- Oil filter system 10 mu fine mesh- filter system with decontamination gauge
- High oil temperature cut out alarm signal
- Pressure gauges and filters with contamination gauges are mounted



Primary hydraulic control panel

The primary hydraulic control panel is installed on the HPU unit, which is installed on the skid frame, consisting of the controls for the following functions:

- A-frame forward / backward • Bell up / down
- Clump weight up / down
- Power sheave up / down
- Bell lock activated and deactivated (only if the option for the bell catcher is selected)

Pressure gauges are provided for the main pump hydraulic system pressure and secondary pump hydraulic system pressure.



Primary and secondary switchboard

The primary switchboard includes an alarm panel with system status indicator lamps and audio alarm, installed on top of the control panel. It controls all electrical systems of the HPU system (oil, temperature, filter status, etc.). The panel allows the operator to easily see the status of all electrical equipment. In accordance with the DNV GL rules for diving systems, the secondary switchboard for the Wet bell and handling system should be located in another compartment than the primary switchboard. This portable switchboard is for that reason provided with 20 metre extension cable that can be mounted near the standby generator, which provides the required level of redundancy in the event of fire and loss of main switchboard power.



Wet bell incl. viewports

The wet bell is provided with a steel dome, outfitted with two viewports on the side of the dome. For offshore conditions it can be recommended to use a steel dome rather than having an acrylic dome, because acrylic is fragile, wears out by UV, and replacement is expensive. The diver recovery hoist and diver handles are an integral part of the dome to assist divers into the Wet bell. For anti-slip purposes a floor grating is fitted in the bell.



Main wet bell umbilical

The IHC Hytech-Cortland main Wet bell umbilical of 110 metre is spiral wound with a polypropylene outer braid, and comprises the following:

- 1/4" Pneumo Hose (4 pcs.)
- 3/8" Gas Supply hose (4 pcs.)
- 1/2" Hot water hose (1 pc.)
- Communications, camera, data signals and power cables (depending on the options chosen)



Main wet bell junction panel

On the outside of the Wet bell (above the side entrance) a panel will be installed to hook up the main Wet bell umbilical. It contains both gas connections and electrical connections. The connections for the excursion umbilicals can be found internally, clearly marked per diver.



Gas supply for three divers

The standard wet bell life support system is as follows:

- 4 Pcs. onboard gas supply cylinder of 50 litre, 200 bar with first stage regulator. This is the secondary supply, providing the divers' air manifold with emergency gas. These will be split into two separate banks outside and clearly marked.
- Each diver's manifold has separate surface gas supply, cross over valves to provide gas to the demand regulators installed on demand valve type of breathing regulator (helmet type)
- The bell blowdown supply is supplied from the standby diver supply and includes a dome vent valve
- A hot water manifold is supplied for connection to the diver's hot water system (if applicable)
- Pneumo-fathometer depth monitoring: provided for all divers and the Wet bell



Lifting eyes

The wet bell is fitted with a central lifting point and three additional lifting eyes for attachment of the main wet bell umbilical Chinese finger / stress release as well as for emergency recovery. A lifting sling set is included.



Lighting system

Three pieces underwater Wet bell lights are mounted outside of the dome facing both entrance and exits to the Wet bell. Internally one bell light is mounted. These lights will provide a good illumination-Lux during dive operations.



Umbilical storage

Steel horns (three pieces) for storage of up to 45m. umbilicals will be provided. Excursion umbilicals will be stored inside, whilst the bell man umbilical will be stored outside.



Diver recovery hoist

A diver recovery hoist is provided to lift an unconscious diver into the Wet bell air space.



Caisson indicator

A caisson indicator is provided for monitoring Wet bell depth to the divers.



Two-way bullhorn

The Wet bell is equipped with a two-way bullhorn mounted on a stainless steel bracket in the top of the wet bell dome for communications between the divers in the bell and the operators at the dive control station.



Optional scope of supply

Hydraulic umbilical power sheave

The IHC Hytech hydraulic power sheave is a large diameter cable sheave with a groove to carry the umbilical line with an outer diameter of approximately 70 to 80 mm, which is driven via a direct mounted wheel drive model of planetary gearbox with integrated hydraulic motor and control valve.

The IHC Hytech power sheave acts in a constant tension mode. The pulling force (adjustable) is based on an interface friction, four diabolic rollers are constantly pressed onto the umbilical outer diameter by a hydraulic cylinder, the pull force is approximately 400 kg and the line speed is related to the Wet bell travel speed. The Umbilical can be stored in the umbilical basket.



Hydraulic umbilical winch

Using the hydraulic umbilical power sheave is 1 way of umbilical handling, but still requires manual labour to guide the umbilical in the storage basket. Alternatively, an umbilical winch can be installed on the top frame for 110 metres umbilical. The winch also stores the umbilical, saving labour costs and space, since the umbilical basket is no longer needed. It is hydraulically operated with constant tension device. It is provided with integrated swivel and slip ring couplings for transfer of diving gas and electrical signals.



Emergency crank system for manual Wet bell recovery

The Wet bell can be raised to surface by means of a hand operated backup crank system, if for example the complete hydraulic system cannot be used. Hydraulics over centre valves are also hard piped onto the cylinders to prevent uncontrolled movement of the rams due to a loss of hydraulic pressure. This ensures a safe operation of the system at all times. The crank can only be used for hoisting purposes.



Acrylic dome

The standard Wet bell has a steel dome. However, in some cases it can be preferred to have an acrylic dome.



Wet bell catcher

The Wet bell catcher holds the Wet bell stable when divers have to enter or exit. The top of the dome is provided with a cone. When the Wet bell is brought to the surface and raised upto the catcher installed in the A-frame, it is automatically caught into the swinging catcher assembly that ensures the Wet bell can swing in one axis only. The catcher is operated hydraulically with various hydraulic safety features (including locking device) to ensure the operator does not inadvertently operate the system without taking up the slack on the main umbilical.





Umbilicals: Excursion umbilicals 40 metre (other lengths are available)

The excursion umbilical for diver 1 and 2 is spiral wound and comprises the following:

- 1/4" depth hose
- 3/8" gas hose
- 3/8" hot water hose
- 2 Twisted pairs comms cable IHC Hytech
- Mini-TV cable for camera and lighting system



Umbilicals: Bell man umbilical 45 metre (other lengths are available)

The excursion umbilical for bell man is spiral wound and comprises the following:

- 1/4" depth hose
- 3/8" gas hose
- 3/8" hot-water hose
- 2 Twisted pairs comms cable

All umbilicals are provided with a Chinese finger / stress release with carabiner which can be connected to the diver's safety harness.



Remote control panel for hydraulics

Besides the fixed control panel an IHC Hytech remote control panel will be provided, which is connected by means of a flexible cable with a length of 10 metre, making the operator more mobile. The following functions can be controlled:

- A-frame forward / backwards
- Bell up and down
- Clump weight up and down
- Bell lock activated and de-activated



Sea acceptance test (SAT) and training

Once the system has arrived on-site and is cleared by customs, 2 engineers of IHC Hytech will come over in order to perform a SAT test. Altogether the SAT and training will be max. 5 days. The Client will be responsible for the following:

- A barge or ship should be available on which the Wet bell system can be installed
- The fastening of the Wet bell system to the deck of the ship should be done by the Client. Of course our engineers will support this
- The ship should be capable of moving into an area where the SAT test can be carried out, so protected from high currents, and waves
- The costs for the gas mixtures and breathing air for carrying out the SAT
- Arranging trained divers and operators in order to do the SAT
- The divers must understand the English language



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