



## **Self propelled habitat.**

The self propelled habitat is designed around an in-house concept, which makes the vehicle the ideal platform for diving operations inside cooling water intake pipelines, culverts, outfalls and sewer pipes.

The system drives through culverts and is operated either from the surface or by the divers. This concept allows divers to work safely over long distances in confined spaces and creates a safe house and a dry working environment. The habitat is connected via the main umbilical to the habitat control room and live support systems. Divers are connected to the habitat via short 20-metre excursion length umbilicals. Inspection and maintenance can be carried out minimising the diver excursion distance.

The vehicle itself drives on eight wheels. Four running wheels mounted on the bottom side and four on top driven by four HP water/hydraulic motors. Operations are controlled and monitored from inside the habitat control room using state of the art techniques for life support, air/gas analysing, video and communication. The hydraulic drive of the wheels is powered by onboard HP water/hydraulic motors. This enclosed water/hydraulic drive system is supplied by an environmentally friendly HP fresh water pump system and is fully redundant.

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In the present configuration, the habitat is capable of working in culverts over distances up to 400 meters, with a minimum width of 2500mm and a maximum width of 2800mm.

#### **Habitat safety features**

- Low risk, diver excursion distances are limited.
- Diver observation by cameras mounted in and outside the habitat.
- The habitat is built according the IMCA rules and regulations.
- Fully redundant life support systems.
- Fully redundant propulsion system.
- Provision for up to 72 hours of backup air/gas supply.
- Continuous monitoring of air/gas supplies.
- Adjustable drive speed.
- Driving the habitat is only done by one diver, who operates the controls from either inside or remotely from outside the habitat.

#### **Habitat commercial advantages**

- No dewatering required.
- Shut down periods can be kept to a minimum or can even be omitted.
- Extended dive times using specially designed dive and decompression tables.
- Smaller dive teams.
- Greater accuracy while working inside the dry environment of the habitat chamber.
- The availability of these habitat techniques, overcomes the need to install intake hatches or other means of access points for divers over longer pipeline routes.
- All operations can be carried out from onshore, no costly marine spread required offshore.

#### **Habitat technical advantages**

- The HP water supply to drive the habitat can be used to power a diversity of tools (rotary) core drilling machines, abrasive cutting disk, HP water jet cleaning, etc.
- Capability to transport or pull (8-ton) heavy equipment and or materials.
- Video and photographic images displayed real-time.
- The air/gas supply system configured in such away that two divers can work simultaneously outside the habitat.
- Because of the moving arms, the habitat is capable to pas narrow sections and to cope with chances in shape.

#### **Principle of operation**

- A full function check will be performed prior to the deployment of the system.
- The habitat is deployed by crane at the desired location.
- The diving supervisor, inside the habitat control room is in overall charge of the operations and is in direct communication with the divers, crane operator and supporting personnel.
- One diver drives the habitat into the entrance of the culvert, operated from either inside or remotely from outside the habitat.
- The main umbilical runs over a driven sheave wheel and is handled by supporting personnel.
- Ones positioned inside the entrance of the tunnel the required dive team enters the habitat and the diver operator, drives the habitat to the determined work location.
- Meantime supporting personnel pays out sufficient length of umbilical and monitors the tension.
- Ones in position the HP water supply is switch over to run the required tools.
- Divers than made ready to start the diving operations.



**Deployment of the habitat inside a handling frame.**

Due to the moving arms, the habitat is capable to pass narrow sections and to cope with changes in shape.



**Conducting trials to pass the narrow section as required for a previous project.**

### **Habitat Control Room**

The fully air-conditioned habitat control room, a standard ISO 20 foot container, is configured in such way that two identical habitat systems can be connected. Each system has its own independent life support, air/gas analysing, video and communication system. The operations are monitored and controlled by the diving supervisor from behind a control desk situated inside the habitat control room.

The diving supervisor acquires and processes all the necessary information using at least the following:

- Cameras displaying images from the habitat chambers interior and exterior.
- Diver hat-mounted cameras.
- “Round Robbin” communication system to and from the habitat chamber and all the individual divers.
- Constant monitoring of air/gas supply and quality.
- Constant monitoring of oxygen levels inside the habitat chamber.

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Further, the divers receive their breathing gasses from independent air/gas supplies. The air/gas supply is delivered from an especially for this purpose designed compressor container unit.

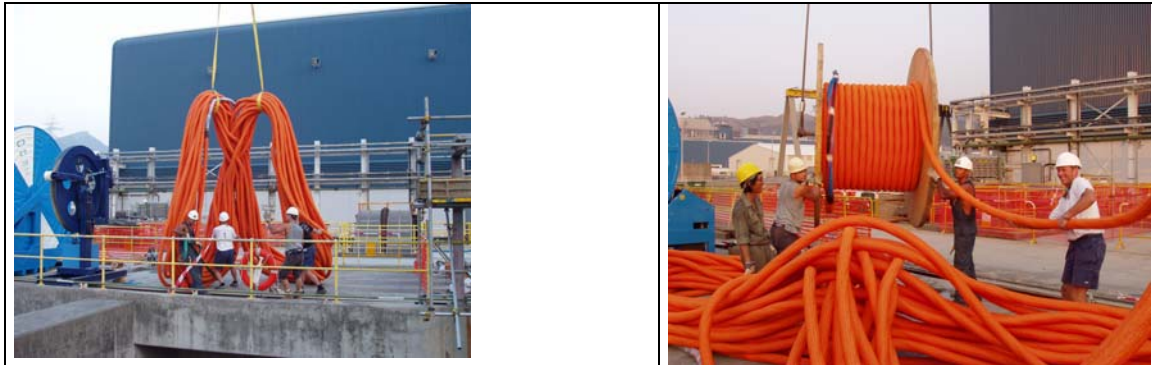
### **Compressor Unit.**

Inside a standard ISO 20 foot container, LP and HP compressors are installed. The air/gas supply system to the habitat is realised by two independent systems, one HP air/gas supply system for the divers and one LP air supply system for the habitat chamber. Each system delivers the gasses from an air bank of sufficient capacity and the compressors maintain the capacity, together with full built in redundancy systems.

### **Umbilical and Power Sheave.**

All necessary gasses, communication and power supplies are provided by a life support umbilical.

Due to its weight and length, handling of the umbilical is done by routing it over a hydraulic powered sheave wheel. This sheave wheel is positioned at a convenient location and inline with the travelling direction of the habitat.



**Handling the Life Support Umbilical.**

### **Tools**

A diversity of specially designed hand tools (rotary) can be used and are driven by the habitats HP water/hydraulics supply system.

Currently available special tools such as:

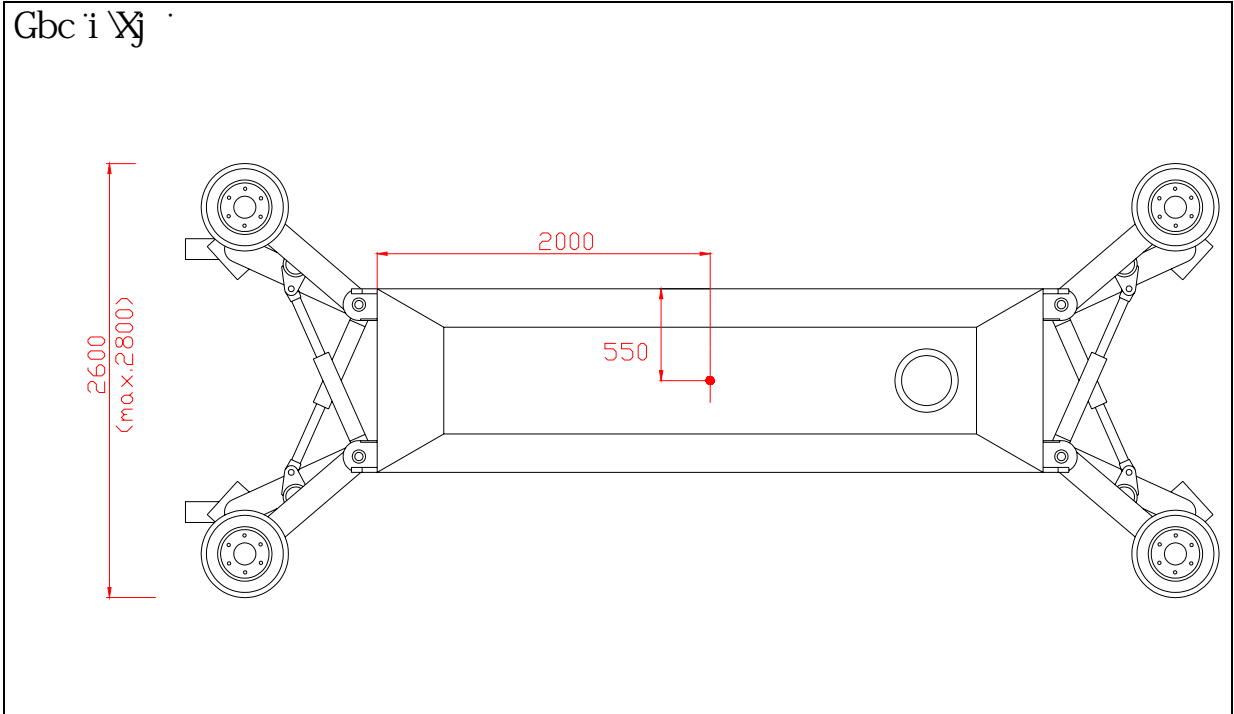
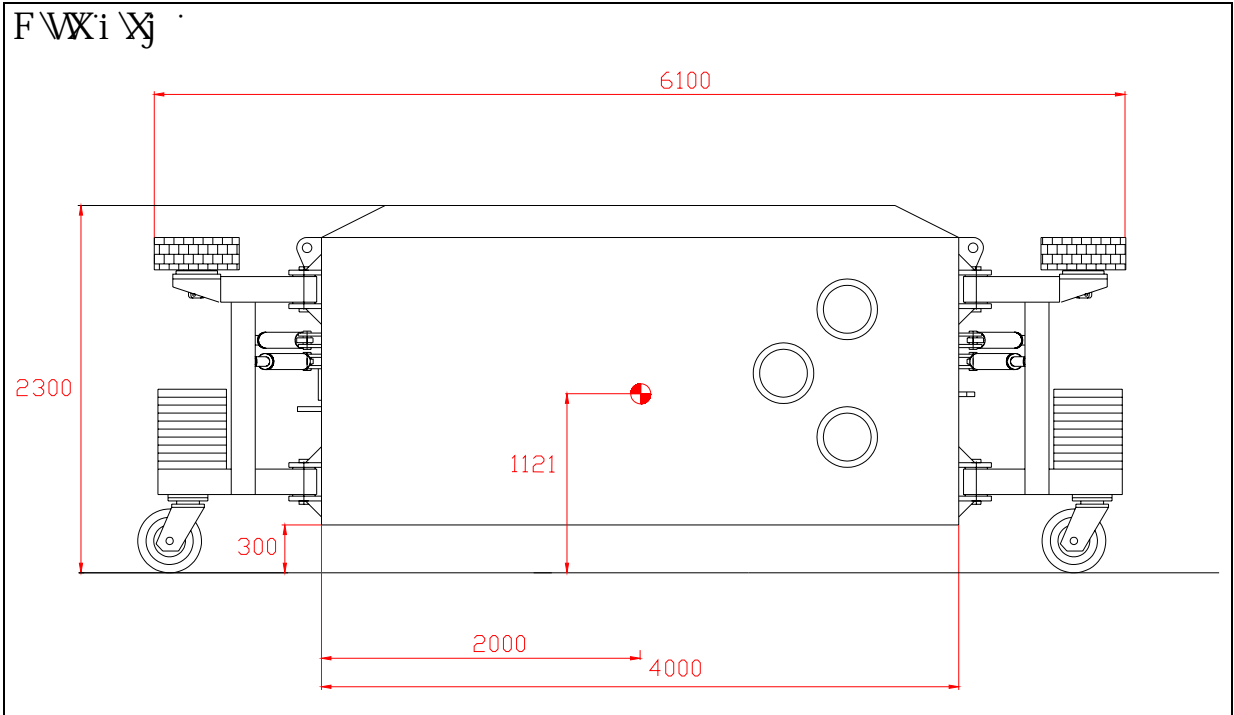
- Core drilling machine.
- Abrasive disk cutter.
- HP water jet cleaning.



**Water/hydraulic core drill**

If necessary, a great variety of hand tools can be stored inside the habitat for the works to proceed.

**Dimensions**



<b>SPECIFICATIONS</b>	-	Length	:	6100mm
	-	Width	:	1100mm
	-	Height	:	2300mm
	-	Weight in air	:	10,000kg
	-	Weight in seawater	:	500kg
<b>CONSTRUCTION</b>	-	Steel welded		
<b>WATER HYDROLICS</b>	-	4 x 200 bar fresh water pumps		
<b>LIFE SUPPORT UMBILICAL</b>	-	HP water hose 2 x 200 bar WP 20 mm		
	-	Air hose 1 x FDH08G 69 bar WP ½" NB		
	-	Gas Hose 4 x FDH06G 69 bar WP 3/8" NB		
	-	2 x Fibre-optic conductors each comprising 4.50/125 multimode fibres in steel tubes.		
	-	2 - 2 * 5 mm <sup>2</sup> screened twisted pairs used for communication.		
	-	2 - signal cable comprising 6 x 0.5 mm <sup>2</sup> screened twisted pairs and 4 x 2.5 mm <sup>2</sup> single core		
	-	Polyethylene monofilament over braid.		
<b>NOMINAL MECHANICAL CHARACTERISTICS</b>	-	Finished diameter	:	88 mm
	-	Weight in air	:	4050 kg/km
	-	Weight in seawater	:	250 kg/kg
	-	Minimum bend radius	:	575 mm (static)
	-	Minimum bend radius	:	860mm (dynam)
	-	Minimum breaking load	:	78.5 kN
<b>CAMERA</b>	-	SONY interline transfer hyper NAD CCD		
<b>UMBILICAL POWER SHEAVE</b>	-	Type PS 2000/70/90		
	-	Max line speed 90 m/min		
	-	Nominal line pull 200 kg		
	-	Max pull on break 400 kg (pending on friction)		
	-	Installed power 5.5 KW 3 phase 400 V /50 Hz		
	-	Weight 1,600 kg		
	-	Seize L x W x H, 2.6 x 1 x 2.3 meters.		
<b>CONTROLS</b>	-	Manual		
	-	Adjustable speed		
<b>DEPLOYMENT &amp; RECOVERY</b>	-	Mobile Crane or Cantilever		
	-	Launch frame as required		
<b>HABITAT CONTROL ROOM</b>	-	Length	:	6100 mm
	-	Width	:	2440 mm
	-	Height	:	2400 mm
	-	Weight	:	5,400 kg

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<b>COMPRESSOR UNIT</b>	-	Length	:	6100 mm
	-	Width	:	2440 mm
	-	Height	:	2400 mm
	-	Weight	:	8,500 kg

<b>POWER REQUIREMENTS</b>	-	380 VAC 50 Hz
		Max. load 210kW / 250 kVA

### **HABITAT INTERIOR**

- 1 x Full dive panel for individually supply of air or mix-gas (nitrox) to three (3) divers .
- 1 x Oxygen resuscitators.
- 1 x Medical oxygen supply as required.
- 3 x 50 litres 200 bar HP cylinders for back up air supply.
- 1 x Complete toolset inclusive of rotary tool connections
- 1 x "Round Robbin" fully open communication system.
- 1 x Camera system.
- 1 x Emergency battery lighting system.
- 3 x 20 meter diver excursion umbilicals.
- 1 x O2 level testing facility.



**Habitat Interior**