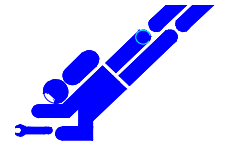


NORDSEETAUCHER

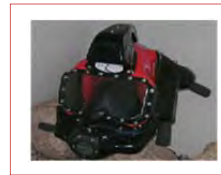


N-SEA-DIVERS 北海潜水公司

Hyperbaric Tunnel Construction and Diving®

高压下隧道施工及潜水

and



Work under Hyperbaric Conditions

Diving and Compressed Air Work

in

Tunnel-Boring-Machines

盾构机潜水与待压作业





With the current edition

„Hyperbaric Tunnel Construction and Diving®“

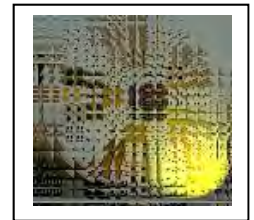
the NORDSEETAUCHER GmbH (N-SEA-DIVER) would like to thank our client, customers and suppliers for the shown confidence quite cordially.

For a pleasant, interesting and successful cooperation we are available also in the future.

And of course we assure you a professional and qualified execution of our work furthermore, too.

Hamburg / Ammersbek in January 2020

The NST Team



and

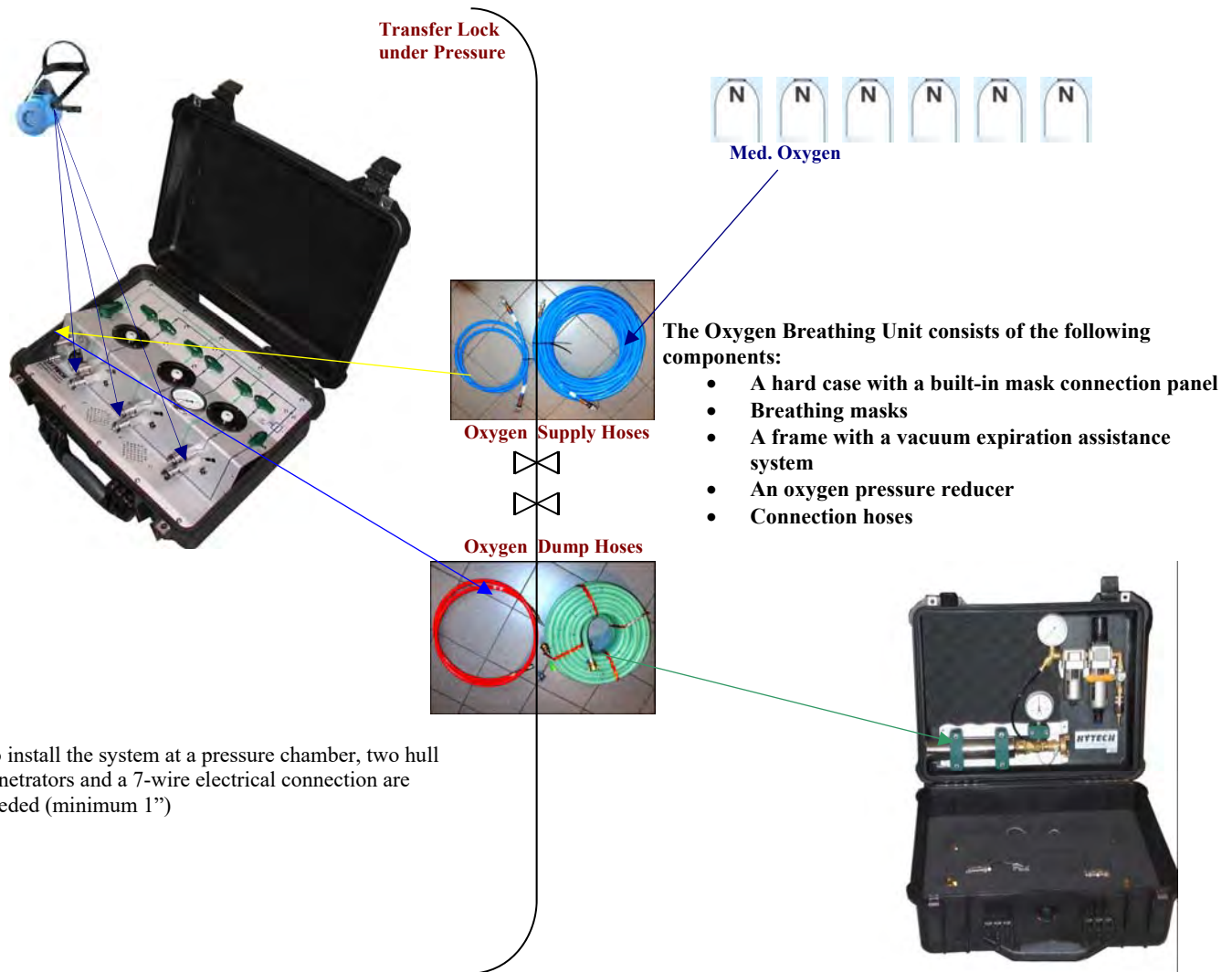


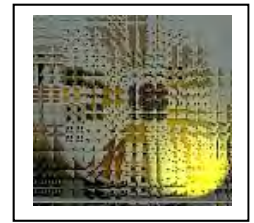
presents

POBS - Portable Oxygen Breathing System

(Utility Model DE 20 2005 014 078)

The portable oxygen breathing system is a solution for pressure chambers where fragile mask and communication connections are not permanently needed. For example locks built into tunnel boring machines, where the lock is mostly used to transfer materials into the head of the machine. The portable oxygen breathing system can easily be taken out of the pressure chamber when it is not in use for decompression. The system can provide up to three masks with oxygen, and has communication connections built in for a 3-channel communication set.





Portable Oxygen distribution system for 3 masks includes:

- Heavy duty transport box, complete with integrated panel, consisting an aluminium anodized control panel, with line diagrams, pictograms, as well as 3 x inhalation and exhalation breathing regulators with a free flow adjustment knob, all with inhalation and exhalation isolation valves.
- The interface hoses between the oxygen inlet and the oxygen outlet system, length each hose 3 meters, and complete with phosphor bronze swaged fittings.
- The chamber wall penetrations with control valves
- Oxygen inhalation and exhalation hoses with a length of 45 meters
- 1 x high pressure oxygen regulator; 1 x oxygen BIBS vacuum controller; 1 x low pressure reducer in the control panel
- Exhaust vacuum system which makes it possible to exhale at shallow depths, and this exhaust vacuum control system will be installed in an ABS heavy duty transport case (identical to the oxygen panel which is used for the portable oxygen control panel)
- all quick connectors on the oxygen control- as well as vacuum panels-, as well as on the hoses-, will be provided with blind caps/protective caps

All fitted together to a full working system.

The breathing masks to be connected to the portable oxygen system

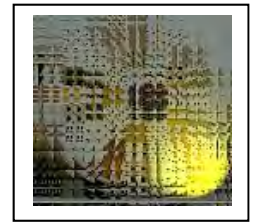
- We supply “Sea Long” resuscitation masks with a soft wearing comfort, better than the most other masks on the market.
- The mask comes complete with a 90 degrees hose adaptor, and the headgear.
- Also masks are designed for long term use, and can be disinfected easily.

The communication system for the oxygen breathing masks:

- The technician wearing a throat microphone, which has to be mounted around the neck / throat, by means of a small rubber strap

The communication box:

- The communication box is a transportable box with handgrip, and front lid to be installed at the position of the lock attendant or supervisor.
- The communication box is provided with a 220 volt power supply, as well as a rechargeable battery.
- Further the system is provided with volume controls, electrical connectors for the power leads running from the chamber to the diver communication box.
- The length of the connection cable between the man lock and the communication system is up to 45 meters, and will delivered complete with a electrical through hull penetrator, which has to be installed in the chamber wall.



NORDSEETAUCHER - Hytech Mixed Gas / Air Saturation on TBM's

The specification of the Mixed Gas/Air Saturation System complies (where this is feasible-, possible-, and applicable) the regulations as laid down in the OSHA guidelines for Hyperbaric Work.

The work pressure of the special designed Living Chamber and Shuttle is up to 17bar.

The Surface Decompression Chamber (SDC)

The SDC is the living compartment in which the Divers/Technicians decompress or are going in Saturation.

The special Decompression/Living Chamber and the control panel are installed in 20ft standard container to protect / isolate the chamber from the environment (dust, sand, rain, sunshine). The main dimensions are 6060 x 2440 x 2590mm.

The containers are provided with a cooling system for the container environment

The SDC will be mounted in this container and sea fastened bolted through the container floor.

The chamber container is outfitted with a integrated junction panel, installed on one of the longitudinal sides or the roof ceiling of the container.

When the container is transported this connection panel is covered by door (s).

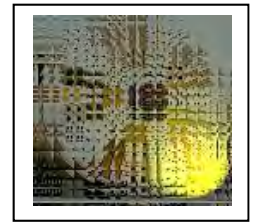
In the junction panel of this SDC container the interfaces between the SDC and the control panel are installed.

The SDC control container (container in which the chamber control is installed)



This is a modified 20ft container in which the special decompression chamber control panel, an extra entrance door, an umbilical junction connection panel and the electrical power supply cables interface with connection hoses are installed.

In order to control the temperature inside the container the unit is provided with not flammable and not combustible insulation materials against all walls. The ceilings are covered with cladding.



LIVING CHAMBER FOR MAXIMUM 4 PERSONS

Hy-Tech 2200 mm diameter double lock decompression/living chamber:

Design criteria:

The pressure vessel is designed and built according to the regulations ASME Section VIII-Div1 PVHO and this is witnessed/certified by a independent notified body, like Lloyds Register, TÜV, Germanischer Lloyd or any other authorised certification authority.

The technical lay out, such as piping-, air and gas systems and electrical systems will be designed to the general safety standards for saturation diving systems. These will be submitted to Lloyds Register and/or Germanischer Lloyd.

Layout of the main chamber:

The main chamber has an overall length of approx. 4.200 mm. The main chamber is provided with a separation curtain, dividing the main chamber in 2 sections.

The sleeping area

The sleeping area has 4 bunks/beds, each bed approx. 2100 mm long and 700 mm width (1 on each side of the chamber and 1 above the other)

The sitting area

This section is outfitted with a bunk where 4 x workers easily can sit and rest. The bunks are provided with fire retardant mattresses and do have back rests.

The chamber is outfitted to accommodate maximum $3 + 1 = 4$ Diver/Technicians

Food lock / Medical lock

The main chamber as well as the entrance lock is provided with a medical lock system in order to bring food-drinks-, medical supplies etc. into the main chamber.

Layout of the entrance chamber

The entrance chamber has an overall length of approx. 1.400 mm (exact length to follow after final design is finalized) The entrance lock is provided with one foldable seat and is outfitted for 1 worker and the seat provided with a backrest and fire retardant seating material.

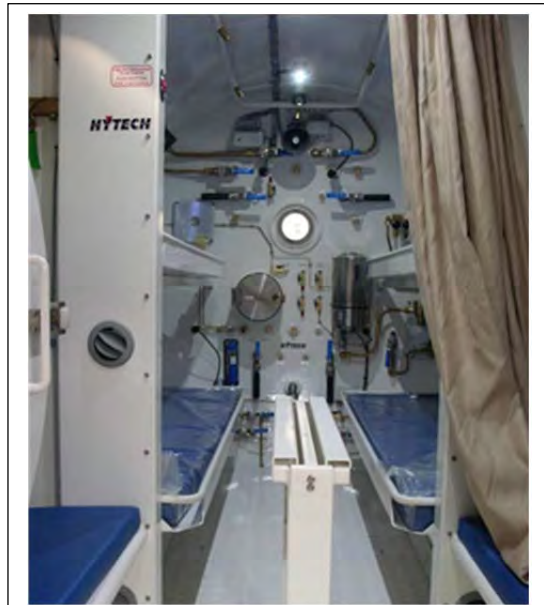
Note

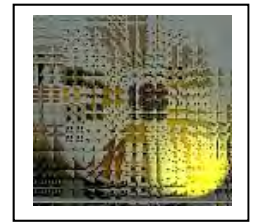
The entrance chamber is outfitted with a hyperbaric toilet and a wash basin with hand shower, complete with water drains, etc.

Communication systems

The main chamber and entrance chamber are provided with an electrical communication system of which the transmitter and receiver part is placed in the control console of the decompression chamber. It is installed in the control container in order to have clear communication with the occupants insides the main chamber and the entrance chamber and the operator behind the control panel. (12 Volt)

This unit has a built in digital Helium un-scrambler.





Main Transfer Shuttle (MTS)



The specification of the Mixed Gas/Air Shuttle System complies (where this is feasible-, possible-, and applicable) the regulations as laid down in the OSHA guidelines for Hyperbaric Work.

Design criteria:

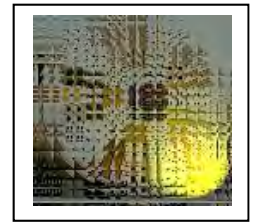
The pressure vessel is designed and built according to the regulations ASME Section VIII-Div1 PVHO and this is witnessed / certified by a independent notified body, like Lloyds Register, TÜV, Germanischer Lloyd or any other authorised certification authority.

For the technical layout of the transfer chamber/shuttle the OSHA guidelines for Hyperbaric Work will be used (where this is feasible and/or possible and/or applicable) and also the rules- and regulations for diving systems and submersibles of LRS will be taken in consideration

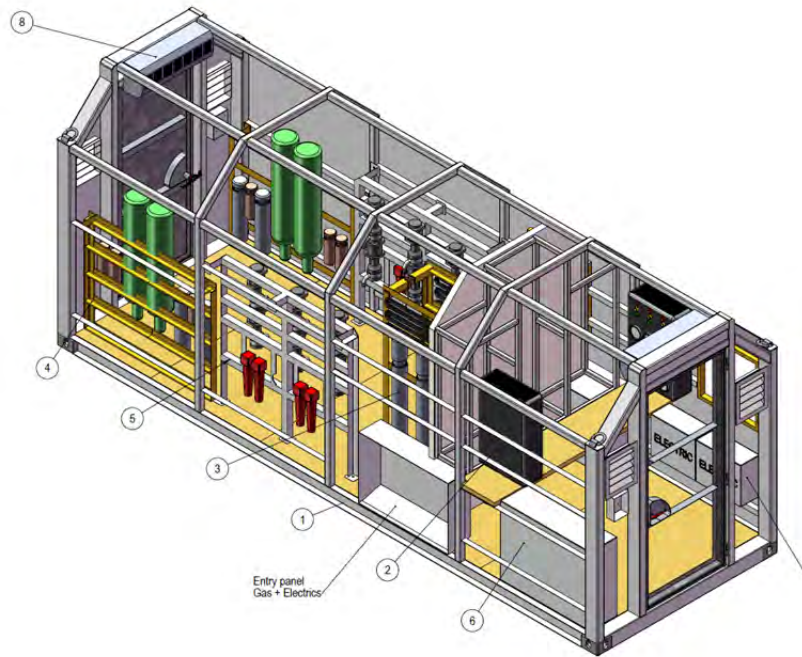
The technical lay out, such as piping-, air and gas systems and electrical systems will be designed to the general safety standards for saturation diving systems. These will be submitted to Lloyds Register and/or Germanischer Lloyd.

The layout of the MTS will allow the transport of 4 persons in sitting position
(4 diver/technicians or 1x prone patient with 1 x attendant in sitting position)

We assume that the **Man Lock Chamber (MLC)** on the TBM will installed in the tunnel drilling machine at the premisess of HK-Germany. This MLC should preferably be outfitted with a IHC-Hytech- type of mating flange or clamping spool piece.



Hytech - NORDSEETAUCHER Gas Recovery System for use on TBM's



Gas Reclaim Surface System

The purpose of this document is to simplify the set up and understand the Gas Services Reclaim System functions.

Gas Reclaim Systems are developed in the Deep Diving Industry. The new system is developed for Hyperbaric Works on TBM's (Tunnel Boring Machines)

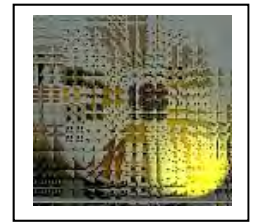
Reason for this is the following.

When Diver/Technicians are working at depths exceeding 50 meters of water depth the breathing gas they are using contains Helium (actually they are breathing Heliox (Helium /Oxygen) or Trimix (Helium, Oxygen, Nitrogen)).

Helium is a very expensive gas and difficult to obtain in various parts of the world. For example, when a Diver/Technician is working at depths of 100 meters water depth, the gas consumption per minute is around 300 liters (depending on workload / conditions).

The price of helium gas is around €15 till €25 per 1000 liters (all depending where the helium gas is purchased and also depending on the volume of gas purchased)

This roughly means that per hour the diver is consuming $60 \times 300 = 18.000$ liters / gas divided by $1000 \times 15 = 270$ Euro till 450 Euro.



In case 3 Diver/Technicians are busy in overpressure this means a total gas consumption of €800 till €1.350 per hour and/or approx. 6.750 Euro per shift.

In order to reduce the cost of the consumed gas, a Helium Reclaim System is designed to recirculate the gas supply to the Diver/Technicians. This new designed system will save the gas consumption of 90% on average

Upon request of NORDSEETAUCHER - IHC Merwede - Hytech has developed / designed a Helium Gas Reclaim System for Hyperbaric Work in Deep Tunneling, whereby Compressed Gas Technicians are operating at depths whereby the breathing air is replaced by Heliox and/or Trimix.

Below you find a short description of the working principle of the NST - TBM Gas Reclaim System.

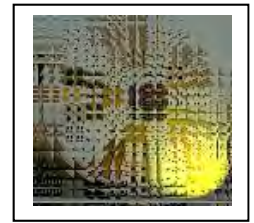


The principle of the Gas Reclaim System is to re-circulate the gas supply to the “Compressed Gas Diver/Technicians” who are acting / operating in the pressurized compartment of the TBM.

The purpose of the Gas Recovery System is to recover gas mixtures breathed by the Compressed Gas Diver/Technicians in the TBM, re-process it and deliver it into the supply system.

The gas is removed from the helmets or masks as it's exhaled by means of a recovery valve.

From there it is passed via the Shuttle/TBM to the surface where the gas is scrubbed to remove carbon dioxide, filtered to remove moisture and any particulate or biological contaminant and Oxygen is added to give the desired breathing mix. The gas is then compressed and delivered to storage until required for use when it will be delivered to the Shuttle Gas Supply Console.



Operation

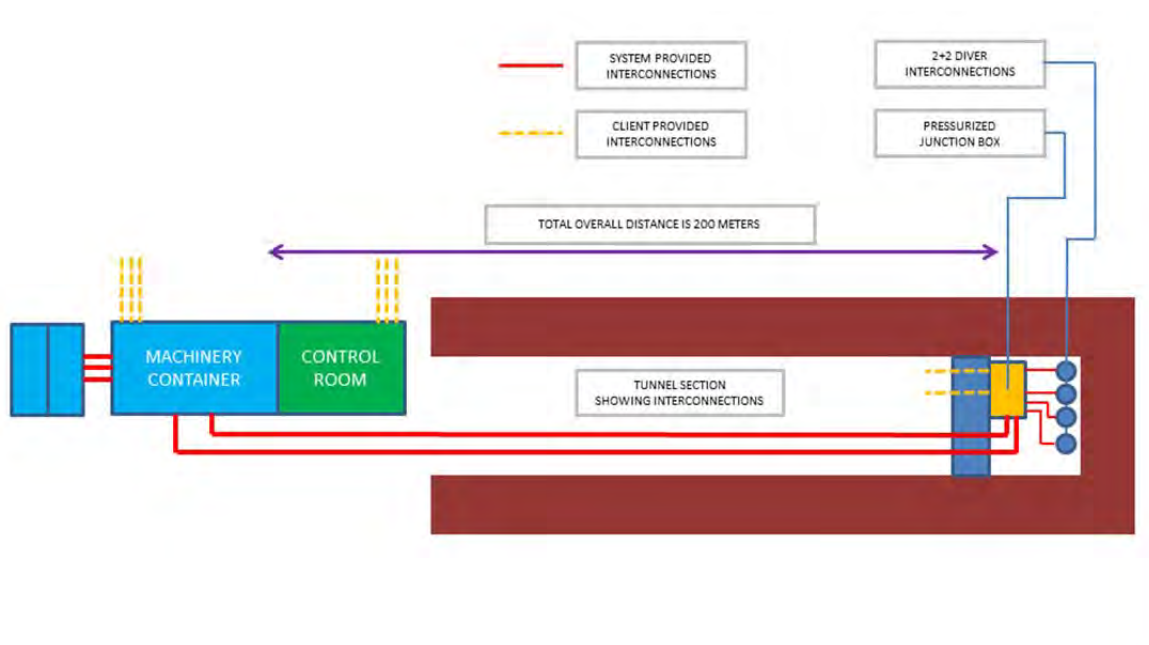
Exhaled gas is recovered from the divers by means of Reclaim Valves, mounted on helmets/belt.

The exhaust umbilical is connected via SEACO valves (supply actuated exhaust cut off valves) situated inside the Shuttle/TBM. Gas then passes into a back pressure regulator, which controls the pressure in the exhaust umbilical. The chamber operator can monitor this pressure by means of a gauge. Gas is then passed to the surface via a non-return valve.

On surface, the gas enters the LP Reprocessing Unit, where Oxygen is made up to the correct mix. The gas is then passed to a Gas Booster where the pressure is increased prior to returning to the High Pressure Reprocessing Unit. It is scrubbed to remove CO₂ and any other impurities before being passed to the Volume Tank for storage and eventual re-supply to the conventional gas supply system. This gas is passed via a main umbilical to the bell gas supply manifold and from the manifold to the Diver/Technician demand regulator using the technician umbilical.

During normal operation, the Oxygen used by divers is replaced by a metered flow into the system (metabolic O₂ make-up). This Oxygen flow together with all other aspects of system operation may be monitored by the Hyperbaric Supervisor at the control console. In the event of interruption of the gas supply from the Reprocessing Unit, the Supervisor is immediately informed by means of an alarm but the gas supply is maintained from the Heliox/Trimix bank via regulators first on the make-up panel and subsequently on the Shuttle Gas Supply Console.

Set Up Reclaim System TBM



Global set up gas reclaim units used for tunneling diver/technician reclaim



Air supply

Breathing protection equipment

The compressed air filter unit AF 1400 produces breathing air in compliance with international standards from every compressed air source. The unit is fully compatible with all breathing protection devices that run with compressed air. The device can supply breathing air for up to four persons. No electrical socket is required. Its weather-proof, shockresistant and conductive casing makes the AF 1400 ideal for all kinds of on-site applications.



AEROTEST Simultan LP

The Aerotest LP and HP are the standard low and high pressure Aerotest simultaneous kits.



Technical Data

Transport case
Weight approx 4.4 lbs (2 kg)
Supply Pressure
Maximum 150 psi (10 bar)
Flow
0.2 L/min and 4.0 L/min
Detects Four Contaminants
Oil, CO₂, CO, H₂O Vapor
For use by
Military, Chemical Industry,
Pharmaceutical Industry,
Medical Industry and Hospitals,
Food Industry, Power Plants,
Consultants and Contractors,
Offshore Industries, Hyperbaric Tunnel Constructions

AEROTEST Simultan HP



Technical Data

Transport case
Weight approx 6.6 lbs (3 kg)
Supply Pressure
Maximum 4500 psi (300 bar)
Adapters
CGA 347 (female) connection
to cylinder valve
CGA 347 (male) connection to
compressor/filling station
(G 5/8" or INT)
Flow
0.2 L/min and 4.0 L/min
Detects Four Contaminants
Oil, CO₂, CO, H₂O Vapor
For Use By
Petro-Chemical Industry, Power
Plants, Ship Industry, Gas
Industry,
Utilities, Fire Brigades, Industrial
Hygienists, Manufacturing,
Pharmaceutical Industry,
Diving Industry



TUNNELDIVING CONTAINER

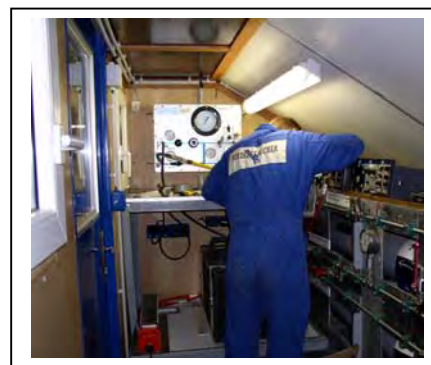


Container Datas:

Length of Container 3,0 m
Length over all 4,7 m
Width over all 2,0 m
Height of Container 2,0 m
Height over all 2,25 m

Container Equipment:

1 x 1 Compressor Draeger K 14 200/300 bar
4 x 50 Ltr. HP Air Storage
2 x 50 Ltr. HP Air Reserve
1 x Diver Panel
2 x Communication Round Robin
1 x Video System
1 x Air Test Unit
1 x Office Computer
Spare Parts



Diver Umbilical:

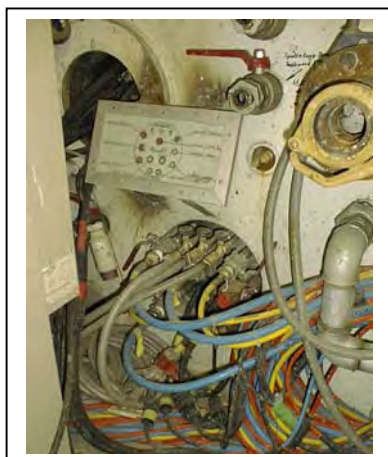
2 x 30 m Container – Flange
3 x 20 m Flange – Diver

Diver Helmets:

2 x Kirby Morgan 27 / Composite DSL-D1

Diver Suits :

3 x Heavy Duty
3 x Harness + Weight
3 x Gloves

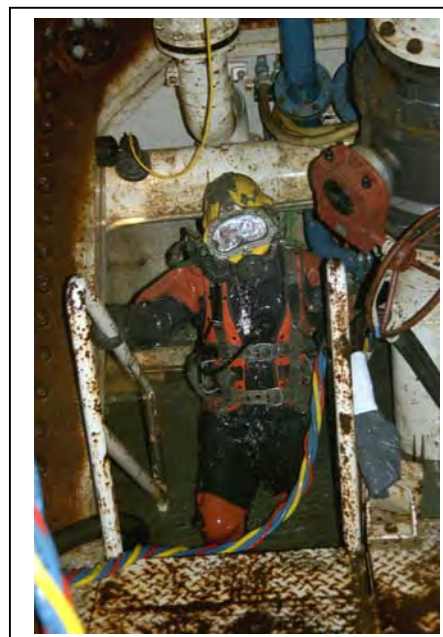


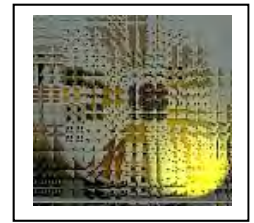
Pressure-Wall Flange:

Flange Diameter NW 300 (460 x 40 mm)

Flange Connection:

3 x 3/8" LPAir Supply
3 x 1/4" Depth Measurement
1 x 1" Water Supply
1 x 1" HP Air
3 x Kommunikation (Round Robin)
3 x Light
2 x Video
2 x Hydraulik Supply (in / out)
2x Power Supply Welding / Cutting





Hyfex Fire Extinguishers

- DNV Approved
- Easily handled
- Two sizes available
- Instant response
- Economical



HY-FEX Model 7.5 Litre:

Height	600 mm
Diameter	150 mm
Weight charged	12 Kg
Cylinder volume	7,5 liters
Foam discharge	50 liters
Discharge time	50 seconds
Discharge distance	6 m
Effective discharge	99%
Cylinder test pressure	200 bar
Cylinder working pressure	133 bar
Temperature rating	-15° to +55°C
Tested depth	450 MSW
Chamber volume rated	14 m ³

Hyfex Hyperbaric Fire Extinguishers are DNV Approved. They are simple, easily handled, and have been designed to be fitted in hyperbaric diving and medical therapy chambers.

They are available in two sizes to facilitate easy mounting and be appropriate in the different compartment sizes found in such hyperbaric systems.

The 3-liter Hy-Fex Extinguisher will probably be found in air dive chambers, entry and transfer compartments and the 7,5-liter Hy-Fex will suit main living chambers and large treatment chambers.

They are foam stored pressure type charged up to 133 bar, with a suitable chamber gas-usually helium. This gas provides plenty of overpressure required to force the water and AFFF mixture through the outlet nozzle, to give a strong jet of foam.

The Hy-Fex units mainly comprise of one robust aluminium cylinder containing the foam mixture and pressurized gas.

This is in contrast to the old fashioned and cumbersome two-cylinder extinguishers used in the past.

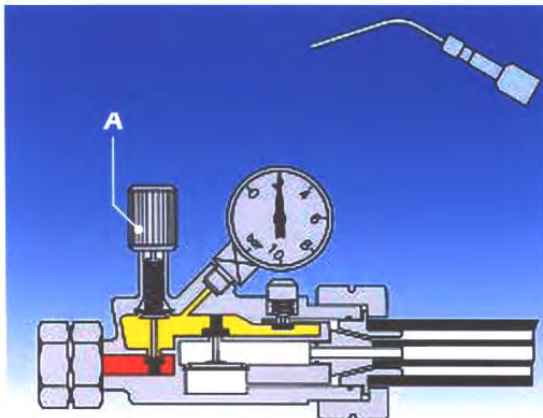


Safety anti leakage and gas delivery line IBEDA – GAS - STOP

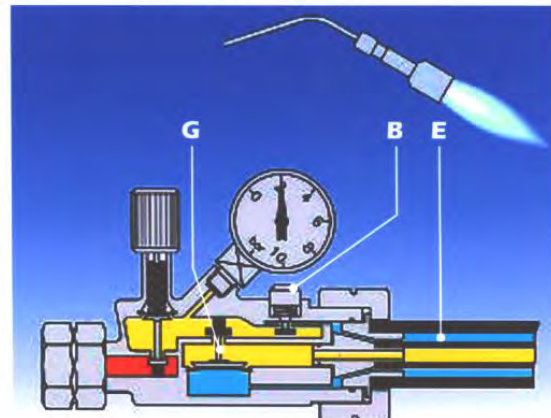
The anti leakage and gas delivery line safety is especially constructed for use with gases obtained from either cylinder or mains supply. Through the double hose system, where there is the possibility of hoses damage or loose connections, the gas stop provides absolute safety by preventing unintentional and unnoticed escape of liquid fuel gas.

The principle - IBEDA GAS STOP

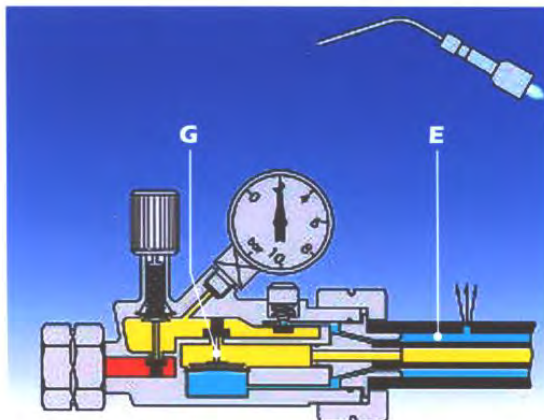
1. Start-up: Open main gas supply valve on cylinder and adjust the working pressure with the regulator control knob A.



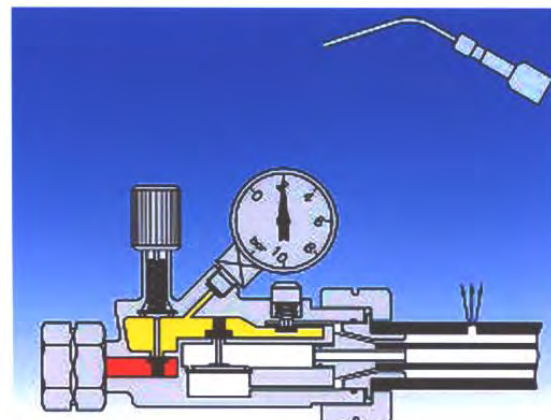
2. When depressing the filler button B, gas flows into the space between the outer and inner hose E and through valve G into the inner hose. The operating unit (torch) is now ready for use.



3. In case of leakage at the hose thread connections and / or the hose itself, the valve G will close automatically and cuts off the gas supply.



4. The gas supply has been cut off automatically. There is no gas in the supply line.





NORDSEETAUCHER GMBH
INT. DIVING CONTRACTOR

AMT
AMT Maschinen- und
Gerätetechnik GmbH

Hybrid 600 UW - Hyperbaric

600 A electronically regulated welding power source for
welding and cutting in wet and dry hyperbaric environment.



*The system concept consists of: power source, wire feeder, cooling unit,
remote control, heating mats, welding torches and accessories.*

*The units are built to EN 60974-1 and meet the additional requirements of welding
power sources for underwater wet welding. They may be used during intended
use and in compliance with applicable regulations and rules for welding under
water and under excess pressure !*

System advantages

- ◆ emergency shutdown
- ◆ low open circuit voltage
- ◆ User friendly
- ◆ Multifunctional by
GMA, MMA, Heating
- ◆ compact design
- ◆ high process stability
- ◆ adjustable Arc-Force
- ◆ adjustable Hot-Start
- ◆ 100% generator-compatible
- ◆ high efficiency
- ◆ high reliability

Technical Data

Type	Hybrid 600 UW - Hyperbaric
Mains voltage	3 x 400V, 50 Hz
Mains voltage fluctuation	max. +/- 10%
Power consumption	max. 27 KVA
Power factor cos. phi	ca. 0.98
Efficiency	> 85 %
Open circuit voltage	max. 60 V
Welding current range	20 A – 600 A
Welding voltage range	10 V - 50 V
Duty cycle (no filter mat)	60 % (25°C)
Dimensions Power source (h-w-d)	400 x 400 x 700 mm
Weight power source (no. periphery)	95 Kg

Our power sources are labeled with CE- and S-Symbol according to EN 60974-1. They are made in Germany.



Hybrid 600 UW - Hyperbaric

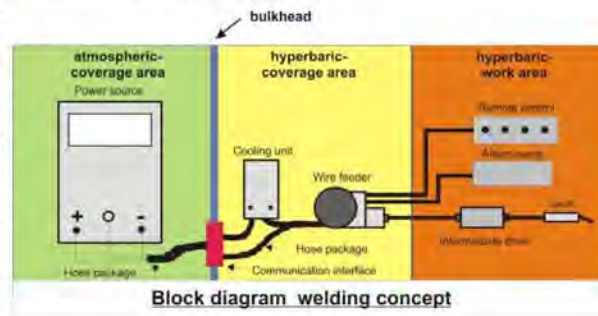
Elektronically regulated GMA / MMA welding power source for welding and cutting under excess pressure in dry and wet conditions.



Device concept

The **Hybrid 600 UW - Hyperbaric** was developed specifically for welding and repair work in hyperbaric and wet environment. (eg. tunnel boring machine). In developing the system, the valid rules and regulations and the AMT safety concept for under water welding machines have been applied.

In conjunction with the associated welding peripherals which was exactly matched to the increased requirements of the welding personnel to the hyperbaric welding and wet underwater welding, the **Hybrid 600 UW - Hyperbaric** represent with their newly developed control concept the optimal system technology for over pressure welders. That from AMT developed and since years approved AMT safety concept for UW devices provides a maximum protection for the welder (divers) against electrical hazards.



For safety, the power source must never be used in direct over pressure range. All for the process necessary interconnections are routed through a panel mounting in the hyperbaric workspace and distributed to the peripherals. In hyperbaric work area as the wire system are composed of wire drive and push-pull unit, cooling unit, remote control and auxiliary equipment.



By integrating the different methods (GMA welding, MMA welding, electrode cutting, gouging, and heating) in a facility, allows the user to perform all the work by preheating about cutting up to welding in a single dive (pressure) operation.

The operation of the control system is done by the welder or his assistant over a remote control locally in the hyperbaric range.

GMA welding sample, weld with the new AMT control concept under 5 bar pressure!

Fields of application

- **MIG/MAG:** New developed GMA control concept for short-, normal- and spray arc welding with low spattering under pressure with solid wires of 0.8 to 1.6 mm and flux cored wires from 1.0 to 2.4 mm diameter. Highest process stability by AMT - HYBRID technology.
- **MMA:** Optimal properties with high precision direct current for all types of electrodes from acid to basic. Integrated hot-start and arc-force function ensured best welding results in all welding positions. Large power reserves for special electrodes with more than 100 % deposition rate.
- **Gouging:** Due to the high energy levels and the associated high short-circuit currents of about 1000 A very good properties in arc cutting and gouging.
- **Heating:** Using the integrated heat program and associated heating mats, can be to prevent stress cracking of the weld area preheat partially.

AMT – Safety concept to protect the welder (diver) against electrical accidents

- fulfills the guidelines „BGV-D1“ and „Code of Practice for the Safe Use of Electricity under Water“
- enhanced protection due **maximum open circuit voltage of 60 V-dc** (permissible according to BGV: 65 V-dc)
- external emergency stop for fast network-based shutdown in case of danger
- **passive idle voltage limitation** due to secondary switched construction
- Active idle voltage limitation at power fluctuations through special electrical suppressor
- **Output voltage limit of 15 V-dc** at inactive welding process or break in the arc
- **external enable switch** for disconnection the power electronics
- **set point dependent enable power part > 20 A**
- **electronic mains over voltage protection**



Abrasive Cutting

水下和盾构上的磨料切割技术

Underwater and in Tunnel Boring Machines

in co-operation with



cutting of concrete in a tunnel boring machine

隧道内的混凝土切割

WASS - System

(WasserAbrasivSuspensions Schneidverfahren)

is an abrasive cutting system for cutting of concrete and steel, above and underwater as well as for cutting in nuclear power plants and tunnel boring machines.

WASS系统:

WASS, 是指在混水下, 隧道内或核电站内的混凝土或钢结构的磨料气割技术。

Technical Datas 技术资料

cutting pressure up to 1500 bar 切割压力最高搭 1500bar

water flow 8-10 ltr./min 水流: 8-10 升/分

abrasive (grit) consumption 1,3 kg/min 磨料消耗量: 1.3 公斤/分

cutting speed in steel is approx.: 钢结构的切割速度约:

50 mm thickness = 40 mm/min 50mm 厚: 40mm/分

180 mm thickness = 15 mm/min 180mm 厚: 15mm/分



The length to be cut was from 250° till 110°

切割角度: 250° 至 110° 间

The height to be cut was approx. 5 cm

切割高度约 5 厘米

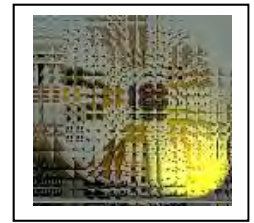
The depth to be cut was approx. 110 cm

切割深度约110厘米



The nozzles were mounted on top of the cutter head. The hose were connected to the tunnel pressure wall.

喷嘴安装在刀盘顶部, 水罐通过盾体压力墙连接



VideoEndoscopeSystem Everest XL G3



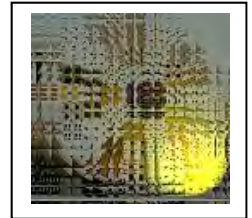
A video probe should be always used if the compressed air technicians are unable to inspect the tools at the cutter head in complete safety.



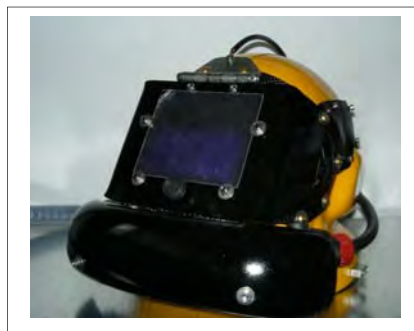
The advanced, proven inspection technology of the XL G3 range of products enables you to inspect and measure the angle, depth and distance of all damage or objects precisely and safely.

Images can be recorded, stored and retrieved for precise, seamless documentation.

References: Herrentunnel Lübeck-Germany, Metro Linie 9 Barcelona-Spain,
Pescanova Fish Farm, Mira-Portugal

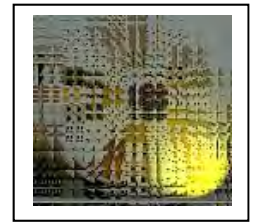


DeepSea Lightweight Model DSL A-2 AIR



This new helmet design of Composite Beat Engel, Switzerland is the construction of an overpressure helmet. It has been realized in close cooperation with Nordseetaucher GmbH. This type of helmet - that with an additional kit can be transformed within one hour into a breathing controlled helmet - is now operational in extreme hazardous environment like tunnel machines and gives full satisfaction to the user.





Research and Certification 研发与资质

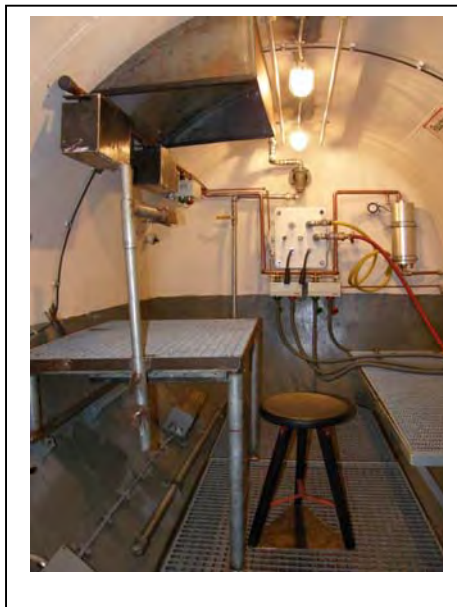
Because welding in compressed air becomes more and more interest in Caissons and Tunnel Boring Machines, Nordseetaucher GmbH has started in the beginning of the year 2010 a research and training program in co-operation with the Germanischer Lloyd, Germany and some manufacturer for welding electrodes and wires.

水下沉箱施工和盾构施工对带压焊接的需求越来越大，因此，北海公司已于2010年初开始与德国船级社以及一些焊条和焊丝的供应商共同开启了研究与培训计划。



The Hyperbaric Chamber for Research and Training
研发与培训所需的高压仓

Outside 外观



Inside 内饰



Divers and Compressed Air Technicians who has gone through the training program successfully receives a certificate as a Professional Certified Hyperbaric Welder.

成功通过培训计划的潜水员或带压作业技师都将获得专业高压焊接资格证书。

