



UBS DNAX[®] TECH 250 LP FEED[™] Operations Manual

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High-pressure compressor manual

Low-pressure Compressor Manual

Honda Engine Manual or Gas Motor Manual

Every effort was made to ensure the accuracy of the information contained within. Undersea Breathing Systems Intl. However, retains the right to modify its contents without notice.

1.0 Introduction:

This manual and the accompanying compressor manuals will assist you in the proper set-up, operation and maintenance of the **DNax TECH 250 LP**. Be sure to read both manuals entirely and if you have any questions on the system please call (805) 815-4044, Monday through Friday, 8:00 AM to 5:00 PM PST and ask for Tech Support.

2.0 System Components, Overview and Technical Data

DNax Nitrox LP TECH :

- Semi-permeable Membrane
- Low-pressure Two Stage Compressor
- O2 Analyzer Port & Permeate Pressure Gauge
- Pro o2 Analyzer
- Auto Thermostatic Control
- 220 volt Heater
- Combination Over/under Pressure Relief Valves
- EZ 1000+ Food-grade Compressor Lubricant
- Powder Coated Tech 250 Frame
- 13' Permeate Hose to Attach to your High Pressure Compressor

Specifications:

- ◆ Produces 24% -40% Nitrox @10scfm @ .5-3 PSI
- ◆ LP Air Filtration: Norgren Series 74
 - Auto Drains/DP Gauges
 - Coalescing 1.0 Microns
 - Fine Polishing .01 Microns
 - Oil Vapor Removal .003 PPM
 - LP Pressure Regulator
- ◆ Mix Accurate To 1/10th Percent
- ◆ 230VAC 60 Hz 1 or 3 phase / 50 Hz Available

Low Pressure Feed Air Compressor Technical Data:

- LP Compressor – 7.5 hp–23.5 cfm@175psi
 - Maximum Block Output Pressure: 200 PSI
 - Differential Pressure: 145-190 PSI
 - Number of Stages: 2
 - Number of Cylinders: 4
 - Rated at: 25.8 SCFM
 - Power Requirements: 230/440 VAC, 1Ph/3Ph
 - Lubricant: EZ-1000

- ◆ *LP Dual Control Headunloader*
- ◆ Air Aftercooler
- ◆ Supplying Grade D Air
- ◆ Volume Tank with Over pressure Relief & Drain
- ◆ Weight - 300 lbs.
- ◆ Dimensions (*Length X Width X Height*): 44" X 23" X 46"
- ◆ Powder Coated Tech 250 Frame with Moving Handles
- ◆ Optional Honda GX 340 11hp Engine or Honda Diesel

Suggested Maintenance Intervals:

LP Purification: 100 Hours

4338-04	Filter Element for F74G 5 micron
4344-02	Filter Element for F74H .01 micron
4341-01	Filter Element for F74V .003 PPM

Replace EZ 1000+ Lubricant: 100 Hours

Typical Specification For Grade-E Air:

- O2 Percentage: 20-22
- CO2: 1000 PPM
- CO: 10 PPM
- Hydrocarbons: 25 PPM
- Water: 67 PPM
- Dew Point: -50 F
- Oil & Particles: 5 mg/m3
- Odor: None

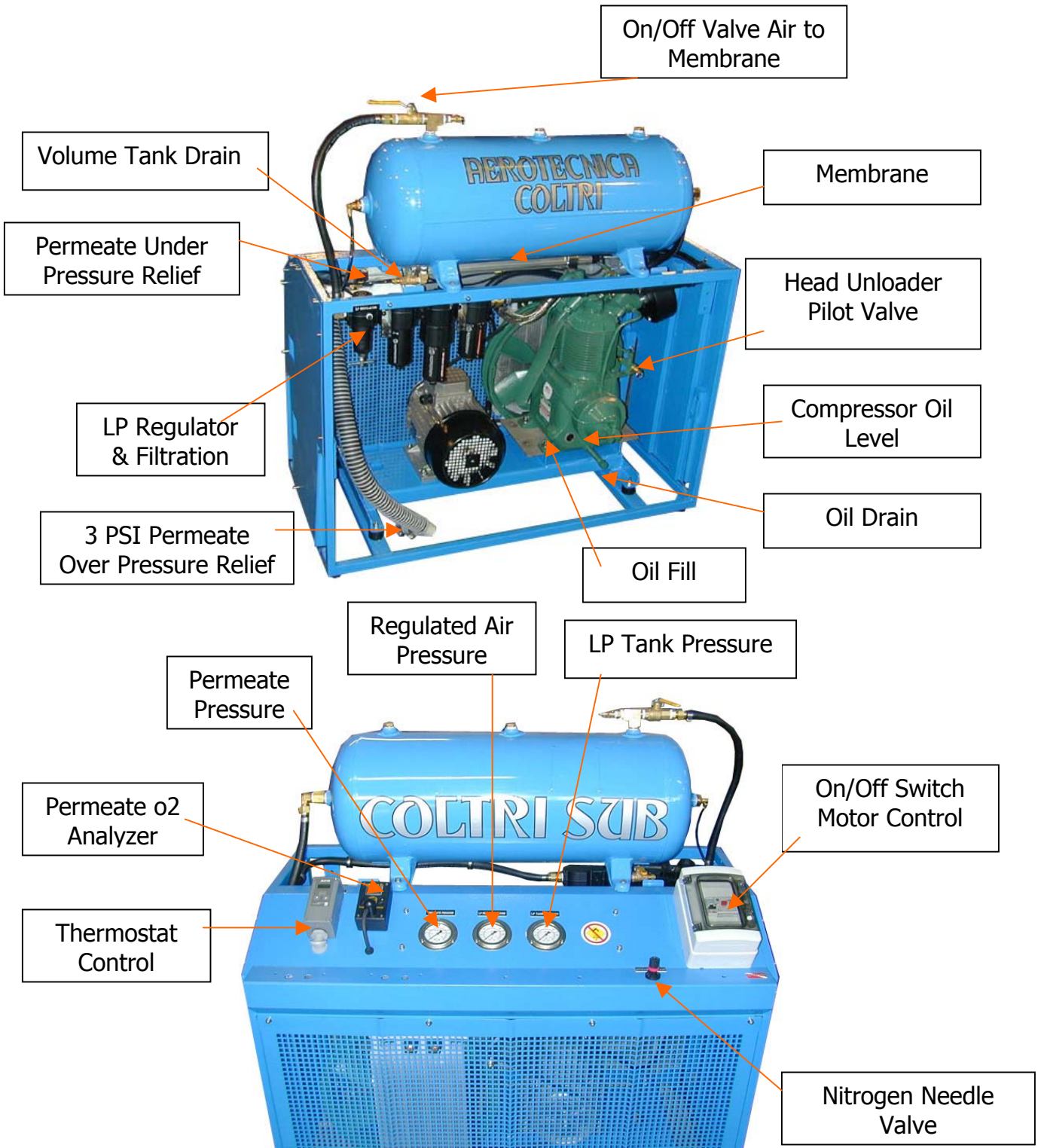
System Overview:

The **DNax TECH LP** nitrox production system consists of a low pressure compressor package combined with a membrane system package to supply o2 rich permeate to a the inlet of a high pressure or low pressure compressor. Product gas DNax nitrox is available at desired oxygen concentrations (up to 40% O2 by volume) at a pressure of .5-3 PSI.

The system utilizes a 7.5 horsepower, 23.5 cfm@175psi low-pressure compressor mounted together with a single or three phase electric motor or gas or diesel motor in a rigid, powder coated, Tech 250 Frame. The compressor system components include: Low pressure compressor with air aftercooler, dual control head unloaders, volume tank with ASME over pressure relief, condensate drain, motor and rigid frame with handles to move package.

The nitrox system part includes: Low Pressure filtration, low pressure regulator, heater with thermostat control, permeable membrane, compressor intake porting and a permeate hose to attach to your existing low or high pressure compressor.

Low Pressure Feed Air System



Honda 11hp Option



Electric Start with 18 amp Charging Circuit

This package can be supplied with a 600 watt inverter to supply power to the heater or a AC plug that can be plugged into an external power source. (Shown in picture with plug)



Over Pressure Relief. On end of permeate hose that gets attached to the high or low pressure compressor that will pump the nitrox.

3.0 Safety Concerns and Operational Warnings

Undersea Breathing Systems has taken extreme care in providing you with the information needed to safely operate this system. However, it is up to you to make the appropriate decisions about system safety.

WARNING: THIS EQUIPMENT IS USED TO PROVIDE LIFE SUPPORT. READ THIS MANUAL IN ITS ENTIRETY. FAILURE TO HEED THE WARNINGS AND CAUTIONS CONTAINED WITHIN MAY RESULT IN SEVERE INJURY OR DEATH.

WARNING: THE COMPONENTS YOU WILL BE USING CONTAIN ELEMENTS THAT MAY EXPOSE YOU TO BOTH LOW AND HIGH-PRESSURE GAS STREAMS. GAS, EVEN UNDER MODERATE PRESSURE, WILL CAUSE EXTREME BODILY HARM IF NOT TREATED WITH CARE.

DO NOT ALLOW ANY GAS STREAM TO BE DIRECTED AT ANY PART OF THE BODY. ANY HIGH-PRESSURE HOSE END OR FITTING WILL CAUSE EXTREME HARM IF IT COMES LOOSE FROM ITS RESTRAINT (OR TERMINATION) AND STRIKES ANY BODY PART. USE APPROPRIATE CARE IN MAKING ALL CONNECTIONS.

Caution: This system is designed for continuous volume production when following proper operational instructions per low pressure and high-pressure compressor manuals.

Caution: This system contains a manual condensate drain for the volume tank. Drain daily.

Cautionary Operational Note: DO NOT USE ANY FORM OF MINERAL OIL IN ANY COMPRESSOR IN THIS SYSTEM. Use only EZ 1000 lubricant

Cautionary Operational Note: DO NOT USE THIS SYSTEM TO PRODUCE ABOVE 40% O₂ CONCENTRATION.

Cautionary Operational Note: THE NITROGEN EXITING FROM THE NEEDLE VALVE MUST BE VENTED OUTSIDE. SUFFOCATION AND DEATH CAN OCCUR IF NITROGEN IS ALLOWED TO COLLECT IN AN ENCLOSED SPACE.

4.0 Legal Precautions:

A gas fill log, of permanent style with no loose leaves, must be maintained that documents the following information.

- DATE
- TANK NUMBER
- C-CARD NUMBER
- SUPPLIER'S CHECK OF OXYGEN (O₂) CONTENT PLUS SIGNATURE
- USER'S CHECK OF OXYGEN (O₂) CONTENT PLUS SIGNATURE
- MOD (MAXIMUM OPERATION DEPTH) IN USER'S HANDWRITING

Proper air/DNAX gas analysis tested on a quarterly basis and comprehensive maintenance is the best way to assure proper, safe, and economical DNAX nitrox production.

5.0 Theory of Operation:

This system supplies a breathable gas stream consisting of an elevated oxygen content relative to normal atmospheric content of approximately 21% O₂ by volume. This technique employs gas separation technology utilizing a permeable membrane to separate certain gas molecules from other gas molecules, allowing a controlled flow of output gasses of different oxygen concentrations. **This system produces DNAX Nitrox in oxygen concentrations of 22% to 40% at maximum pressures of .5-3 PSI. Supply gas is fed from a low-pressure compressor at a pressure of (145-185 PSI) to the membrane, which then supplies the nitrox to the input port of the HP compressor at 1 to 1.5 psi.** The gas stream is fed through a thermostat-controlled heater. As the gas moves through this assembly, its temperature is raised to 120 degrees F. The purpose of this heater is to even out the variations in gas temperature and produce a more linear performance curve.

Once through the heater, the input gas is allowed to pass through the membrane. As the gas passes through the membrane, the gas volume applies pressure against the inside walls of the permeable fibers resulting in the migration across the wall of varying levels of the different constituents of air. Gas volumes of desired O₂ concentrations are achieved in this manner. In this stage the normal oxygen content of the "Grade-D" air (20.9%) is raised to output percentages upwards of 24% to 40%.

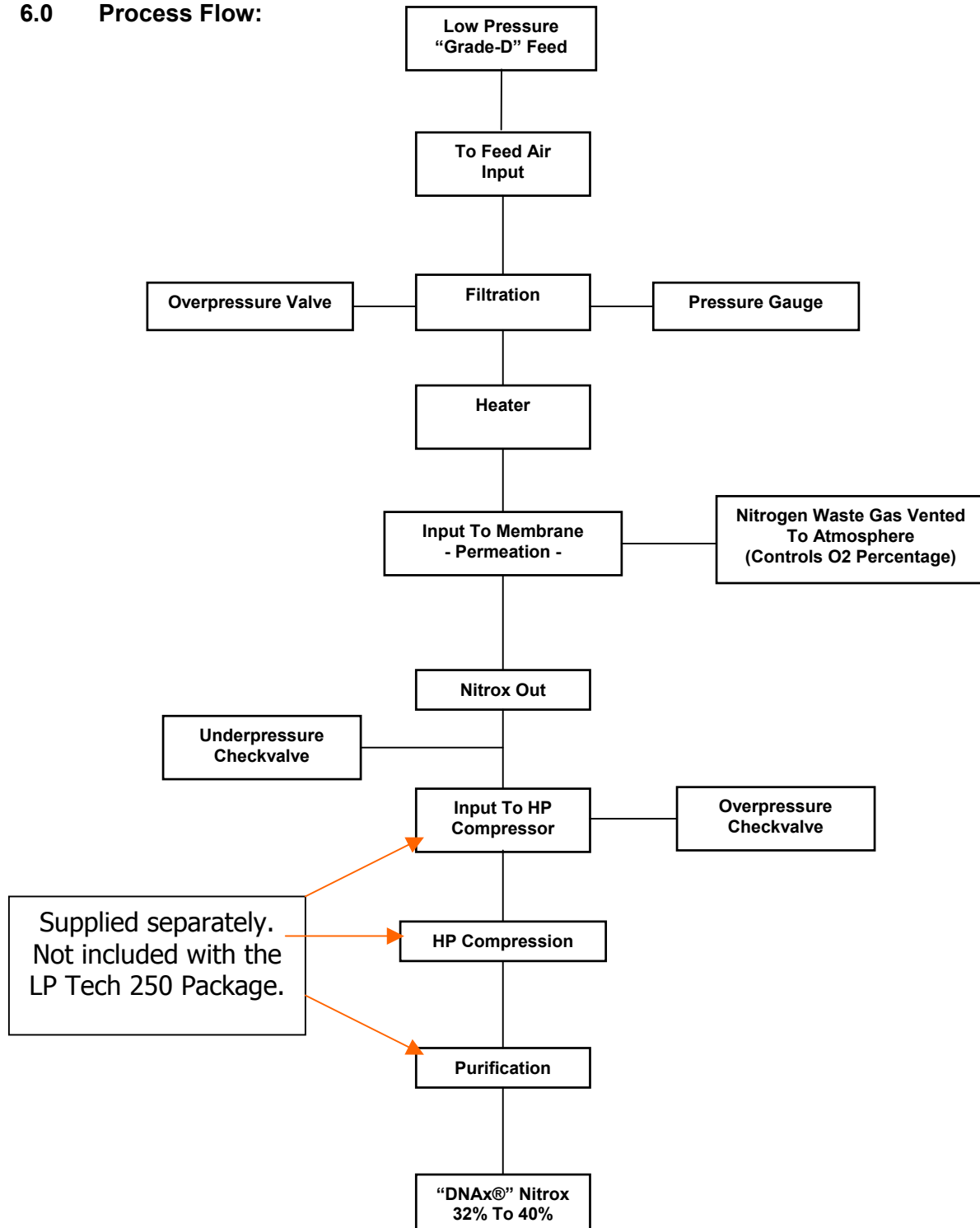
A needle valve in the outlet stream of the waste gas (nitrogen) controls the relative O₂ concentrations while input pressure regulation allows control of the output volume of the membrane. This outlet volume control is required to balance the input requirements of the high-pressure compressor. As the gas volume of desired oxygen concentration is produced it is contained and directed to the inlet port of the high-pressure compressor. An overpressure checkvalve is installed on the inlet fitting that attaches to your high or low pressure compressor to protect the compressor from over pressurization of the first stage. Negative pressure protection is accomplished in the same manner by installing an under-pressure checkvalve in the ambient air intake side of the membrane output fitting.

As the gas volume is subsequently compressed, it is alternately cooled and raised in pressure again until it reaches its final design output pressure. Final filtration and purification is accomplished at final compressor discharge.

UBS DNAX[®] TECH 250- LP FEED SYSTEM™

Product gas “DNAX” nitrox is available at desired oxygen concentrations (up to 40% O₂ by volume) at maximum pressures of 3200 - 3700 PSI, for filling Nitrox Storage Bottles or SCUBA cylinders.

6.0 Process Flow:



UBS DNAX TECH 250 LP Feed

Setup, Operation, and Maintenance Step-by-Step

California/ International Office:

Phone: (805) 815-4044

Fax: (805) 815-4196

E-mail: glenn@underseabreathingsystems.com

Assembly Preparation:

1. First familiarize yourself with the components of the system in the first section of the TECH 250 LP FEED manual.
2. Please read and follow instructions in both compressor manuals.
3. Unpack the TECH 250 LP FEED Compressor and remove from the pallets.
4. Visually inspect the system to make sure there has been no damage during shipping. Contact UBS immediately if damage is detected.
5. Connect the permeate hose from the LP Tech 250 to the input port on your high pressure or low pressure compressor (see page 15).
6. Follow the remaining step by step instructions for initial set up and operation.

Final Preparations

Electrical Power Connection

Check all written specifications given in this manual. Follow all state and local electrical codes. **Do not use extension cords.**

Amperage Load for System:

LP Compressor Feed: For single-phase motors 31amps

For 3 phase motors - Use 230VAC, 22amps

Membrane Heater:

Use 230 VAC, 10 amps

Check Lubricants

Before starting the compressors, add lubricant until levels are full.

Compressor Rotation Check For 3 Phase Motors

Always turn on both starters and run motors very briefly to check proper rotation
(See arrows on pulleys)

Set-up and Assembly

STEP 1: Power Connection

Requirement: 230 volt AC, single-phase power or 3-phase power

When using 3 phase motor, ALWAYS CHECK MOTOR ROTATION PRIOR TO USE.

Optional hour meter: Install by connecting across the proper terminals at the motor connection. Please contact Undersea Breathing System for specific instructions for making this modification.

No other electrical components are included with the system.

A. Connect power to system as follows:

Locate a source of 230 VAC single-phase power that has adequate circuit protection and can supply (50) amps to the system. Check to see if the facility wiring will be adequate for the current requirements. Additional circuit protection will have to be installed if the circuit does not meet these requirements.

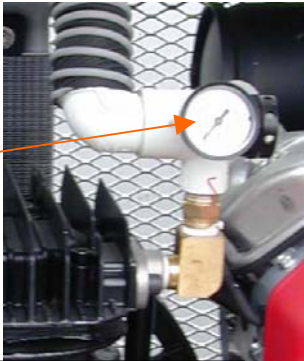
Connect the black and white motor wires to a source of 230 VAC power.

Connect the green (ground) wire to a suitable grounding point.

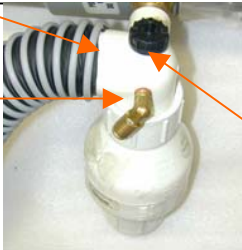
STEP 2: Connect Permeate Hose Under Pressure Relief Valve.

1) Check to see if Permeate Hose is attached Secure to Under Pressure Relief Valve

Over Pressure Relief with Permeate Hose Attached to a Low Pressure Compressor



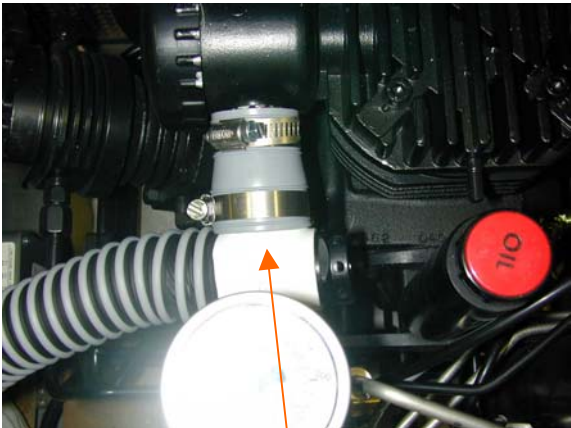
Under Pressure Relief Valve. Outlet to Permeate Pressure Gauge on Panel



Additional Permeate o2% Test Spot

STEP 3: Compressor Overpressure Valve:

1) An overpressure relief valve is provided at the compressor intake. This valve prevents over pressurizing



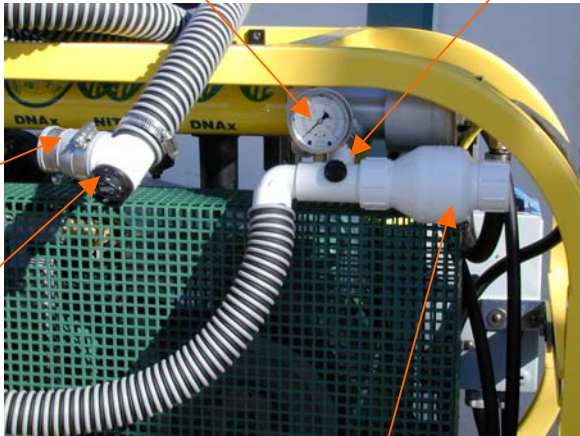
Over Pressure with Permeate Hose attached to Coltri MCH16

Permeate Pressure Gauge

Permeate o2% Analysis Port

Attach to HP Compressor Intake

Overpressure Relief Valve

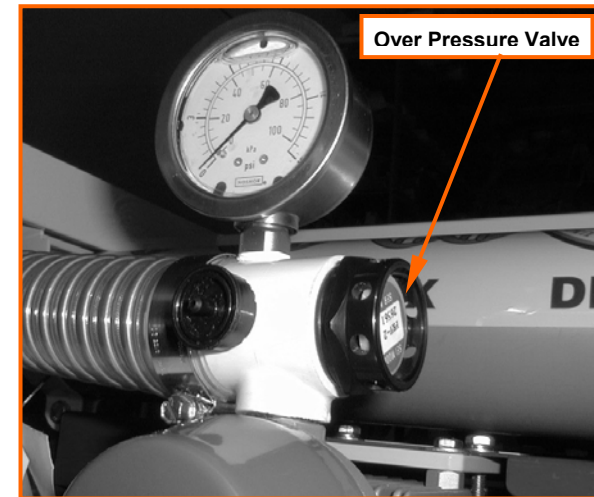


Underpressure Relief Valve

the compressor intake, and limits the pressure to approximately 1 lb. positive.

2) During normal operation, the valve will flutter, normalizing the surging from the compressor first stage input valve.

Should the nitrox flow exceed normal pressures, this valve will open fully, protecting the compressor.



3) Normal gauge pressure at the compressor intake will be between .5 and 1 PSI. The LP to LP input pressure regulator can be adjusted To lower nitrox output pressure to this same level and will result in supply gas conservation.

Note: Be sure to adjust the LP-LP regulator to achieve the minimum setting on this gauge. The system will vent any excess nitrox and the air supply will be conserved if this setting is adjusted to the minimum.

STEP 4: Oxygen Analyzer And Connections:

An oxygen analyzer has been connected to the DNax system to provide an indication of the oxygen percentages you are producing.

Permeate o2 Analyzer Mounted on Tech 250

A. The UBS PRO2 oxygen analyzer is mounted in a location close to the membrane nitrox output port. The membrane output port is located directly above the compressor intake. Connect one end of the 1/8 ID rubber tubing (provided with the analyzer) to the small, black, one-way checkvalve attached to the compressor intake tee. In the picture in Step 2, Page 13, the one way checkvalve is just to the left of the overpressure relief valve.



A. Calibrate the analyzer to 20.9% as follows:

Remove the fitting covering the sensor.

- Expose the sensor to ambient air for approximately (15) seconds.
- Adjust the potentiometer until the reading stabilizes to 20.9%.
- Re-connect the sensor fitting to the analyzer.



Procedures

- 1. Hook-up Permeate hose to HP compressor*
- 2. Hook-up wiring.*
- 3. Check all oil levels. Use EZ-1000*
- 4. Start LP compressor*
- 5. Start HP compressor and open fill whip*
- 6. Allow to run for 5 minutes*
- 7. Adjust regulator pressure so permeate pressure is 1.5 PSI*
- 8. At this point there should be no flow of air into the underpressure relief*
- 9. If the permeate pressure goes above 2.5 PSI there will be a flow of permeate out of the overpressure relief.*
- 10. Read o₂% on permeate analyzer*
- 11. Adjust o₂% at the nitrogen release needle valve (p. 5)*
- 12. When the o₂% at the fill whip is the same as the o₂% at the permeate analysis port, close the fill whip and start filling tanks.*