

Inspection and Maintenance

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1.1 General

The following section describes the maintenance and inspection procedures that are used to complete the Annual, Monthly and Daily Checklists, to ensure optimum reliability and performance. These procedures are additionally used in conjunction with the daily pre and post dive maintenance checklists. The following service intervals are the minimum recommended for helmets being used under good conditions. Helmets and BandMasks® used in harsh conditions, i.e., contaminated water, welding / burning operations, or jetting may require more frequent servicing.

The intention of the maintenance and overhaul program is to help maintain all helmet components in good working order in accordance with KMDSI factory specifications. It will also help to identify worn or damaged parts and components before they affect performance and reliability. Whenever the serviceability of a component or part is in question, or doubt exists, replace it. All mask and helmet components and parts have a service life and will eventually require replacement.



NOTE

The side block does not need to be removed from the helmet or mask annually, provided excessive internal corrosion is not present. Kirby Morgan recommends that every three years the side block assembly be physically removed from the helmet or mask. For fiberglass shells per “1.1.6 Separating the Side Block Assembly from the Helmet/ Mask Shell” on page SB-7, and for stainless steel shells per “1.1 Separating the Side Block Assembly from the Helmet Shell” on page SSB-1. Clean and inspect the stud and securing screw, replace if bent, stripped, or any damage is detected.



NOTE

All pipe thread fittings used on our helmets, masks and components require sealing with Teflon® tape. **DO NOT USE LIQUID SEALANT.** When installing Teflon® tape on pipe threads, apply the tape starting two threads back from the end of the fitting.

Apply the tape in a clockwise direction under tension. Two wraps are all that is needed. Applying more than two wraps of tape is not recommended. The use of more than two wraps could cause excess Teflon® tape to travel into the breathing system.

Disassembly and reassembly of components is explained in a step-by-step manner that may not necessarily call out that all O-rings and normal consumable items will be replaced. The manual is written in this way so that if an assembly, component, or part is being inspected or disturbed between normal intervals, it is acceptable to reuse O-rings and components provided they pass a visual inspection. When conducting annual or scheduled overhauls, all O-rings should be replaced. The side block should be removed from the helmet at least every three years (or 400

operating hours) so that the stud and securing screw can be inspected. All O-rings should be lightly lubricated with the applicable lubricant.

1.2 Lubrication/Cleanliness

Helmets intended for use with breathing gas mixtures in excess of 50% oxygen by volume, should be cleaned for oxygen service. They must only be lubricated with oxygen compatible lubricants. All air supply systems must be filtered and must meet the requirements of grade D quality air or better. Helmet breathing gas systems/gas train components used for air diving should only be lubricated with silicone grease Dow Corning® 111® or equivalent where noted. KMDSI uses Christo-Lube® at the factory for lubrication of all gas train components requiring lubrication, and highly recommends its use.

Before 1999, Kirby Morgan Dive Systems, Inc., used Danger and Warning Notices in the helmet and mask owner's manuals limiting the breathing gas percentage to less than 23.5 percent oxygen. This was due primarily to cleaning issues in regards to possible fire hazards and was in compliance with the recommendations of the Association of Standard Test Methods (ASTM), National Fire Protection Agency (NFPA), and the Compressed Gas Association (CGA) as well as other industry standards.

During the 1990's, open circuit scuba use of enriched-air (Nitrox) by technical and recreational divers became very popular, and as use increased, so did the number of combustion incidents during the mixing and handling of the breathing mixtures. These combustion incidents brought attention to the dangers and inherent risks associated with oxygen and oxygen enriched gas mixtures.

Kirby Morgan cannot dictate or override regulations or recommendations set forth by industry standards or governing bodies pertaining to enriched gas use. However, it is the opinion of Kirby Morgan that breathing gas mixtures up to 50% oxygen by volume should not pose a significant increased risk of fire or combustion in Kirby Morgan helmet and mask low-pressure components and does not warrant the need for the stringent specialized oxygen clean post-sampling and particulate analysis normally accomplished for components used in high pressure oxygen

valves, regulators, and piping systems. The decision for using 50% has been primarily based on a long history of operational field use.

As long as Kirby Morgan helmets and masks are cleaned and maintained in accordance with the maintenance manual, the equipment should not pose a significant increased risk of a fire or ignition originating in the helmet or mask low-pressure (<250 p.s.i.g. /<17.2 bar or less) components when used with enriched gases of up to 50% oxygen. However, CAUTION should be exercised any time enriched gases are handled or used.

In general, helmets and masks used primarily for mixed gas use are subject to far less oil and particulate contamination than those used for air diving. For this reason, helmets and masks commonly used with both air and enriched breathing gases should be cleaned and maintained with greater care and vigilance. It is important that all internal gas-transporting components, i.e., side block, bent tube, and demand regulator assemblies remain clean and free of hydrocarbons, dirt, and particulates. Whenever the equipment is depressurized, all exposed ports or fittings should be plugged/capped to help maintain foreign material exclusion.

Gas train components should be cleaned according to the procedures outlined in the operations manual at least annually and/or whenever contamination is suspected or found. Helmet and mask interior and exterior surfaces should be cleaned at least daily at the completion of daily diving operations. Helmets and masks used in waters contaminated with oils and other petroleum or chemical contaminants may require cleaning after each dive.

Helmet and mask components requiring lubrication should be lubricated sparingly with lubricants approved for oxygen use such as Christo-Lube® or equivalent oxygen compatible lubricant. KMDSI highly recommends using Christo-Lube®, and uses Christo-Lube® during the assembly of all KMDSI gas train components.

⚠ WARNING

Do not use lubricants of any kind on the diaphragm or exhaust valves. Use of lubricants can attract and hold debris that could interfere with the proper operation of the regulator.

Regardless of the approved lubricant used, never mix different kinds of lubricants. Persons mixing handling and working with breathing gases should be properly trained in all aspects of safe gas handling.



During annual overhauls, all O-rings and soft goods, i.e., valve seats and washers should be replaced. KMDSI offers kits that have all the necessary parts.



The neck dam rubber need not be replaced if the inspection reveals no damage or significant wear and the rubber components are not dried out.



The oral nasal mask and oral nasal valve requires replacement, only if inspection reveals damage, distortion, or signs of damage.



All threaded fasteners and parts require careful cleaning and inspection as well as the mating parts. Replace any and all threaded parts or components that show signs of wear or damage.

KMDSI highly recommends a certified KMDSI repair technician make all repairs and that only genuine KMDSI repair and replacement parts be used. Owners of KMDSI products that elect to do their own repairs and inspections should only do so if they possess the knowledge and experience. All inspections, maintenance and repairs should be completed using the appropriate KMDSI Operations and Maintenance Manual.

Persons performing repairs should retain all replacement component receipts for additional proof of maintenance history. Should any questions on procedures, components, or repairs arise, please telephone Kirby Morgan Dive Systems, Inc., at (805) 928-7772 or E-mail them at kmdsi@kirbymorgan.com or telephone Dive Lab, Inc., at (850) 235-2715 or E-mail them at divelab@divelab.com.

1.3 Routine Maintenance

Routine and preventative maintenance is critical and must be done on a regular basis. All parts and components of the helmet have a useful service life and eventually will require replacement. Some items, when properly maintained, can go many years before replacement becomes necessary. Each helmet or mask ships with a logbook to track usage, maintenance and repairs in.

It is essential to the safety of the user that a routine and periodic schedule of maintenance, inspection, and testing be carried out. Helmets should be pre-dive inspected on a daily basis. Helmets in continuous use around the clock should be rotated out every 24 hours and have a daily pre-dive inspection performed. Post dive cleaning and inspections should be completed each time helmet or mask use is finished for the day. To minimize the spread of germs, sanitization should be performed after use and in between use by different divers. Sanitizing procedures and recommended solutions are described and explained in the General preventative section of each KMDSI helmet and mask manual. If the user is in doubt about the serviceability or has questions in general, please contact your local KMDSI authorized repair facility or KMDSI at telephone number 805-928-7772. Check the Dive Lab website at www.divelab.com for the most up-to-date maintenance procedures.

KMDSI Maintenance Checklists are located on the KMDSI and Dive Lab websites. The checklists are intended for all helmet and mask models. There are also checklists for the KMB-18/28 band masks which are visually similar to the helmet checklists.

- A2.1. All SL and KM helmets (all models) Recommended Annual Maintenance Inspection and Overhaul
- A2.2. Monthly Maintenance
- A2.3. Daily Set-Up and Functional Checklist
- A2.4. Supervisor's Equipment Checks Prior to Entry
- A2.5. Supervisor's Equipment Checks In-Water
- A2.6. Post Dive Cleaning

1.3.1 Daily Pre-Dive Maintenance A2.3

The helmets and masks should be set up in accordance with the Daily Set-Up and Function Checklist A2.3. The checklist can be laminated, placed on a clipboard and checked off with a grease pencil. Completion should be logged in both the supervisors log and the helmet or mask log book. The daily pre-dive checks are the minimum daily checks KMDSI recommends. The daily pre-dive checks may be modified to suit the needs of the user, provided the basic intent of the checklist is being completed in a manner consistent with the original intent.

1.3.2 Daily Post Dive Maintenance A2.6

The helmets and masks should be cleaned in accordance with the A2.6 checklist. The checklist can be laminated, placed on a clipboard and checked off with a grease pencil. Completion should be logged in both the supervisor's log, and the helmet or mask log book. The daily pre-dive checks are the minimum daily checks KMDSI recommends. The daily post-dive checks may be modified to suit the needs of the user, provided the basic intent of the checklist is being completed in a manner consistent with the original intent.

1.3.3 Supervisors Equipment Checks A2.4 and A2.5

These checks should be conducted by the diving supervisor or by persons designated by the supervisor in accordance with company policy.

1.4 Monthly Maintenance

A monthly inspection should be performed in accordance with the A2.2 checklist on a monthly or as directed by the A2.2 and / or anytime serviceability of the helmet or mask is in doubt. Helmets or masks used in contaminated waters or for welding, burning, and jetting operations will require service and inspection more frequently. If a situation arises that casts any doubt as to the serviceability of a part or component, it should be replaced.

Use the appropriate manual for the model helmet or mask being serviced.

1.5 Yearly Maintenance

1.5.1 Overhaul/Inspection Checklist A2.1

The A2.1 checklist procedure fulfills all requirements for complete inspection. The checklist should be performed at least annually or more often if daily and monthly inspections reveal signs of excessive corrosion, contamination, damage, signs of improper operation, or if the helmet log shows the unit had previously been used in a questionable environment. The daily and monthly inspections will determine the necessity for overhaul with greater accuracy than simply placing a number of hours on the overhaul schedule. All O-ring's, exhaust valves, and soft goods should be replaced at least once a year. In between overhauls the soft goods can be cleaned, inspected and reused, provided a careful inspection reveals no damage or deterioration. Again, previously logged questionable diving environments will be a determining factor as well. The A2.1 checklist should be filled out and retained in your maintenance files. This will provide an excellent record of maintenance. ALL maintenance should be annotated in the helmet log.

The Overhaul Checklist Procedure A2.1 is intended to aid persons performing routine overhauls of KMDSI helmets (KM and SuperLite®) and Kirby Morgan Band Masks. The checklist should be used in conjunction with the Operations and Maintenance Manual and is primarily intended to guide and document the maintenance as it is completed. Specific detailed procedures for each section of this checklist can be found in the Operations and Maintenance Manuals. This checklist when completed should be retained in your equipment maintenance files and the helmet or mask log book should be updated. The checklists are intended to be used for all models of KMDSI SuperLite® and KM Helmets and band masks. All KMDSI helmet and band mask manuals can be downloaded free at www.kirbymorgan.com.