D-ONE®

DIVINGHELMET

DIVING HELMET

Operations and Maintenance Manual

Subspec Srl

a Drass Group of Companies

Viale P.N. Magri 116/a - 57121, Livorno - Italy

REVISIONS

1	08/03/2022	Revision After notified body comments	CC
0	30/04/2020	First Issue	CC
Rev.	**Date**	**Description**	**Issued by**

INDEX

DEFINITION GLOSSARY AND ACRONYMS

The following definitions and standard international glossary are used for an easy and comprehensive document reading:

BDR	Balanced Demand Regulator
BOB	Bail Out Bottle
HP	High Pressure
HT-01MKI/MKII	Oral Nasal Mask
IMCA	International Marine Contractor Association
LARS	Launch And Recovery System
LP	Low Pressure
LPM	Liter Per Minute
MSW	Meters Sea Water
RTV	Room Temperature Vulcanizing

1 INTRODUCTION

DRASS Galeazzi, founded in 1927 with the aim of designing and manufacturing diving systems and equipment, invested heavily into fostering innovation design of its products.

The industry had been utilizing a cylindrical shape for deep dive products, but when Drass Galeazzi introduced the spherical shape to the world, great depths were suddenly reachable and new frontier opened up for everyone.

Throughout the years, DRASS Galeazzi has continued its tradition of innovation and with extensive field experience coupled with decades of innovative equipment development, DRASS Galeazzi Research and Development Department initiated in 2017 its newest challenge of designing and developing a Diving Helmet called the **DRASS D-ONE.**

All of the progress and innovative design techniques that DRASS R&D has developed, comes from creating equipment that is at the cutting edge of technology and production quality.

This ensures the highest level of safety for the operators involved in the Commercial Diving activities and, at the same time, satisfies the desire for stunning design as per typical Italian tradition.

DRASS R&D Team is not comprised simply of highly skilled Design Engineers, but also includes Professionals with wide-ranging experience in the Commercial Diving sector.

This culmination of experience, professional diversity, and innovative focus has enabled the development of products that provide extraordinary value and set us apart from our competitors.

Much of the team being physically and personally connected with the Oil & Gas Commercial Diving sector for decades has provided invaluable insight.

This extensive and increasingly rare experience is always incorporated into every detail of every product we manufacture.

It allows for a dynamic and methodology within Drass which drives innovation and keeps us at the forefront of the industry year after year.

The **DRASS D-ONE** represents the highest echelon of product which DRASS proudly offers in the marketplace.

Confident that the proposed innovations will maximize Diver safety and comfort while providing ergonomic implementation and usage practicability, Drass believes the D-ONE can greatly serve the interests of the Operators in this technological and demanding sector.

NOTE

Copy of this manual will be available in different language on request. Please contact your DRASS dealer or directly DRASS.

2 DESCRIPTION & SPECIFICATION

2.1 GENERAL

This diving helmet has been engineered and built to be utilized in the Commercial/Industrial diving sector up to a water depth of -50msw with a gas supplyfrom the surface "Surface Supplied" technique or from a diving bell "Wet Bell" technique.

Both denominations come from the Commercial Diving sector and are internationally recognized and used to define the technique utilized.

Both mentioned techniques make use of an umbilical hose for the gas, communications and ancillaries supply.

The breathing gas can be either supplied or from a low-pressure compressor system or from a high-pressure supply, bottles rack, properly reduced at a dive panel.

Both cases, the breathing gas is supplied to the Diver by means of an umbilical.

Low pressure or high-pressure supply, for both techniques utilized for the breathing gas supply, the dive management calls for a Diving Supervisor at surface, properly trained in the use of the equipment dedicated to this activity.

The Supervisor by means of a dive panel for the gas management, communications and all ancillaries required by the ongoing activities, directs the job done at working-depth.

Thanks to the microphone and loudspeaker, part of the helmet, that compose the communications system, the Supervisor is always in contact with the working diver, providing the required assistance to the progress of operation, managing the gas supply, constantly monitoring the various dive parameters and improving the safety of operations.

WARNING

Helmet sport usage with SCUBA technique is not considered and rather advised against due to technique intrinsic air supply limitations. Everyone can use the helmet, provided he/she has a good knowledge of the Commercial Diving aspects and techniques, typically Commercial Divers and Navy/Military/Law Enforcement/Fire Fighter divers or, has sustained a dedicated course.

Sport usage (scuba) is discouraged as well as the use to whom is not acquainted and/or without proper and dedicated knowledge.

2.1.1 CERTIFICATION

This Helmet has been certified for air use up to -50msw as per "European Standard EN 15333-1:2008 / AC:2009", "*Respiratory equipment - Open-circuit umbilical supplied compressed gas diving apparatus - Part 1: Demand apparatus*" and EU Regulation "2016/425".

EU Conformity declaration paper copy will be supplied together each helmet.

2.2 SPECIFICATIONS

Weight:	ca. 15Kg.
Helmet shell:	Stainless Steel 316L
Porthole:	Polycarbonate
Side Block:	Stainless Steel
Hardware:	Stainless Steel
Control knobs:	Polyurethane
Neck Dam:	Neoprene
O-Rings:	NBR
Head Cushion	Nylon
Lubricants:	Christo Lube®

Gas supply: AIR

Maximum air depth: -50msw

Water temperature: 4°C ÷ 34°C

Inlet pressure: 9.5 bar over ambient pressure

Air quality as per EN 12021:2014

Umbilical minimum I.D.: 3/8" (9,5mm)

Maximum length: 160m

Head Protection Class A (EN397:2012+A1:2012)

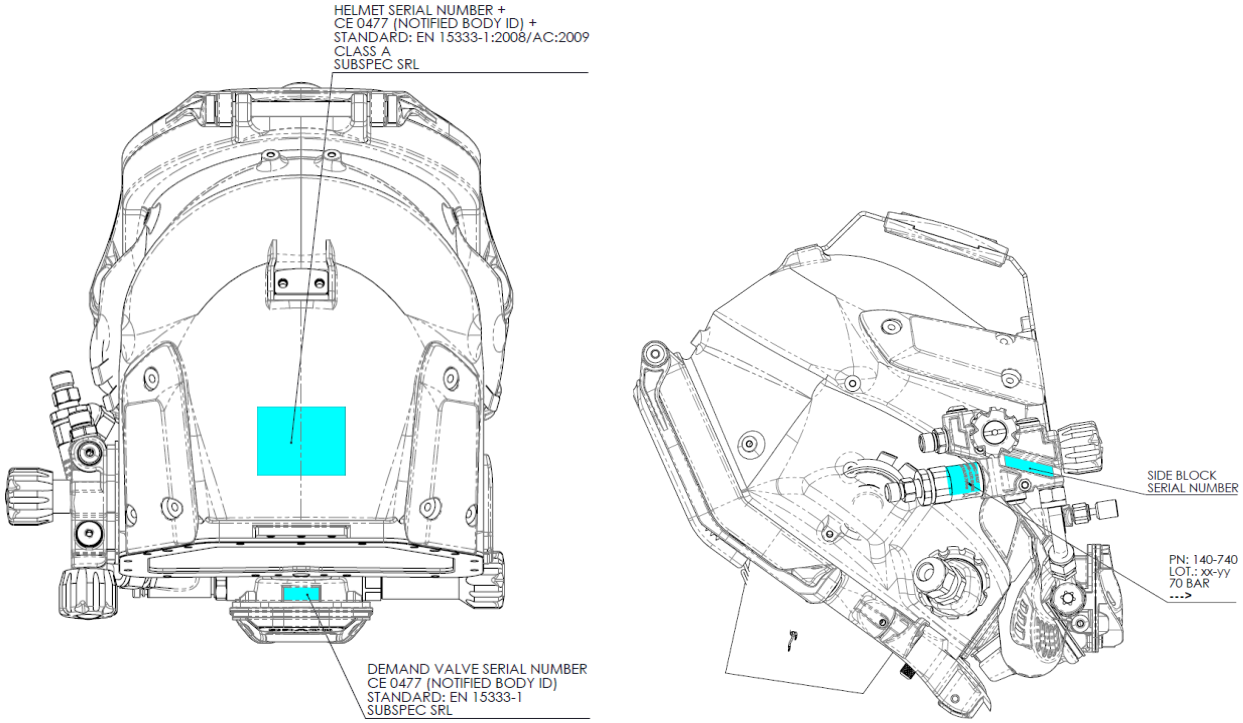
2.3 NOTIFIED BODY

Notified Body:
Eurofins Product Testing Italy S.r.l.
Via Cuorgnè, n. 21
10156 Torino

Identification number: 0477

2.4 NOTIFYING BODY NUMBER

Notified Body Number, Reference Standard and serial number are depicted on the regulator body as per following picture:



2.5 OPERATING TEMPERATURE

The helmet can be used in waters with a temperature range of 4°C and 34°C as per EU Standard minimum requirements without the need to have a hot water system and the hot water shroud installed to prevent freezing. The hot water shroud and hot water can and should be used in case of diving in low temperature water for divers' comfort.

In case of use in water temperature below 4°C for divers' comfort and to prevent freezing of the demand regulator, the installation of the hot water shroud in conjunction with a hot water supply is suggested and recommended. When diving with a water temperature of 4°C or above but with a topside temperature near or below 0°C, it is possible the demand regulator icing on deck.

This is due to the refrigeration effect of the breathing air pressure reduction that, in conjunction with the divers' exhaled air and moisture, comes in contact with the topside lower air temperature. To prevent this freezing at surface, simply run warm water on the demand regulator exterior prior to water entry.

3 OPERATIONAL SPECIFICATIONS

Every Helmet has been tested and its performance assessed with various type of diving umbilical and supply pressure.

Users should become accustomed with the supply requirements for product best performance, ensuring safe and comfort to the Diver.

The supply pressures have been developed making use of a simulator breathing machine at all depths.

Supply pressure for DRASS helmet, can be found in § "*12 Appendix 2 – Maintenance and Inspection Procedures, § 12.6.2_Table 1 - Balanced Demand Regulator Pressure Settings*".

3.1 DESIGN PHILOSOPHY

The development of the helmet started in 2017 and several innovations have been introduced such as a new shell design, a safe and practical locking system, a more ergonomic approach to comms cable routing and to all auxiliary systems that compose and are attached to the helmet shell and a simpler approach for the Helmet maintenance.

DRASS Helmet has been conceived and developed with the aim to offer an up to date Commercial Diving breathing system.

Innovative systems implemented in the DRASS helmet allow for a simplified assembly/disassembly process, assuring a swift and optimized approach to daily routine maintenance as well as to more specific overhaul processes.

Helmet various systems and parts can be easily routinely maintained and, thanks to the Helmet peculiar possibility of reconfiguration, according to dive needs and/or diving technique utilized, the helmet can be quickly configured as required.

The helmet has an interchangeable *pod* that in the standard air configuration, supports the breathing and exhaust system of the helmet:

- A last generation Balanced Demand Regulator
- A High-performance Exhaust System

The helmet is at present delivered with the standard air pod configuration, but in thenear future other pods shall be available, allowing for a single shell to be configured fordifferent Diving techniques.

In detail, there will be available the following pods:

- Air pod (standard configuration)
- Gas Reclaim pod
- Gas Reclaim and Rebreather pod

The second stage regulator, balanced type, thanks to its design and engineering, offers superb gas rate providing high volume of breathing gas with the minimum inspiration effort exceeding by far the Certification requirements.

The exhaust system that perfectly match the inspiration pattern offered by the balanced demand regulator, enables the Divers to exhale with the minimum effort.

The perfectly engineered and fine-tuned breathing system provides an increased comfort to Divers even during prolonged dives.

The Helmet is composed by two main parts, the Helmet Shell and the Neck-Ring Assembly, the latter has a patented solution for its installation system.

Ergonomically engineered, the Helmet 30° rear-angled design, allows for a more comfortable usage of the Helmet. When facing upwards the rear-angled design offers an improved head freedom of movement and

less fatigue, offering a more natural and comfortable method of tilting the head upwards with less stress and fatigue even during prolonged dives and allow for an optimized larger field of view.

The helmet once donned is hold in position by means of the locking collar, open and closing of the locking collar is done by meansof a latching system made with an intrinsically safe double action operated pull-pins, one on each side.

In the unlucky event of breakage of the pins of the locking collar, a safety system prevents the Helmet to unexpectedly openunderwater and become dislodged from the locking collar and be pushed upwards by the air inside that may lead to serious injuries or drowning and death.

If the locking pull pins get damaged, blocked or else, once at surface or in the diving bell, the Tender, inserting a pin in the hole at the back of the pull pin system and pushing forward, can easily release the pull pin and open the Helmet.

Pull pins are a simple mechanism that to properly operate need just a good cleaning with running fresh water to eliminate any trace of particles, sand, mud or salt encrustation.

A classical chinstrap completes the Helmet safety.

Communications are made by means of a standard earphones/microphone assembly that can be quickly replaced as required for an efficient maintenance of the Helmet.

A 2 wires or 4 wires (standard) configuration can be easily selected depending on needs. The comms pod, located on the right side of the helmet is ergonomically designed to offer a safe cable routing, preventing any possible entanglement offering a smooth path to the umbilical.

The oral/nasal mask is tailored to fit all visage contours and is made of nontoxic and nonallergenic quality silicone.

Divers' comfort, is also assured by the head cushion that, combined with the chinstrap and adjustable neck pad allow long comfortable hours of use.

3.2 HELMET CHARACTERISTICS

I. The Helmet is a single piece made of 316L stainless steel, and CNC machined ensuring customer with a long-lasting product of the highest quality

II. The neck dam ring tightly seals inside the lower part of the Helmet by means of an O-Ring

III. The neck dam, made of nonallergic neoprene, can be easily installed and is placed between the neck dam ring assembly

IV. When in position the neck dam ring is recessed inside the lower side of the Helmet, and protected from any kind of impact assuring a correct seal

V. Installation and replacement of the neck-dam is quickly and easily carried out thanks to the neck-dam ring assembly design (Patent Pending)

VI. The internal adjustable chinstrap provides Divers' comfort and safety, securing the Hemet in position once donned

VII. On the rear side of the Helmet, part of the locking collar, there is an adjustable neck-pad that should be set in proper position before diving to fit each Diver's requirement. This can ensure the performance and comfort of the Helmet; once set, no other adjustment is

required. Neck-pad setting is different from diver to diver, and should be correctly re-set for each diver

VIII. The two double-action Pull-Pin-locking system, one on each side of the Helmet, is the system that keeps the neck dam ring / Helmet assembly safely together. The system requires a double action to pull-back the pin and detach the Helmet thus preventing any inadvertent opening or mis-manoeuvring

IX. In case of Pull-Pin breakage, the system keeps the Helmet in closed position preventing any possible detachment and dislodgement and consequent floating away of the Helmet. In case of Pull-Pin failure/breakage, the system needs a pin from the backside of the pin lock to be opened, action that is easily carried out at surface or in the diving bell by theTender

X. The cushioned head protection is held in position inside the Helmet by press-studs

XI. Comms system is easy to be replaced for a quick change or maintenance and can be easily configured with a 2 or 4 wires comms system. A control pod placed on the right of the helmet, is 90° shaped to offer a favourable cable routing to the exiting comms cable. It can be configured or with the usual pig-tail connector RM4 4M 90°shaped male/female connector or by a waterproof bulkhead connector MCBH4

XII. A twin exhaust membrane valves system in the regulator pod and one large membrane exhaust system in the regulator body, provide a higher exhalation rate ensuring perfect isolation with the external environment.

3.3 DRASS D-ONE

4 GENERAL DESCRIPTION

4.1 SHELL

The helmet and the neck-ring are fully made of stainless steel 316L and the helmet body, the shell, is the part where all the components are installed.

As necessary, the helmet design enable the easy replacement of the various parts either for maintenance and/or for helmet reconfiguration according to the dives needs.

WARNING

Any repair to the helmet stainless-steel shell must be carried out by an authorized DRASS repair center or by an appointed technician.

4.2 GAS SYSTEM

Main gas supply arriving from the surface via the umbilical and emergency gas arriving from the Emergency Gas Supply, the bailout bottle, both flow in the same circuit of the side-block.

Function of the Side Block is the distribution of the arriving gas to the various users, in direct way, with no divers' control to the Balanced Demand Regulator, ensuring the required continuous breathing gas supply and, in a divers' activated way for the helmet defogging/free-flow system and for the activation of the Emergency Gas Supply.

For detailed Side Block description and functionality, see § *"8.3 Side Block Assembly"*

4.2.1 ONE-WAY VALVE

The umbilical that supply the breathing gas to the helmet, is connected at the side block with the interposition of a One-Way Valve. This is a valve that allow the flow of gas in only one direction only, from the umbilical to the side block and not vice versa.

It is an important part of the breathing circuit and must be present and properly working to prevent possible injury that may also lead to death. For detailed One-Way Valve description and functionality, see § *"8.2 One-Way Valve"*.

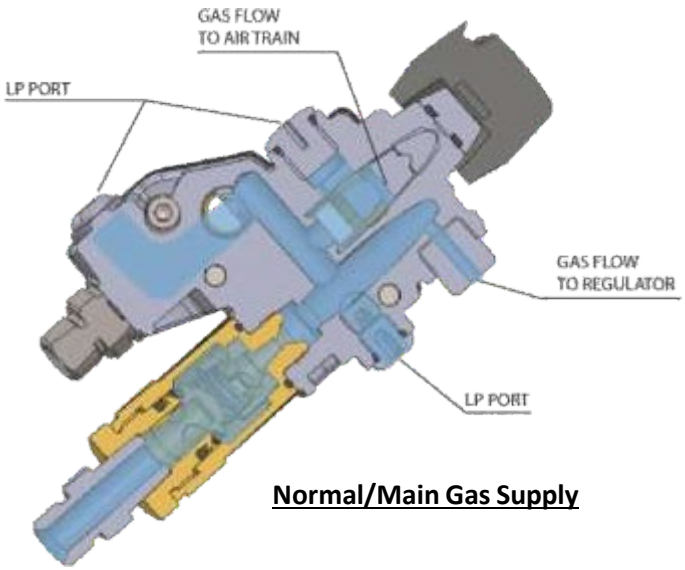
WARNING

- Never dive without a One-Way Valve
- Never dive with a damaged or not properly working One-Way Valve

In case of doubt, contact DRASS

4.2.2 MAIN SUPPLY

From the One-Way Valve the arriving gas flows inside the side block where the main supply is distributed to all users.



Normal/Main Gas Supply

4.2.3 DEMAND REGULATOR / MAIN GAS SUPPLY CONNECTOR

From the side block, the gas is supplied to the Balanced Demand Regulator by means of a bent tube that arrives to a "*banjo*" fitting. The gas flow is controlled at the demand regulator by the inlet valve that supply the

gas to the diver only on demand and shut off during the exhalation phase.

Due to different supply pressures that may supply the helmet, the demand regulator is also provided by an adjustment knob.

This multi-turn system allows the diver to properly fine tune the regulator in order to exert the minimum breathing effort and compensate for the pressure variation in the umbilical.

4.2.4 DEFOGGER / FREE-FLOW PORT

On top of the side-block there is the second port, controlled by diver activated knob: it is used to activate the helmet defogger as required and is not meant to connect any dry suit or buoyancy compensator.

The defogger is used to let a steady flow of air directly onto the helmet face port to eliminate the fogging that may form due to the different temperatures, warmer inside the helmet and colder outside, clearing the lens.

In the event of helmet flooding, the defogger/free-flow control knob when activated, allow a large volume of gas inside the helmet forcing the water through the helmet exhaust valve.

The free flow is also used in case of emergency to produce an uninterrupted flow of gas not controlled by the demand regulator.

During an emergency event, the st-by diver typical approach to a distressed/incapacitated diver, is the opening of the free flow valve once reached the diver to assist in order to supply to the unconscious diver a steady flow of breathing gas.

In doing so, a large and continuous flow of gas is supplied to the diver under rescue and breathing is granted for the time required to rescue the diver even if the helmet is partially flooded, the diver could be fainted and/or is incapacitated to breath normally.

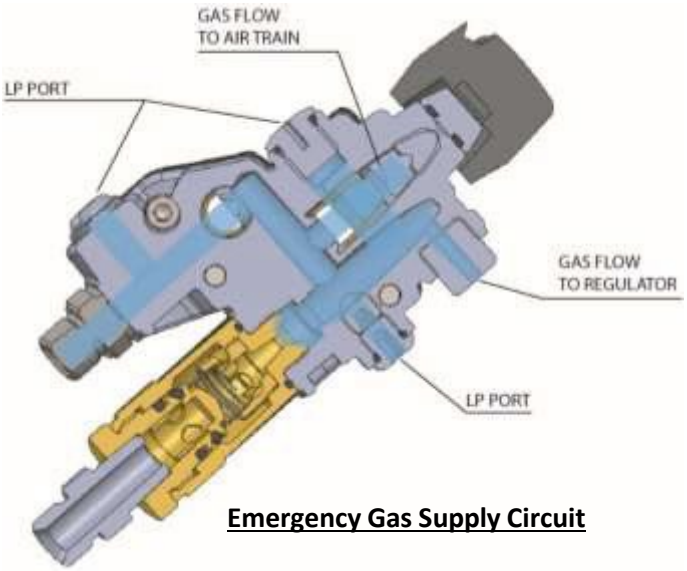
4.2.5 INFLATION PORT

The LP gas arriving at the plugged port suitable for the dry suit/buoyancy compensator inflation, is provided by a flow restrictor that, in case of hose break or other failure, prevent the quick discharge, being restricted to about 100LPM discharge flow.

The inflation port when in use for its design does not interfere with the breathing circuit.

4.2.6 EMERGENCY GAS SUPPLY

Gas from the bail-out bottle, used for emergency situations, arrives at the side-block as-well, and its activation is governed by means of a valve provided by a knob, easily reachable activated by the Diver.



Emergency Gas Supply Circuit

4.2.7 BAIL-OUT EMERGENCY CONNECTION

It is normal for the working diver, to be equipped with an independent supply of gas, an emergency bottle supply, dedicated to the gas provision if the main gas supply became unavailable, the Bail Out Bottle.

A pressure reducer, a first stage regulator, is connected to the bail-out bottle and the pressure reduced gas, by means of a LP hose, arrives to the side-block at the emergency

valve controlled by a knob that is diver activated.

NOTE

The first stage regulator for BDR correct functioning and best performance, should supply a gas with a pressure of 9,5Bar ±0,5Bar.

4.2.8 DIVER HELMET ATTACHMENT

Donning of the helmet is done by the positioning of the neck ring assembly and the subsequent positioning of the helmet over it.

The neck ring assembly supports the polyurethane/neoprene neck dam with the sealing circumferential O-Ring and thehelmet supports the head cushion, fixed by press studs, and the chinstrap.

The outer circumferential O-Ring that seals the helmet lower side fit inside a perimetric seat of the neck ring; the neck-dam that seals around the divers' neck, is in turn positioned inside the parts composing the neck ring.

The lower side of the helmet has a recessed machined seat where the neck-ring assembly tightly fit, ensuring the sealing with the outside and is locked in position by means of two locking-pins, one on each side of the helmet.

At the back of the helmet on the locking collar, there is the neck-pad that can be adjusted to match each diver neck size. The neck-pad assembly once the locking collar is closed, present a smaller opening than the divers' head, preventing any possible helmet dislodging.

The head cushion, the neck-pad, thechinstrap and the neck-dam, all together firmly secure the helmet to the diver's head and, at the same time, provide the required sealing offering good fit and comfort.

On both sides of the helmet, the twodouble-action locking pull-pins engage with the locking-collar, firmly securing the assembly. When donning the helmet, if the two locking pins are left in the closedposition, once the locking collar is engaged, they will simply snap to the locked position. For safety of operations, opening of the helmet, require instead a double action to disengage the pins from their locked position:

- A rotation to unlock the system and activate the pull-pins
- A firm forward Pull
- A further rotation to fix the pull pins in open position

4.2.9 SEALING

The helmet sealing is obtained by the neck ring circumferential O-Ring and the Helmet sealing against the diver's neck is obtained by means of the cone-shaped neck-dam.

The neck-dam is made of neoprene and can be adjusted to make it larger suiting different neck sizes by trimming. Trim in step of 3/5mm max. at a time or it may result in a loose fit.

The Neck-dam even if made with a high quality and soft neoprene, when new or at surface may be a bit uncomfortable, but once in the water, due to compression of the neoprene foam, will loosen slightly.

A leaking neck dam became uncomfortable due to the continuous flow of gas that create diver discomfort and water can also enter inside the helmet depending on diver's head position/orientation.

Always replace a worn-out neck dam to ensure comfort and safety to divers.

4.2.10 CARBON DIOXIDE

To reduce as much as possible the carbon dioxide build-up inside the helmet volume if flushing is not properly governed, an oral/nasal mask made of nonallergic nontoxic

silicone to fit over the diver's nose and mouth is connected to the regulator securing nut.

When the helmet is donned, the lips of the oral/nasal mask, adhering to the diver's face contour, isolate the diver's mouth and nose from the helmet interior, conveying the exhaled gas to the regulator body exhaust system.

The oral/nasal mask avoid the breathed-out CO_2 enriched gas, to be exhaled in the helmet inner atmosphere, preventing the carbon dioxide build-up in the helmet confined volume.

In the long term, the helmet internal volume polluted by the exhaled CO_2 enriched gas, may cause typical side effect to diver's health that, if at low concentrations have little toxicological effect, typically headache, but at higher concentrations may lead to an increased respiratory rate, tachycardia, cardiac arrhythmias and impaired consciousness.

Concentrations of more than 10% may cause convulsions, coma and death.

4.2.11 COMMUNICATIONS

The helmet is equipped with a high-quality microphone/earphone sets that can be configured in 2 wires or 4 wires (Round Robin), depending on users' needs and convenience and the helmet standard delivering configuration is 4 wires.

The wiring is routed to a communication pod on the right side of the helmet from where the cable or connector exit with anergonomic 90° angle, in line with the helmet contour. The comms exit can be equipped or by a normal pigtail with a RM4 4M connectoror by a waterproof bulkhead connectorMCBH4.

4.2.12 CLEARING THE EARS

Under normal conditions, at atmospheric pressure, the middle ear pressure is equalized with the back of the throat.

When diving, the external pressure increases and the pressure increased levels exercised on the divers' eardrums, needs to be restored. Divers are familiar with the clearing the ears maneuver, medically known as "Valsalva".

The helmet is provided by a nose-pad, part of the shaft that passes to the outside where a knob is attached. The shaft-nose-block assembly can slide in and out so, when required, the diver can push it in and position it under his nose and use it to close the nostrils and executing the Valsalva maneuver, clear his ears during the descent. The nose pad can also be rotated upside down and retracted to get more space underthe diver's nose.

4.2.13 FACE PORT LENS

The helmet lens is made of strong and clear plastic polycarbonate and is easily removable for replacement.
A special polyurethane gasket is located in a recessed seat of the helmet shell, properly sealing the helmet lens with the outside environment.
When replacing the lens, attention must be paid to not overtighten the retaining screws. For screws proper torque see § "*11 Appendix 1 - Torque Tables*". In case of doubt contact DRASS.

5 OPERATIVE INSTRUCTIONS

5.1 DESIGN PRINCIPLE

WARNING

It is tacitly implied and intended that whoever shall use this helmet, is trained in the use of Commercial Diving helmet and relevant diving technique.

Use of DRASS helmet foresee the use of an umbilical as primary source of breathing gas. Make sure to use a proper umbilical c/w communication cable and other members, pneumofathommeter, hot-water, etc.

In Commercial Diving the umbilical is the life-line to the surface and, as a suggestion, the best solution is to use the type of umbilical where the hoses and cables are twisted together, wound as rope strands. This can ensure the required strength to support strains and possibility of umbilical failure and kinks that may cause the umbilical gas flow restriction, are also prevented.

During their dive, Divers must be tended at surface by a qualified tender that knows how to manage, to tend the umbilical in agreement with the Supervisor received orders. For surface supplied technique, the umbilical is connected to a diving station at surface that, managed by a trained Diving Supervisor, is the core of the ongoing diving activities.

The Balanced Demand Regulator has been designed to work with a supply pressure of 9,5bar over ambient pressure, allowing for a wide range of supply system. As a minimum, the diving console or the supply system intended, should supply 62,5l./minute at depth.

For the helmet better performance and safety of operations, it is recommended to ensure that the umbilical is connected to a diving console capable to supply the required pressure and gas volume as indicated in § "12 *Appendix 2 – Maintenance and Inspection Procedures, § 12.6.2 Table 1 - Balanced Demand Regulator Pressure Settings".*

5.2 RECEIVING YOUR DRASS HELMET

When receiving your new DRASS helmet, unpack it carefully and make a thorough examination for any damage that may have occurred during the shipping.

NOTE

Make use of the included inspection sheet, and step by step check about your helmet integrity.

In case your helmet is found damaged due to shipment, please contact your DRASS dealer or directly DRASS, depending on site of purchase.

Completed the inspection of the new helmet, also complete and return to DRASS the enclosed "warranty card".

No claims are accepted if the "warranty card" has not been forwarded to DRASS, duly filled and Helmet has not been online registered.

5.3 PREPARING THE HELMET FOR FIRST USE

Helmet must be checked and properly set-up before use. The adjustment must be made to wear the helmet in a safer and more comfortable way.

5.3.1 HEAD CUSHION

Every helmet is supplied with a standard head cushion of padded cell foam. If required for the divers' comfort, the head can be moved forward, towards the oral nasal mask, simply adding layers of foam at the back of the head cushion. Do not exaggerate, since this may

lead to position the divers' chin too far, towards the oral-nasal mask creating a situation of discomfort. Increasing or decreasing the amount of cell foam at the top of the head cushion move the divers' head up or down.

As/if required the cell foam can be shaped with scissors to better suit the divers' needs and get a better fit.

5.3.2 TRIMMING THE NECK-DAM

The neck-dam is cone shaped and every time you need to replace it or when your helmet is new, its size may need to be adjusted to suit your needs.

Due to the cone shape, the neck-dam might be too tight and to loosen the neck-dam tightness, to stretch it a little bit, it can be slid over a bottle or other suitable diameter and letting it sit overnight.

Depending on situation, some trimming may be required to fit your neck. Neck dam trimming can be easily done with the help of the Tender. Hold the edge of the neck-dam parallel and with a long scissor cut a thin portion of the neoprene, making trims of no more than 3/5mm at a time to avoid over trimming.

Once finished the neck-dam should fit as tight as not to leak and consider that the neck-dam may be slightly snug at surface and once underwater, should fit comfortable since the neoprene foam cells under pressure will break-down loosening over time.

Make sure that the neck-dam has no holes or the Balanced Demand Regulator will not work as designed and the helmet may flood.

5.3.3 NECK-PAD

It works in conjunction with the chinstrap, preventing the helmet dislodgement.

Proper setting of the neck-pad can ensure an improved comfort and safety of the helmet.

The neck-pad is part of the locking-collar and can slide back and forth to suit different divers' neck size and conformation.

It is fixed by means of three screws that, once loosen, allow the adjustment.

5.3.4 NECK PAD ADJUSTMENT

To properly regulate the neck-pad, the diver needs the Tender assistance.

If the neck-pad is going to be adjusted without the neck-dam ring assembly, supply of air to the helmet is not needed, if theneck-dam ring assembly is used, the air supply must be connected to the helmet.

Place the helmet on a flat surface, face down, detach the locking collar disengaging the pull-pins and once free, swing the locking collar out, away from the helmet base.

Make sure that the head cushion snap tabs are properly engaged with the head cushion in position.

Loosen the three screws that hold the neck-pad until it is free to move; pull out the nose pad and put the helmet over your head with the oral/nasal mask in position covering mouth and nose creating a proper sealing with your face contour.

Slide the pull-pins in closed position and close the locking collar engaging the two pull-pins that will snap in locked position.

At this point, with the help of the Tender, slide the neck-pad towards your neck until it sits snugly but in a comfortable way.

Tender to mark the position with a felt pen and screw in the three screws previously loosened, holding the neck-pad in position.

At completion, reverse the operation, rotate, pull-out and rotate in open locked position the two pull pins opening the locking collar, remove the helmet and, repositioned the helmet onto a flat surface, firmly retighten completely the three screws holding the

neck-pad according to the marks done and tighten the three screws.

Once finished the neck-pad is adjusted for your head and no more adjustment are needed.

5.4 PRE-DIVE CHECK

Before the start of diving a series of check should be carried out to assure that the helmet is in good order and ready to dive. These checks should be carried out well in advance to make sure that, in case of problems, these can be restored without further delay to operation.

5.4.1 VISUAL INSPECTION

A thorough visual inspection of the helmet checking the exterior and the interior of the helmet, should be carried out before each dive:

1. Check the regulator cover for damage and make sure the purge button works properly
2. Check the neck-dam for presence ofholes, torn parts and if it is properly trimmed for correct fitting
3. Check the sealing O-Ring of the neck-dam ring is in place, not damaged and slightly lubricated
4. Make sure the bent tube assembly is free from dent, kinks
5. Make sure the viewport is in good condition and clean
6. Check comms wires are in good condition and properly fastened and comms have been tested
7. Make sure the oral/nasal mask is in position, correctly seated over the regulator mounting knob and the non-return valve is correctly installed
8. Check the pull-pins function properly with a smooth open and close maneuvering
9. Assure that the head cushion is properly fixed to the press studs, and the chinstrap is open as much as possible
10. Ensure that all screws of the frame securing the view-port lens are tightened. For torque specification, see § "*11 Appendix 1 - Torque Tables*"

5.4.2 FACE PORT CLEANING

Thoroughly clean the face port lens with a cloth and a liquid soap. Attention not to use any aerosol spray on the polycarbonate surface. To prevent the lens fogging, apply and smear on the lens surface a mild neutral liquid soap, once applied, do not remove.

5.4.3 VERIFICATION OF MOVING PARTS

Make sure all moving parts such as:

- Regulator adjustment knob
- Defogger/free-flow control knob
- Emergency supply gas knob
- Nose-pad system
- Pull-pins and all locking collar parts

Are all working properly with a smooth operational movement.

5.4.4 COMMS CHECK

Before each dive it is of importance to make sure that the communication system is properly working. This is usually part of the predive check that are routinely carried out as per Diving Company policy and normal practice.

Connect the umbilical comms cable helmet-plug to the helmet and to a dive console at the surface side, put your head inside the helmet and talk with the Supervisor at the dive console.

Make sure that good comms. are present, there is a good volume and intelligibility. In case of poor communications, noise or other problems that may affect the communication with the surface, replace the

earphones/microphone of the helmet as required. See § *"9.13 Communication System"*

Comms. Kit are available from DRASS or from DRASS authorized dealer.

5.4.5 ONE WAY VALVE PREDIVE CHECK

This check invests a paramount importance and **MUST** be carried out before each dive.

1. If connected, disconnect the umbilical from the relevant helmet fitting adapter
2. Make sure that the emergency valve knob on the helmet side-block is closed
3. Connect the LP hose coming from the bail-out bottle regulator to the relevant fitting on the helmet side-block
4. Make sure the defogger/free flow valve knob is closed
5. Open the bail-out valve supplying gas to the LP hose
6. Open the emergency valve knob on the helmet side-block
7. Check that from the one-way valve fitted on the helmet side-block there is no leakage
8. If check positive, close the bail-out valve
9. When bail-out valve closed, open the helmet defogger valve or purge the demand regulator of the helmet to drain the line from gas pressure
10. Close the emergency valve knob on the helmet side-block
11. One-way valve is working properly, ready to dive
12. Connect the main Umbilical and carry out relevant checks

In case of leaking/faulty one-way valve, DO NOT DIVE. Rebuild or replace it, before attempting any dive.

The one-way valve is a very sensitive part of your equipment and must be checked daily. As a routine, Diver/Tender to check it before each dive making sure about its functionality. In case of malfunctioning, do not dive, replace or restore. Diving without or with a faulty One-Way Valve, may lead to death in case of emergency.

NEVER DIVE WITH A FAULTY ONE-WAY VALVE.

A rebuild kit is available, contact DRASS

5.4.6 EMERGENCY GAS SUPPLY

Before the start of each dive, always check and log the pressure of the emergency bail-out bottle.

NOTE

Tender at surface at the beginning of the dive, at diver dressing completion, to check the diver bail out bottle pressure, reading the underwater HP gauge and report value to Diving Supervisor confirming the closure of the relevant knob valve for the emergency gas supply at the helmet side-block.

Diving Supervisor to log the BOB pressure in the dive log, for every dive.

Bail-out bottle should be inserted and properly secured in an appropriate backpack, fitted with specific D-Rings for the hooking of the umbilical and for the lifting of the fully dressed unconscious diver.

WARNING

Always attach the Diver's umbilical to a suitable harness "D Ring" to avoid pulling directly on the helmet.

Never start a dive without the bail out bottle. Bail-out bottle to be worn with appropriate harness, backpack/lifting harness.

In case of loss of main gas supply, diving without a Bail Out Bottle may lead to drowning or death.

WARNING

NOTE: Bail Out Bottle characteristics as per Diving Company policy and Diving Manual requirements

- Always use a good quality first stage regulator to reduce the bail-out HP pressure to LP intended for the supply of the Balanced Demand Regulator fitted on the helmet
- Make sure an overpressure relief valve is present on the first stage regulator and if not, install one to bleed off any overpressure leak that may arise
- Always install an HP underwater gauge at the bail-out first stage regulator for diver's periodical bail-out pressure monitoring whilst underwater.

Supervisor during the dive to periodically ask Diver to check the pressure of the bail-out reporting value. In case of reported bad / low reading, Diving Supervisor to takeappropriate action.

CAUTION

Different approaches are used to manage the emergency bail-out bottle gas supply:
Bail-out bottle valve open and side-block valve close
Bail-out bottle valve close and side-block valve open

Always refer to your Company diving manual and policy

In doing so, the first stage is under pressure all the time and cannot be flooded during descent and the supply of gas is immediately available once opened the helmet emergency gas valve knob on the side-block.

NOTE

The most common and safe method used in Commercial Diving for the bail-out management, is to have the bail-out bottle valve open and the helmet side-block valve closed.

5.5 PREPARING THE UMBILICAL

5.5.1 UMBILICAL FLUSHING

Flushing of the umbilical is made before each dive when the testing of the one-way valve is carried out.

Flushing of the umbilical can assure that dirty, small particles, moisture, if any, are removed, expelled from the umbilical end and cannot affect the functioning of the one-way valve/Balanced Demand Regulator.

If after the above check the umbilical is not connected and immediately used, cap the open-end umbilical fitting and helmet with proper plugs or tape them.

5.5.2 UMBILICAL GAS CONNECTION

Make sure that the fitting adapter of the one-way valve and the connector on the umbilical end is clean, before doing the mating.

When connecting the umbilical to the helmet make use of two wrenches, one to hold the inlet fitting adapter of the one-way valve and one to turn the swivel fitting of the umbilical. Pay attention not to turn the inlet adapter fitting on the one-way valve that, if repeatedly done, may cause a thread wear resulting in leakage and cause valve replacement.

Do not overtighten the connection, just make sure for a firm, snug connection. Excessive

force exerted may cause a deformation of the fittings.

When cracking, detaching the umbilical from the helmet, use two wrenches, one to hold the adapter inlet fitting on the helmet one-way valve and one to turn the umbilical swivel end fitting.

5.5.3 UMBILICAL COMMS. CONNECTION

Depending on type of comms connectors chosen when ordered the helmet, make sure to properly align both connectors before making the mating.

- If the helmet connector is the pigtailed one, RM4 4M connectors, align the connector outer indicator marks and the dummy fifth pin, then press together and then place 2 or 3 wraps of electrical tape over the two mated connectors to prevent any detachment
- If the helmet connector is the bulkhead type MCBH4M, align the fifth dummy pin and press together, then, slide the safety ferrule and screw-it in

For the connectors' separation, reverse the procedure:

- For the pigtailed one, removed the taping, hold the thickest part of the connectors and place your thumb against each other then, push apart against your thumb until disconnection
- For the bulkhead connector, unscrew the ferrule and slide it back along the cable, grasp the thickest part of the connector and gently pull apart from the bulkhead connector on the helmet

Just make sure not to twist the connectors, apply force on the connectors thickest part, and never detach the connectors by pulling on the cables.

5.5.4 UMBILICAL GAS SUPPLY

Once the gas umbilical is connected to the relevant helmet side-block one-way valve adapter fitting, make sure that the defogging/free-flow valve knob is closed, that the Balanced Demand Regulator adjustment knob is all the way in, rotated clockwise.

Charge the umbilical with a gas pressure of 9,5bar ±0,5bar, then open, rotating counter clockwise the Balanced Demand Regulator adjustment knob, until a slight free flow is detected and then turn it back just to stop it.

5.5.5 FOGGING PREVENTION

To prevent the build-up of fogging on the helmet lens, apply a thin film of mild liquid detergent dish washing or other commercial suitable solution. Never use aerosol spray since some propellant in the aerosol may damage the lens.

5.5.6 HELMET DONNING

Dress-up of the diver is usually done with the assistance of a Tender/Assistant. Diver of course, should become familiar with the helmet, but is common practice and Commercial Diving routine to have the Tender and/or the assistant to help the diver to correctly and safely get dressed.

Diver to firstly don the neck-dam ring assembly making sure that the lip of the neck-dam once donned, is upwards on his neck.

Diver/Tender to make sure that the head cushion inside the helmet is correctly positioned, that all press studs are engaged, and the chinstrap is fully open. Tender to position the pull-pins in closed position leaving the locking collar open, freely swinging. Breathing gas is in line and the Balanced Demand Regulator is energized.

Tender to lift the helmet by the handle and position it on top of the head of the diver. Diver to start inserting his head inside the helmet starting from the back and then, pivoting the helmet forward, position the face against the oral nasal mask ensuring proper fitting.

Make sure that the locking collar is open and tilted backwards during the helmet donning.

With the helmet correctly positioned overthe diver's head, diver to fine tune the head cushion and then tie the chinstrap.

Diver to engage the flap of the neck-dam ring assembly inside the relevant neck ring catcher recessed space of the helmet. The; Tender to assist and check the flap correct positioning.

Diver/Tender to grab the neck-dam ring assembly and push it against the recessed base of the helmet; during this action, make sure that the head cushion lower side, does not interfere and continue the approaching up to fully insert the neck-dam ring assembly in its final position, sealing the helmet.

Diver is now isolated from external environment and is breathing from the umbilical supply.

At this point, with the neck-dam ring positioned the helmet is ready to be closed.

Diver slightly tilt his head forward and Tender rotate and close the locking-collar until engaged by the pull pins snapping in locked position.

ATTENTION

Pull-pins MUST be properly engaged to assure the helmet/neck ring assemblies are correctly positioned and sealed. If not sealed properly the helmet may open and flood and as a result the diver could drown

Tender, to carry out a final check to diver's readiness, as per Diving Company policy, procedure and predive checklist.

Tender/Assistant to ensure the umbilical hooking to the diver's harness by means of a carabiner or snap shackle and, depending on logistic position, assists the diver to enter the water by a diving ladder or by a LARS, properly tending his/her umbilical.

ATTENTION

As a routine, always hook the umbilical to the diver's harness. **NEVER** let the umbilical be free to pull-on directly on the helmet, diver may suffer neck injuries.

NOTE

As a suggestion, since the whole gas system has been already checked for its functions and is working and has been set as expected and as required, do not open the free-flow valve/defogger to avoid the removal of the previously applied thin film of antifog product from the polycarbonate face port.

5.5.7 HELMET REMOVAL

Removal of the DRASS helmet is done by rotating, pulling out and rotating again, in locked position, the two pull pins, freeing the locking-collar.

Diver to slightly tilt his head and helmet forward, then Tender/Assistant swings back the locking-collar, behind diver's shoulders.

Tender/Assistant, pulling on the pull-strap at the back, to crack the seal, opening and detaching the neck-dam ring assembly from the helmet.

With the nose pad fully retracted towards the external, diver to loosen the chinstrap and get ready for the Tender to remove the helmet

Once the helmet has been removed, diver to remove the neck dam ring assembly. Diver to slip off the neck-dam ring assembly.

5.5.8 BAIL-OUT REMOVAL

- Tender to detach the umbilical from the diver's harness
- Tender to close the bail-out bottle valve
- Tender to open the side-block emergency supply valve to further release the pressure in the LP hose of the bail-out bottle
- Tender to open the free-flow valve or purge the Balanced Demand Regulator to discharge the pressure in the LP hose of the bail-out
- Tender to remove the first stage regulator from the bail-out bottle
- The helmet can now be prepared for another diver and continue with the activities or be prepared for the storage

Diving operation shall continue or cease, and the helmet dealt accordingly to Company Diving Manual and policy.

5.5.9 HELMET STORAGE

If the helmet is not going to be used immediately but shall be stored, do the following:

- Remove and rinse properly the head cushions and, in doing so, consider removing the padding foam as required
- Rinse the oral/nasal mask and Balanced Demand Regulator as well as the inner part of the helmet with fresh water, pay attention to dislodge the microphone and the earphones avoiding their wetting
- Rinse the neck-dam ring assembly with fresh water and let it dry
- With the umbilical still connected, flush the Balanced Demand Regulator to expel all water
- Close the umbilical main source of gas, purge the umbilical by opening the free-flow valve
- Unscrew the Balanced Demand Regulator adjustment knob, make sure it is fully out
- Check and dry as required the communication components, if required apply proper moist-remover and let them dry
- When umbilical drained, by means of two wrenches, detach the umbilical from the fitting on the helmet side-block one-way valve adapter fitting and plug the umbilical end with suitable plug to avoid dirt entering inside the hose
- Place plugs on the helmet side-block open fittings
- Once helmet is dry reposition comms system and head cushion
- Neck-dam ring assembly dried, lubricate O-Ring
- Place helmet in carrying bag or dedicate box for storage
- Hang the Neck-dam ring assembly by the pull-strap d-ring

Following the above, will preserve your new helmet in perfect condition ready for further use. In case of needs or for further indication/maintenance/spare parts, contact DRASS or a DRASS dealer.

6 MAINTENANCE & INSPECTION

DRASS can assure its helmet is made following the highest standard, however, routine inspection and scheduled maintenance, can grant that this sensitive important piece of your gear remain fully operational.

NOTE

DRASS helmet is accompanied by a dedicated helmet Logbook for the recording of all maintenance and repairs done. It tracks the helmet usage for its entire life and require to be filled in by the Technicians servicing the helmet.

In case of helmet resale as a used item, the accompanying Helmet Logbook is an important added value and a guarantee for the buyer.

Most of the items composing the helmet have a long-lasting life before a replacement become necessary, others, according to their service life may require a replacement, and further others, to ensure the correct functionality have a maintenance period that needs to be followed by the Users, to ensure the helmet proper safe functioning.

Routine and periodic maintenance can ensure the safe usage of the helmet.

⚠ CAUTION

On Commercial Diving Projects, where several Divers use the same helmet, it is recommended a sanitizing routine to prevent the spread of germs. See relevant section § "*7 Preventive Maintenance – General, § 7.6.2 Helmet cleaning/sanitation between dives*" of this manual.

Helmets on use should be inspected daily before each dive and helmets on continuous use, such as on a Commercial Diving Project, should be rotated every 24 hours and looked after by a Competent Person/Appointed Technician before resuming their usage.

If in doubt, please contact your local DRASS authorized dealer and/or look on DRASS dedicated website.

On DRASS website you can find lists of the spares for the scheduled maintenance and relevant parts.

The following Maintenance Modules rule and ensure scheduled DRASS helmet maintenance:

- Module_M1A: Annual Overhaul, Maintenance, and Inspection Checklist
- Module_M2M:Monthly Maintenance
- Module_M3D: Daily Maintenance
- Module_M4S: Supervisor's Pre-Dive Checks
- Module_M5S: Supervisor's In-Water Checks
- Module_M6S: Post Dive Checks

NOTE

DRASS run helmet maintenance courses and endorse Technicians with the DRASS Technician Certificate, enabling to carry out the required scheduled maintenance as well as, appoint a DRASS authorized dealer to run the Helmet courses and issue the relevant certification.

Please contact DRASS for more information.

6.1 DAILY MAINTENANCE

The helmet should be set-up and checked daily as per module "*M3D_Daily Maintenance*". At checklist completion it should be logged up by the Supervisor in the Project logbook as well as on the helmet logbook. It is the minimum required checklist to carry out as requested by DRASS.

6.2 PRE-DIVE CHECKS

Supervisors to carry out the modules "*M4S_Supervisor's Pre-Dive Checks*" as a part of their equipment checks before each dive. Log up the checks done in the Project Logbook and helmet Logbook.

6.3 IN WATER CHECKS

Supervisors to carry out the module "*M5S_Supervisor's In-Water Checks*" as a part of their equipment checks. Log up the checks done in the Project Logbook and helmet Logbook.

6.4 POST-DIVE MAINTENANCE

After each dive, the helmet should be checked as per module "*M6S_Post Dive Checks*" and at completion, it should be logged up by the Supervisors in the Project logbook as well as on the helmet logbook.

6.5 MONTHLY MAINTENANCE

DRASS foresee a routine inspection to be carried out on a monthly basis however, in case of intensive usage of the helmet, when there are doubts about the helmet'sintegrity, when the helmet is used during sandblasting/jetting operation, diving in contaminated waters or in welding/burning activities, helmet service is required to be carried out more frequently. The Daily Maintenance routine shall help to determine the need for a specific maintenance.

Replace the components in doubts to ensure proper helmet functionality and service.

Log up in the helmet Logbook the serviced/replaced parts as per module "*M2M_Monthly Maintenance*".

6.6 YEARLY MAINTENANCE

Module "*M1A_Annual Overhaul, Maintenance, and Inspection Checklist*" should be followed and the relevant required parts maintenance executed at least annually unless the daily/monthly maintenance reveal signs of excessive usage, contamination, corrosion or signs of damages that may suggest a more frequent maintenance. Allsoft goods, O-Ring, exhaust valves, membranes, can be thoroughly checked, cleaned and reused between overhauls and substituted at least yearly.

The extensive "*M1A_Annual Overhaul, Maintenance, and Inspection Checklist*", should be properly recorded in the helmet Logbook.

7 PREVENTIVE MAINTENANCE - GENERAL

A well-kept helmet can ensure a long lasting and safe system to the user, in this section the preventive maintenance to implement, to keep your DRASS helmet sound and in good order.

Your DRASS helmet has been designed to allow an ease of access to all parts for a proper maintenance.

7.1 REQUIREMENTS FOR A GOOD MAINTENANCE

DRASS developed the DRASS D-ONE helmet with theCommercial Diving in mind and the helmet preventive maintenance can be executed by the Diver making use of normal common tools and following the instructions found in this Manual. However, there are some intervention that must be done by an authorized, properly DRASS trained Technician/Competent Person and dedicated tools.

Periodic and accurate maintenance can ensure the proper working of the DRASS helmets. All disassembled parts should be properly cleaned and all components that require to be lubricated, should be serviced accordingly.

Checklists documents should be followed and filled in properly, detailing the components substituted and/or repaired and the checklists updated regularly.

All screws and fasteners require a proper torque value for their reassembling, see § "*11 Appendix 1 - Torque Tables*".

In case of need of technical assistance, refer to DRASS Authorized Dealer nearest to you or contact DRASS.

7.1.1 TOOLING

DRASS Helmet are usually maintained and spare parts replaced by a Competent Person.

However, for small and simple routine maintenance, a Diver should be enough accustomed with his DRASS helmet to carry out the minimum maintenance required and keep his helmet in top working conditions.

The following tools are the ones suggested by DRASS and should be present on every Dive site where DRASS helmets are used:

Torque wrench with the following open-end attachments:

- 11mm
- 14mm
- 16mm
- 17mm
- 19mm
- 25mm
- 26mm

Torque screwdriver with the following inserts:

- #1 Flat Blade
- #2 Flat Blade
- #3 Flat Blade
- #4 Flat Blade
- #1 Phillips Head
- #2 Phillips Head

Set of Allen keys in the following sizes:

- 0,9mm Allen Key
- 2,0mm Allen Key
- 2,5mm Allen Key
- 3,0mm Allen Key
- 4,0mm Allen Key
- 5,0mm Allen Key
- 6,0mm Allen Key
- 8,0mm Allen Key

Open end wrenches in the following sizes:

- 11mm
- 14mm
- 16mm

- 17mm
- 19mm
- 25mm
- 26mm
- Two adjustable wrenches, 6 and 8 inches in length
- 3/8-inch Flat Blade Screwdriver with a Notch in the Center of the Tip.
- 1/4-inch Flat Blade Stubby Screwdriver
- (2) Needle Nose Pliers
- Small diagonal Cutting Pliers
- Slip Joint Pliers
- Regulator Mounting Nut Tool
- O-Ring Removal Tool
- Ball Peen Hammer
- Tie Wraps: P/N
- Silicone Grease Loctite® 222
- Thread locker Loctite® 248*
- *NOTE: requires three hours cure time prior to equipment use.
- Clean rags

7.2 HELMET AND PARTS CLEANING

Cleaning of the helmet and parts should be carried out making use of mild detergent solution, parts that are showing some corrosion or spot of rust should be washed with a nylon bristle brush and the parts soaked in a solution of 50/50 vinegar and water for 30/60 minutes and then rinsed with fresh water.

In case of stubborn rust spot on the helmet shell, make use of a dishwashing "scotchbrite®" type sponge or pad to remove the stains of rust. At treatment completion, rinse with fresh water.

For the cleaning of rubber parts of the helmets as well as the hat liners, make use of a mild detergent solution followed by a freshwater rinsing and drying in open air.

In case of salt encrustation make use of a diluted solution of vinegar and water and scrub the parts with a gentle nylon brush.

To dry the various rubber and fabric components after cleaning, do not use hair drier, heat gun, since a high temperature can reduce the components serviceability.

7.3 LUBRICATION

DRASS for helmet lubrication, use and suggest users to make use of Christo Lube®.

Helmets used for air diving with an Oxygen content less than 50% may be lubricated with food grade silicone lubricant such as Molikote®111, Dow Corning 111 or equivalent.

Usage of aerosol lubricants is not suggested since their aerosol propellant may damage the plastic, especially the face port.

7.4 SEALING OF THREADS

On all threaded fittings, DRASS apply Teflon® tape for a proper sealing.

Never use liquid sealant, use only Teflon® tape to prevent damage to threads.

7.5 PARTS SEALING

7.5.1 SEALANT

Peculiarity of the DRASS helmet is the fact that to install onto the helmet shell the various components: Side Block assembly, Comms pod, Regulator Body, Optional data Left pod, the apposition of a sealant silicone to get a proper sealing is not required.

The accurate machining of the stainless-steel helmet shell and the engineered design of the various parts allow for the installation of O-Ring on each of the components ensuring, where required, the part sealing with the helmet shell in a simpler and safer way.

All parts do not require any silicone sealant for the proper sealing between them and the helmet shell.

This allow for a very quick intervention when replacing parts or carrying out maintenance.

The helmet is immediately ready for usage: no waisted time for sealant curing (24hrs, typical) and the possibility to carry out the parts replacement/maintenance wherever it is comfortable to do it, since the requirement for the ambient good ventilation due to the fumes produced during the usage of the RTV products, can be avoided.

7.5.2 THREAD LOCK

A thread lock is used on DRASS helmet to prevent loosening due to vibrations or other source that may loosen the tightened parts.

All threaded parts must be properly tightened as per torque table, and the thread lock applied when required.

Typical thread lock utilized on D-One helmet is the Loctite® 248 medium strength stick.

7.6 GENERAL INSPECTION & CLEANING

A minimum standard for the care of the helmet is established by the Company Policy or by each Diver that, accustomed with his helmet, can apply the proper care required by the type of usage done.

Diving in contaminated waters, sandblasting or welding/cutting activities, suggest for an increased maintenance, and replacement of rubber parts might be necessary.

A helmet used in fresh water requires a different maintenance approach than a helmet used in saltwater.

Regardless to the usage, a helmet should be fully cleaned and inspected yearly, and all rubber parts lubricated and/or substituted accordingly. See "*Module_M1A Annual Overhaul, Maintenance, and Inspection Checklist".*

Diving in presence of fuel oil, chemicals, may cause a more rapid degradation of the helmet rubber parts, that may swell, become soft or break.

DRASS recommends carrying out a thorough inspection after dives executed in hostile environment and/or executing welding/cutting, sandblasting activities, paying great care to the rubber parts such as the neck-dam assembly, the balanced demand regulator assembly, diaphragm, exhaust valve, water dump valves for contamination and deterioration of the rubber parts.

Make sure that no contaminants have entered the helmet interior and clean/sanitize accordingly.

7.6.1 HELMET CLEANING/SANITATION BETWEEN DIVES

On Commercial Diving site, where continuous dives are daily performed by many Divers, the sanitizing procedure should be executed between dives. Before the next Diver don the helmet a thorough clean and sanitation of the inside of the helmet must be performed. Removed the head cushion, the helmet interior should be rinsed with fresh water removing all traces of dirt left by the previous Diver; Tender/Assistants to rinse properly with a steady flow of fresh water all the inner parts of the helmet, paying attention to the comms system.

Tender/Assistants to allow a flow of fresh water to exit from the regulator exhaust valve, to rotate the regulator adjustment knob, the free-flow valve and the emergency valve knobs on the side-block, removing all dirt/salt from these areas.

Rinse properly the oral/nasal mask removing the eventual mucus, thoroughly cleaning the mask. At completion, use the proper chosen sanitizing agent as per Diving Company policy and procedure. At the end of the sanitation procedure rinse the helmet with fresh clean water. Follow Diving Company sanitizing

procedure. Clean the neck-dam ring assembly with fresh water and then apply the sanitizing procedure as done for the helmet. Replace the head cushion if/as required.

The helmet is now ready for the next Diver.

Repeat the procedure between dives to ensure that communicable diseases if any, is avoided.

7.6.2 SANITIZING AGENT

On the market there are several suitable sanitizing agents, final user / Diving Company to use the preferred one. The following sanitizing agent is just a suggestion, others may be used as per final user experience, preferences and/or Company policy.

TEGO 51

Amphoteric Disinfectant for civil use - Sanitizer

Italy

Diversey S.p.A.
Via Milano, 15D - 20093 Cologno Monzese (MI)
Tel. +39 (0)2 2580.1 - Fax +39 (0)2 2566960

International

Diversey Global Headquarters

1300 Altura Road, Suite 125
Fort Mill
Charlotte
South Carolina 29708
(803) 746-2200
Customer Service (800) 668-7171
Tech Support (800) 558-2332
Distributors (800) 842-2341

www.diversey.com

WARNING

Pay attention to the sanitizing agent chosen, manufacturer recommendation, and dilution required, since lung irritation may result, and rubber and silicone components may suffer long term degradation.

7.7 DAILY MAINTENANCE

NOTE

See *"Module_M3D Daily Maintenance"*

Beside the above described sanitationactivity (§ *7.6.2 Helmet cleaning/sanitation between dives*), for the good helmetmaintenance the following should be performed at the end of the daily diving operations.

1. Close the air supply on the diving panel that feed the diver's umbilical and close the bail-out valve, purge the two air-inlets, main supply and emergencysupply, opening the emergency valve knob and the free-flow/defogger valve knob
2. When the helmet has been depressurized, disconnect the helmet from the main umbilical hose and emergency LP hose from the bail out, close the valves and install protective caps onto the two threaded inlets on the side-block assembly and umbilical open end

WARNING

Before disconnecting a hose from the helmet, make sure all gas has been vented. Disconnecting a hose under pressure may cause the hose to whip about causing injuries to anyone nearby and can damage the thread of the fitting.

3. Take the neck-dam ring assembly and thoroughly clean it with the sanitizing

agent, remove the circumferential O-Ring. Clean and slightly lubricate the O-Ring, clean the neck-dam ring assemblyO-Ring seat and re-install the O-Ring. Let the assembly dry

4. Detach from the relevant press studs the head cushion and, as required, wash it in a solution of mild soap. Gently brush the fabric with a soft nylon brush and complete with a spry of sanitizing agent. Rinse in fresh water, squeeze out the excess of water and let it dry. Remove the inside foam only if strictly necessary, it will dry given enough time without removing the cushion foam
5. Remove the nose block by loosening the knurled knob and removing the packing nut. Slip off the nose block, remove the microphone and remove the oral/nasal mask. Clean the oral/nasal mask and nose block properly, at the end, apply the sanitizing agent and at completion rinse with fresh water and let them dry. Make sure that the oral/nasal mask valve and relevant seat are clean, no dirt or impurities are present, and the oral/nasal mask valve is installed correctly, see § *"7.8.6 Oral/Nasal Mask"*
6. Remove the communication system from the helmet, remove the covers from the earphones and let them dry. Clean and sanitize the microphone and at completion, rinse it and let it dry
7. Clean the outer part of the helmet shell with a mild soapy solution and a nylon brush and fresh water. Make sure to turn the knobs of the defogger/free-flow valve and emergency valve to prevent salt cumulation from these areas. With the fresh water, clean accurately the pull-pins areas. At completion, wipe the inside of the helmet with a lint-free clean rag. When rinsing the Balanced Demand Regulator, avoid pushing the purge button in order to avoid foreign matter, if any, into the inlet valve and relevant seat
8. Remove the Balanced Demand Regulator frontal 4 screws and remove the regulator cover and diaphragm and clean all inner components, check and clean the dewatering valve. At completion, sanitize the interior as per Diving Company sanitizing procedure. During this operation, do not depress the purge lever in order to avoid water entering the inlet valve. Carry out a visual inspection of the inner part of the regulator, check and clean the diaphragm, the seating area in the regulator and the cover assembly retainer. Once dried properly, reinstall all parts and tighten the frontal screws properly. For torque values see § "*11 Appendix 1 - Torque Tables*"
9. At operations completion, assured that the sanitizing solution has reached all parts of the exhaust areas and regulator cavity, wipe the helmet interior with the solution and then rinse all surfaces with fresh water
10. Totally unscrew the Balanced Demand Regulator adjustment knob all the wayout
11. Check the neck-dam neoprene for damage and replace accordingly
12. Re-install the oral/nasal mask and lubricate and re-install the nose block assembly tightening the packing nut and knurled knob

7.8 MONTHLY MAINTENANCE

On a long Commercial Diving Project or when the helmet is used for more than 20 diving days per month or, every 2 months if the helmet is used for 10 diving days per month or less, the "Monthly Maintenance" should be carried out.

The monthly maintenance should be also performed anytime the helmet service is under question and/or as suggested by the indication gathered during the daily maintenance routine.

NOTE

See "*Module_M2M Monthly Maintenance*"

7.8.1 NECK-DAM RING ASSEMBLY

Carry out a thorough inspection of the neoprene neck-dam looking for holes, punctures that may develop into larger holes.

Make sure about the positioning of the neck-dam, if it has pulled away from the retaining rings assembly.

Check the screw of the neck dam retaining ring for tightness, see § "*11 Appendix 1 - Torque Tables*"

Check the circumferential O-Ring of the neck-dam ring assembly looking for tears, cracks or nicks, ensure it is in good condition, and replace accordingly as required.

7.8.2 HELMET RING AND LOCKING COLLAR ASSEMBLY

Inspect the two pull-pins for smoothness of movement and that are properly engaged by the locking collar when in the close position.

⚠ CAUTION

Do not dive if the pull-pins do not work as expected. Carry out an attentive and thorough Pull Pin maintenance.

If Pull Pins sustained a major damage and cannot be properly serviced or, if even after the maintenance their full function is not precisely restored, return your helmet to DRASS or to a DRASS authorized dealer for proper service/substitution.

These are a sensitive part of the helmet and if they do not work properly may cause a dangerous situation that may lead to helmet dislodgement, flooding, and drowning can result.

7.8.3 HEAD CUSHION

Inspect the foam of the head cushion. If wear, crumbling of foam is noted, replace with new one.

7.8.4 COMMUNICATION SYSTEM

Carefully inspect the communications system, make sure that earphones and microphone, wires and lugs are in good condition, remove the rubber protection from the earphones, no visible oxidation should be present.

Connect the system to a diving radio andcarry out a comms check to ascertain working condition of the system.

With the earphones/microphone system out of the helmet, an electric moister remover can be used for the lubrication of the moving coils of the microphone and earphones.

Allow drying and gently blow away the eventual residual before reinstallation. For detailed maintenance see § "*9.13.2 Earphone Inspection*"

Replace as required (part number: *143-030*)

7.8.5 NOSE BLOCK ASSEMBLY REMOVAL

For detailed instructions, refer to § "*9.4.2 Nose Block Device Removal*"

Make sure to have at disposal the following tools:

- 11mm open end wrench
- Soft jaw pliers or Slip joint pliers and a soft rag or cloth

1. Remove the knurled knob from the nose pad shaft
2. Loose and remove the packing nut on the helmet outside, pay attention to the O-Rings

3. Extract and lubricate the shaft of the nose block and then re-insert
4. Clean and lubricate the two O-Rings of the packing nut
5. Re-position the O-Rings and the nut
6. Tighten the nut of the packing to the point the shaft of the nose-pad can still slide but need a firm push or pull
7. If it is too tight or too loose, loosen or tighten the packing-nut accordingly
8. Reinstall the knurled knob

7.8.6 ORAL / NASAL MASK

The Oral/Nasal mask can be easily removed and reinstalled:

1. Remove the nose block as per above § "*7.8.5 Nose Block Assembly Removal*"
2. Remove the microphone
3. Detach and extract the oral/nasal mask by simply pulling it away from the mounting nut of the regulator mount
4. Inspect the oral/nasal mask looking for damages, torn or excessive wear
5. Replace parts as required. Clean and sanitize the oral/nasal mask
6. Inspect the oral/nasal valve. If in good condition, clean, sanitize and re-use, if not, replace
7. Make sure to reinstall it in the proper way
8. Re-install the oral/nasal mask and valve assembly in position.

   Engage the nut of the regulator mount, making sure the mask has snapped all around the mounting nut.

   Verify the valve is exactly installed to allow the flow in the correct way (see below picture for correctness of installation)
9. Re-install the microphone
10. Re-install the nose block system

7.9 DEMAND REGULATOR & EXHAUST SYSTEM POST DIVE CLEANING & SANITATION

To be executed at diving operation completion or when the helmet should be used by another user.

Tools required:

- 6mm Flat blade attachment on torque screwdriver
- Small Phillips screwdriver
- Clean wiping rag
- Nylon toothbrush
- Spray bottle with detergent solution
- Spray bottle with antiseptic cleaner

7.9.1 DISASSEMBLY – POST DIVE

1. Unscrew the four frontal retaining screws of the regulator clamp cover. Remove the regulator cover and the diaphragm
2. Remove the nose block assembly, remove the knurled knob, loose the packing nut and extract the nose pad shaft
3. Remove the oral/nasal mask and the microphone
4. With the small Philips screwdriver, remove the retaining system of the BAFFO™ System to the helmet body, then pull the BAFFO™ away from the exhaust body. Remove the valve seats and the mushroom valves
5. Using the cleaning solution clean all inner parts of the regulator, making sure to clean well all surfaces exposed to the diver's exhalation.
6. Use a soft brush to properly clean all parts ensuring the cleaning solution reaches all

parts. At cleaning completion rinse with fresh water

7. At cleaning conclusion, carefully inspect all parts, looking for damages and/or deterioration and, in case, replace the damaged parts

7.9.2 SANITATION

Before starting with the reassembly of the helmet, make sure that all cleaned parts are sanitized. The helmet must be sanitized daily if used by only one diver and must be sanitized before each dive when is used by multiple divers.

Always follow the sanitizing agent manufacturer instructions for dilution and application time.

At sanitation completion, rinse thoroughly with fresh water.

7.9.3 POST DIVE REASSEMBLY

Completed the sanitation, repeat the reverse of the disassembly.

1. Reinstall the mushroom valves and valve seat and re assemble the BAFFO™ system
2. Reposition the oral-nasal mask installing the microphone back in position
3. Insert the shaft of the nose pad and lightly tighten the packing nut. Reinstall the knurled knob and check the shaft can slide smoothly back and forth
4. Position the regulator diaphragm and cover, position the locking clamp and screw in the screws with a torque screwdriver at proper torque value, see § "*11 Appendix 1 - Torque Tables*"

8 MAINTENANCE AND REPAIR OF THE BREATHING SYSTEM

The breathing system is composed by the following components:

- One-way valve
- Side block
- Emergency valve
- Bent tube/Banjo assembly
- BDR - Balanced Demand Regulator
- Oral-nasal mask

All Inspections and Overhauls can be executed following the instructions of this chapter and relevant checklists. Checklists documents should be followed and filled in properly, detailing the components substituted and/or repaired and the check lists updated regularly.

DRASS breathing system of the helmet is a reliable and simple system that can ensure long lasting operations. It is important that each diver does not underestimate the need for a good maintenance counting on the fact that the DRASS helmet, due to their sturdy construction, can work with poor or no maintenance.

8.1 TORQUE VALUES

Please refer to § "*11 Appendix 1 - Torque Tables*" for correct torque value.

CAUTION

Never overtighten any parts, it may lead to improper operations. Make sure to always tighten the disassembled parts and verify their tightening as per Torque Table. Under tightening may lead to lose parts and/or improper operation

8.2 ONE WAY VALVE

Gas arriving from the umbilical is conveyed to the side-block by means of a one-way valve.

The One-Way Valve is an important component that, in the unlucky event of umbilical fitting breakage either close to the helmet or at surface, or an accidental cut or burst along the umbilical length, prevents the abrupt gas loss from the inside of the helmet and the consequent helmet depressurization.

Due to pressure gradient differential, between the pressure inside the helmet, always higher, and the point of breakage always lower that, if at surface is at its lowest pressure value, the inside of the helmet at higher pressure will try to equalize with the lower pressure value at the point of breakage.

With no OWV installed, depending on severity of failure, the gas can be abruptly vented and, sucked from the helmet inside, can cause a suction effect to the Diver's eyes, ears and lungs, squeezing the Diver's head, leading to serious injury if not to death.

The installation of the One-Way Valve is of paramount importance and prevents the above ensuring a safe way of Diving.

ATTENTION

One-way valve must be rebuilt or replaced if found faulty.

NEVER DIVE WITH A FAULTY ONE-WAY VALVE

Contact DRASS or a DRASS authorized dealer for the one-way valve rebuild ki.t

8.2.1 ONE WAY VALVE DISASSEMBLY

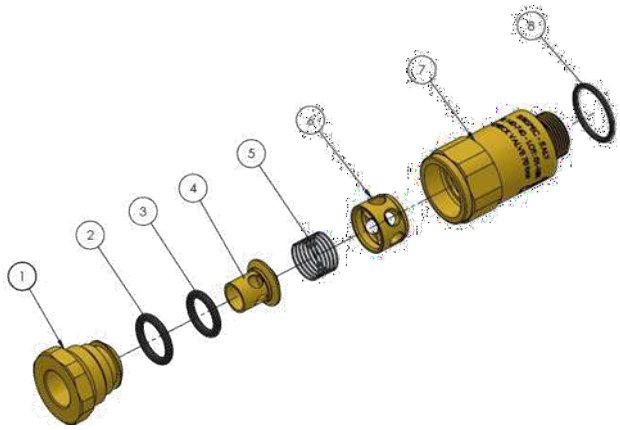
Maintenance of the OWV is simple and can ensure the proper functionality.

Disassembly of the One-Way Valve require the following tools:

- Soft jaw vise
- 1 x 26mm open end wrench
- 1 x 26mm open end attachment on Torque Wrench
- If no soft jaw vise is available use a backup 26mm open end wrench

To disassemble and inspect the one-way valve assembly:

1. Disconnect the umbilical from the OWV umbilical adapter, once removed, plug the umbilical open end with proper plug to prevent entering of dirt/particles
2. By means of the open-end 26mm wrench remove the one-way valve assembly from the side block
3. During the OWV removal, pay attention not to lose the sealing O-Ring (8) positioned between the OWV and the Side Block body



4. Removed the valve assembly, by means of two 26mm wrenches or holding the hex part of the body assembly in a soft jaw vise, remove the valve seat with a 26mm wrench.

   Removed the seat, slide out all other inner components

CAUTION

Do not use pliers on the valve body; use two wrenches or hold the hex part of the body in a soft jaw vise and remove the valve seat with a wrench.

All O-Rings to be replaced during normal/annual maintenance.

5. With all inner parts extracted, check the inside of the valve body, looking for dirt or foreign matter. Clean parts accurately
6. Carry out a careful inspection of the extracted components: the seat O-Ring (2), poppet O-Ring (3) and poppet; check the components for wear and replace as required. Lubricate with appropriate lubricant.

CAUTION

Spring Seat (6) is shown only for information, it is factory installed.

Do not attempt its removal since thread may be damaged and warranty voided.

Wipe the poppet leaving a small amount of silicone lubricant in order to avoid thesticking of material that may compromise the functioning

7. Replace the spring (5), do not attempt to modify the spring tension.

CAUTION

ALWAYS REPLACE THE SPRING

A repair kit is available, contact DRASS for relevant parts.

8.2.2 ONE WAY VALVE REASSEMBLY

1. Carefully check and make sure the two O-Rings (2 & 3) are re-suable. If O-Ring notre-usable or if it is the annual overhaul install new O-Rings.
2. Slide in the new O-Ring (3) on the poppet
3. Place the new spring (5) in the valve body, followed by the poppet
4. Position the new O-Ring (2) on the seat, then tight in the seat on the valve body
5. Following the required torque value of 148 Nm, tight the seat by a torque wrench holding the valve body with a soft jaw vise or 26mm wrench
6. Install a new OWV body O-Ring
7. Reinstall the OWV on the Side Block Body, tight by a 26mm attachment to the

required torque value of 35/40Nm. See *§ "11 Appendix 1 - Torque Tables"*

8. If removed, reinstall the umbilical nipple/adapter wrapping it with Teflon® before reinstallation

⚠ CAUTION

Attention when using Teflon® not to cover the end of the nipple/adapter with it. Loose pieces of Teflon® tape may interfere with the one-way valve functioning and this may lead to blockage of diver's air causing injury

8.3 SIDE BLOCK ASSEMBLY

8.3.1 GENERAL

Main gas and emergency gas, both flow in the side-block same circuit and the side-block is provided by three outlets:

I. One is always open, dedicated to the supply of gas to the regulator

II. One is dedicated to the free-flow valve used to defog the lens of the helmet, empty a flooded helmet and provide a large volume of breathing gas in case of emergency or to support a sudden demand of breathing gas from diver

III. One is plugged and dedicated to receiving a hose for the inflation of a dry-suit or a buoyancy compensator

⚠ CAUTION

On the Side block upper side, there are other2 ports, one a 3/8" and one 1/2" that are notin use. They are factory used for testing andfor future usage and are not intended to be used by the final users.

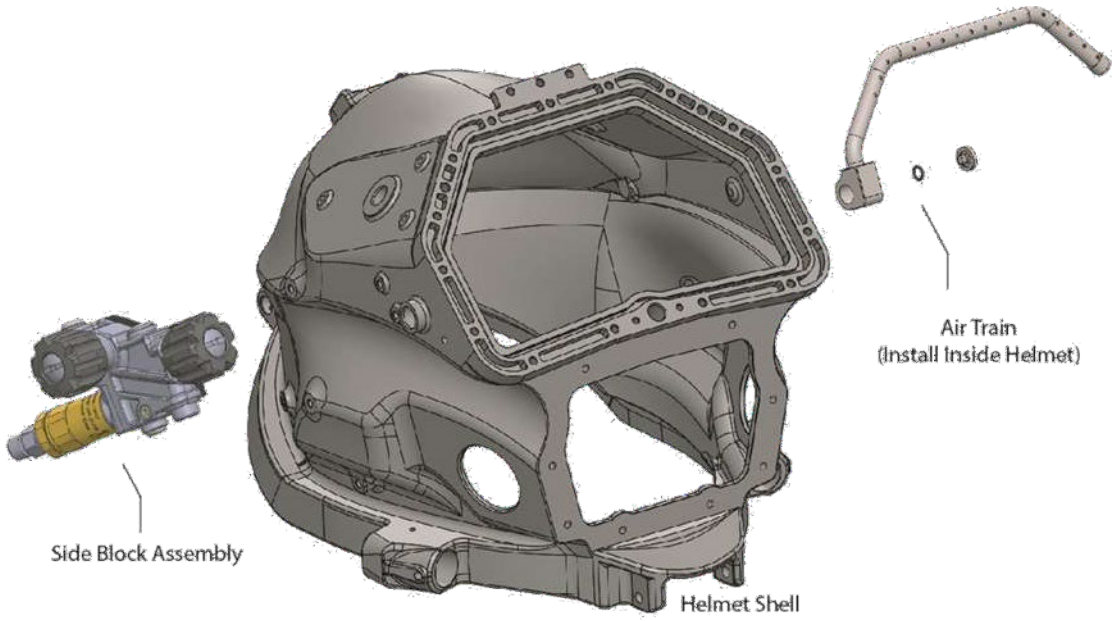
8.3.2 OVERHAUL

Overhaul of the side block should be executed at least yearly, and/or when the components show signs of extensive usage or wear, damage or are not working smoothly.

As a minimum, during the overhaul, replace all O-Rings; a maintenance kit is available from DRASS.

All parts can be inspected without removal, provided that all internal passages do not show contamination or excessive corrosion. In this case the removal for a thorough maintenance is required.

Normal maintenance/overhaul of the side-block does not require its removal from the helmet; however, the Side-block removal can be easily done thanks to its engineering when inspection suggests doing so.



8.3.3 SIDE BLOCK PREPARATION FOR REMOVAL

Removal of the side block require the removal of the following parts that are directly connected with it:

- Bent tube
- Air Train/defogger

The following tools are required:

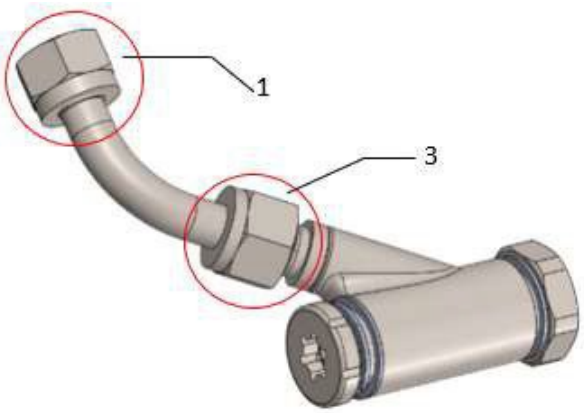
- Flat Blade short screwdriver with a blade of 15mm x 3mm thickness
- 3mm Allen key
- 19mm wrench, open end for the side block side
- 25mm wrench, open end for the BDR banjo

When ready with all tools, spare parts and lubricant, start the disassembling of the side block as per following steps.

8.3.4 BENT TUBE REMOVAL

Refer to § *"8.4 Bent Tube Assembly"* section for the detailed removal procedure. Generally speaking, follow the next steps:

1 With the 25mm open end wrench, loose and remove the connection of the bent tube from the BDR, "banjo" connector (3)



2 With the 19mm open end wrench, disconnect and detach the bent tube from the side-block (1). Attention not to lose the Teflon® O-Ring

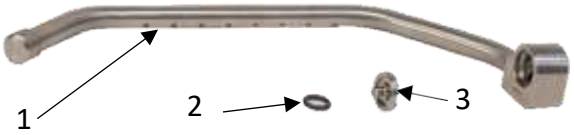
3 Remove the bent tube

8.3.5 AIR TRAIN/DEFOGGER REMOVAL

The air-train (1) deputed to the helmet defogging is held in position by a screw (3)

that can be reached from the inside of the helmet.

1. Unscrew and remove the screw (3), attention to the O-Ring (2) that is part of the screw assembly and should remain inserted in the relevant screw O-Ring seat



2. Slightly pull out the air-train assembly (1) and remove it from the helmet
3. Inspect the air train assembly for dirt or other loosen part inside it that may obstruct the holes in the tube and prevent the correct flow of air impairing its function.

8.3.6 SIDE BLOCK REMOVAL

Removed the Bent Tube and the Air Train/Defogger, proceed with the following steps:

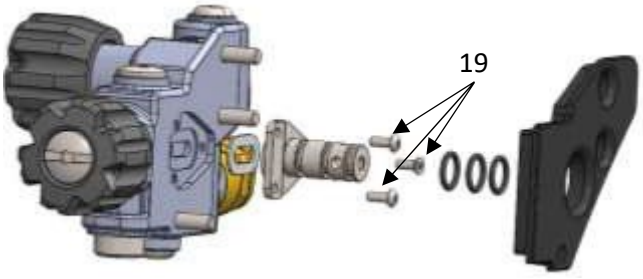
1 From the helmet outside, unscrew the three Allen screws onto the side-block, loosening the side-block assembly

2 Exerting a light pull, detach and extract the side-block assembly from the helmet

3 Remove the plastic Side block Isolator plate from the helmet

8.3.7 SIDE BLOCK MAINTENANCE

1 With the side-block assembly detached, unscrew and remove the three Allen screws holding the side block steady flow adapter (19), inspect and clean the gasket seat, replace the gasket with a new one, as required. Apply a light film of silicone grease (Christo Lube®) Remove the three O-Rings from the side-block steady flow adapter and replace with new ones, as required.



2 Apply a light film of silicone grease (Christo Lube®) and slide in the new O-Rings

Thanks to its design, the side-block assembly can be overhauled/rebuild anytime in a simple way.

If reckoned convenient and practical, once detached the side-block from the helmet, overhauling of the defogger valve, emergency valve and one-way valve can also be carried out as per relevant sections of this chapter

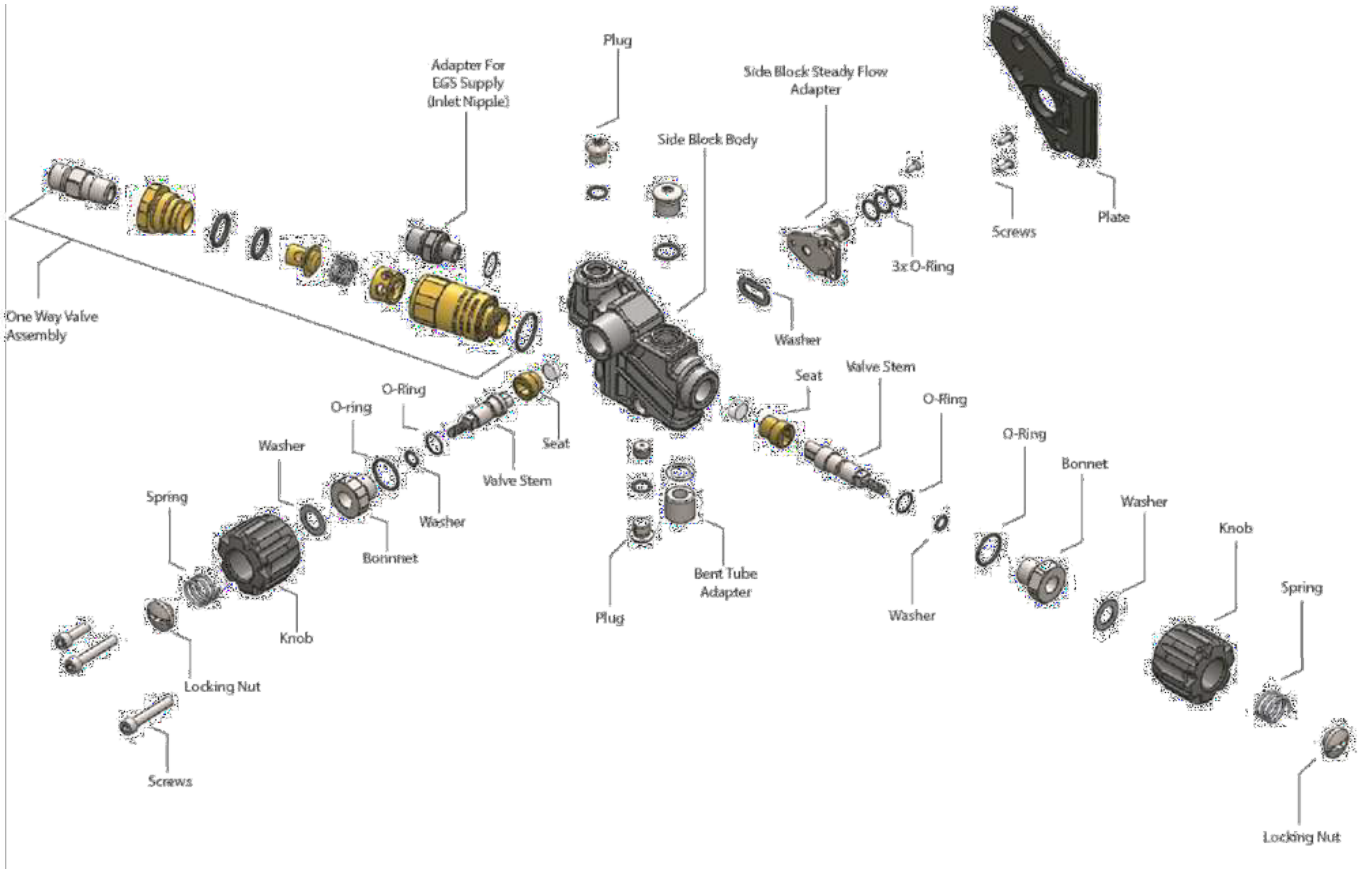
For the Side-Block maintenance, a dedicate kit is available.

8.3.8 SIDE BLOCK REINSTALLATION

Once completed the removal of the side block assembly reinstall it as per following steps.

1. Reposition the steady flow adapter onto its seat and screw in the three small Allen-screws by means of a torque screwdriver applying the torque value required, see § "*11 Appendix 1 - Torque Tables*"
2. Clean and make sure the rim of the side-block hole on the helmet is cleaned and free from dirt, particles that may scratch the side-block through pipe O-Rings during re-insertion
3. Clean the helmet shell and re-position the Side block Isolator
4. Re-insert the side-block assembly onto the helmet. Pay attention not to pinch the O-Rings during the repositioning
5. Insert the three Allen-screws and firmly secure the side-block assembly onto the helmet. Use a torque screwdriver applying the torque value required, see § "*11 Appendix 1 - Torque Tables*"

Re-position the defogger air trainer inside the helmet, screw in the retaining -screw



8.3.9 DEFOGGER / FREEFLOW VALVE

8.3.9.1 DISASSEMBLY OF THE DEFOGGER / FREEFLOW VALVE

For the defogger valve disassembling, make sure to have at disposal the following tools:

- Torque wrench 20mm
- Flat blade screwdriver
- Soft jaw vise
- Teflon® tape
- Lubricant

Follow the next steps for the defogger/free flow valve disassembly:

1. Turn the knob of the valve out in fully open position
2. Remove the locknut and the spring
3. Remove the knob, paying attention to the washer between the knob and the bonnet
4. With the 20mm open end wrench, unscrew the bonnet and the valve stem, the O-Ring and the washer
5. In case the stem remains inside the side-block body, remove it once the bonnet is removed
6. By means of a screwdriver or using the stem unscrew the seat assembly

8.3.9.2 INSPECTION AND CLEANING

1. With a soapy solution clean all parts
2. Clean all metal parts in a 50/50 solution of water and vinegar, rinse with fresh water at completion
3. Inspect and replace as required the Teflon® seat
4. Inspect and replace as required the Teflon® washer and O-Ring
5. Apply a light film of lubricant on all parts avoiding lubricating the valve Teflon® seat since this may attract dust and debris

8.3.9.3 DEFOGGER/FREEFLOW VALVE REASSEMBLY

Completed the maintenance of the defogger/free-flow valve it can be reinstalled.

Tool required:

- Open end wrench 20mm
- Flat blade screwdriver

Make sure to have new washers and O-Rings.

1. Position the new Teflon® washer and O-Ring on the stem
2. By means of the stem, screw all the way in the new valve seat until it is slightly seated. Leave the stem in place
3. Lubricate the new O-Ring and install it on the bonnet
4. Install the bonnet onto the stem making sure washer and O-Ring are in place
5. Secure the bonnet with a torque wrench following the torque value as per Torque table
6. Install the new Teflon® washer and the knob on the stem. Rotate the stem checking for a smooth functioning and that there are no blind stops that may indicate a bent stem. In case of bent stem, it must be replaced

7. Reinstall the spring and the locknut

8.3.10 EMERGENCY GAS SYSTEM VALVE ASSEMBLY

The emergency gas system valve assembly design is similar to the design of the Defogger/free flow valve, the two knobs are interchangeable, but they differ for the inner components. Disassembly and reassembly is roughly identical, and the required tools are the same:

- Torque wrench 20mm
- Flat blade screwdriver
- Soft jaw vise
- Teflon® tape
- Lubricant

1. Turn the knob of the valve out in fully open position
2. Remove the locknut and the spring
3. Remove the knob, paying attention to the washer between the knob and the bonnet
4. With the 20mm open end wrench, unscrew the bonnet and the valve stem, the O-Ring and the washer
5. In case the stem remains inside the side-block body, remove it once the bonnet is removed
6. By means of a screwdriver or using the stem unscrew the seat assembly
7. Also check the nipple/adapter of the emergency gas system valve, inspect and lubricate. Replace as required

8.3.11 INSPECTION AND CLEANING

1. With a soapy solution clean all parts
2. Clean all metal parts in a 50/50 solution of water and vinegar, rinse with fresh water at completion
3. Inspect and replace as required the Teflon® seat
4. Inspect and replace as required the Teflon® washer and O-Ring
5. Apply a light film of lubricant on all parts, Christo Lube® avoiding lubricating the valve Teflon® seat since this may attract dust and debris

8.3.12 EMERGENCY VALVE REASSEMBLY

Completed the maintenance of the emergency valve it can be reinstalled.

Tool required:

- Open end wrench 20mm
- Flat blade screwdriver

Make sure to have new washers and O-Rings.

1. Position the new Teflon® washer and O-Ring on the stem
2. By means of the stem, screw all the way in the new valve seat until it is slightly seated. Leave the stem in place
3. Lubricate the new O-Ring and install it on the bonnet
4. Install the bonnet onto the stem making sure washer and O-Ring are in place

5. Secure the bonnet with a torque wrench following the torque value as per Torque table
6. Install the new Teflon® washer and the knob on the stem.
7. Rotate the stem checking for a smooth functioning and that there are no blind stops that may indicate a bent stem. In case of bent stem, it must be replaced
8. Reinstall the spring and the locknut
9. At emergency valve reinstallation completion, carry out a test. Connect the supply whip to the emergency valve
10. Check the defogger valve knob is open with the emergency valve closed
11. Pressurize the emergency valve to 10bar. Stabilize system and then shut the supply to the emergency valve.
12. Take note of the final pressure after system stabilization and time
13. Using a soapy solution, check for leakage the whole emergency valve system fornot less than 5 minutes. Make sure there is no gas flow, or pressure drop.
14. If the emergency valve is operating properly, there should not be signs of external leakage

ATTENTION

A side block leaking emergency valve is extremely dangerous since the bail out gas reserve may be utilized in the main circuit discharging the bottle. Divers to always check for the underwater bailout pressure gauge for any discrepancy/anomaly that, in case of emergency, may lead to death due to lack of emergency breathing gas reserve.

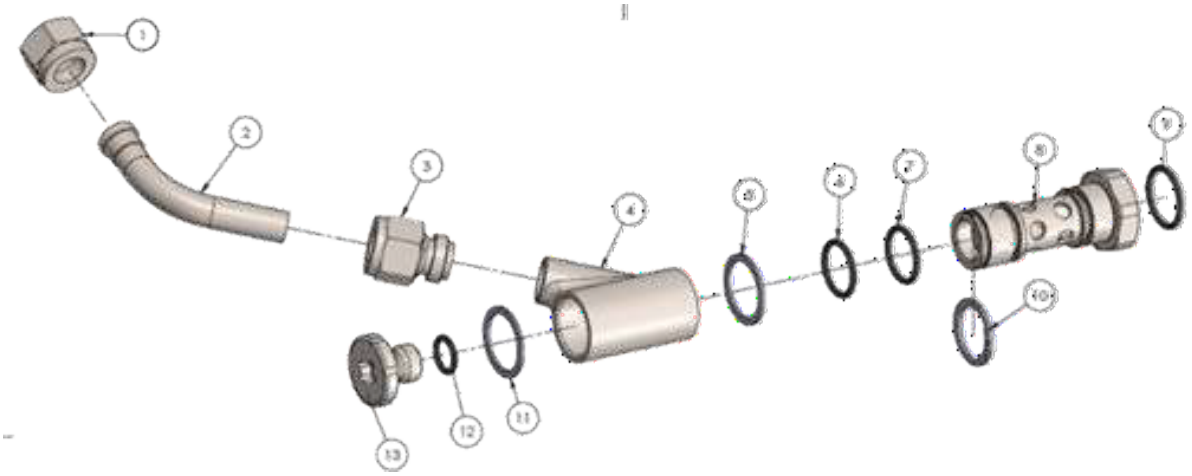
8.4 BENT TUBE ASSEMBLY

8.4.1 GENERAL

The bent tube is the system that routes the gas flow from the side-block to the BDR.

Maintenance to the bent tube is done disconnecting the tube from the side-block and the BDR, Teflon® O-Ring should be replaced during the normal maintenance or whenever these components are deemed unserviceable.

Always carry out an on-field inspection looking for wear or damage and replace accordingly.



8.4.2 BENT TUBE REMOVAL

Required tools:

- 1 x 18mm open end wrench
- 1 x 19mm open end wrench

1 Start the bent tube removal at the side-block end. With the 19mm wrench, loosen the nut (1) holding the bent tube at the side-block. The retaining nut once unthreaded, can freely slide along the bent tube

2 Loosen the lower side of the bent tube, at the banjo connection by means of the 19mm wrench, in doing so hold with the 18mm wrench the fitting

3 Unscrew until the nut (3) is free from the Banjo assembly and the unscrewed nut is free to slide back

4 Pull out gently the bent tube (2) from the BDR assembly, make sure not to lose the

5 Teflon® flat gasket at the side block connection

8.4.3 BENT TUBE ASSEMBLY INSPECTION

1. Clean the bent tube checking the Teflon® flat gasket whenever the tube is removed
2. Check if the bent tube shows signs of scratches, dents or is compressed for more than 3mm. If the helmet has been used for burning jobs control if there are visible signs of erosion, or corrosion. Replace the bent tube as required bearing in mind that this is an important and critical component.

8.4.4 BENT TUBE REINSTALLATION

Required tools:

- 1 x 18mm open end wrench
- 1 x 19mm open end wrench

Make sure to have at ready a new Teflon® flat gasket, as required.

1. Properly clean the bent tube side that is connected to the Banjo connector
2. Connect the end of the bent tube with the banjo connector
3. Align and insert the upper side of the bent tube with the side-block adapter and make sure the new Teflon® flat gasket is in position
4. Start to tighten the bent tube assembly at the BDR banjo side by hand without forcing the thread
5. Do the same at the side-block end

Once ready on both bent tube sides, engage the retaining nuts with the proper wrench as per § *"11 Appendix 1 - Torque Tables"* for correct torque value, tighten both bent tube ends

8.5 BALANCED DEMAND REGULATOR

8.5.1 GENERAL REGULATOR INFORMATION

The Balanced Demand Regulator is a high-performance regulator designed and developed by DRASS R&D and installed on the DRASS diving helmet. It is all made of stainless steel 316L and CNC machined and offers far greater breathing performance when compared to non-balanced or similar products.

8.5.2 BDR TEST FOR OPTIMUM PERFORMANCE

For the good BDR performance, a daily check should be carried out before the commencement of the diving activities.

The BDR should be checked in accordance with DRASS module *"M3D_Daily Maintenance"*.

The BDR should be checked in a complete set configuration and supplied with the proper breathing medium pressure of 9,5bar ±0,5bar. The 9,5bar ±0,5bar is the standard supply pressure for the proper functioning of the BDR.

⚠ CAUTION

On the regulator body, there are two additional 3/8" ports, that are not intended for the final user utilization. They are factory used for the regulator setting.

In the following the steps how to check that the BDR is working properly offering the maximum performance:

1 Rotate the regulator sensitivity knob fullyin until a click can be heard. It means thatthe adjustment knob has reached its maximum bottom position and in order not to damage the system, it stops. The click indicates that the adjustment knob has reached its maximum, pay attention to hear this indicating click

2 Make sure that the gas medium supply pressure is set to 9,5bar ±0,5bar

3 Open the gas medium supply valve to the helmet

4 Grab the adjustment knob and rotate it slowly out for three complete turn

5 Press-in gently the BDR purge cover few times, ensuring that the flow of gas is present and stable

6 When gently pushing in the regulator cover, there should be a 3mm/6mm free travel before the start of the gas-flow. If the regulator cover is fully depressed, a loud and strong surge of gas must be heard

NOTE

NOTE: In doing this maneuvering without the diver donning the helmet, hence, with no backpressure applied to the oral/nasal mask, the regulator may free flow. In this case, simply cover the regulator outlet at the oral/nasal mask inside the helmet to stop the free flow.

7 If when pushing on the regulator cover there is no free play or the stroke exerted is more than 6mm, the regulator needs to be internally adjusted

8.5.3 BDR ADJUSTMENT

BDR internal adjustment required tools:

- Air Supply, 9,5bar ±0,5bar through Standard Scuba Second Stage Hose
- Flat Blade Screwdriver
- 17mm Open-End Attachment on Torque Wrench
- 22mm Open-End Attachment on Torque Wrench
- 22mm Open-End Wrench
- Dual Drive Inline Adjusting Tool & Adapter

1. If the helmet has been already connected with the Diver's umbilical, close the supply to the umbilical, purge the umbilical opening the free flow valve on the helmet and purge the helmet BDR cover making sure the regulator is not supplied and disconnect the umbilical
2. With the umbilical disconnected from the helmet, connect a gas supply to the
3. helmet emergency valve of the side-block with a pressure of 9,5bar ±0,5bar
4. Unscrew the plug located on the side of the banjo fitting of the BDR
5. Screw in the Dual Drive Inline Adjusting Tool with the adapter
6. Open the L.P. gas supply at the side-block opening the emergency valve
7. Read the pressure gauge of the Dual Drive Inline Adjusting Tool. The reading must be 9,5bar ±0,5bar. If the pressure read is out of range, adjust the supply pressure to the requested value
8. Turn and keep the BDR adjustment knob three full turns out/counterclockwise and check, depressing the regulator purge cover, that the free play of the lever is

between the 3mm/6mm range with no gas flowing. Push the regulator purge cover several times and ensure that the free play of the lever does not change

9. If adjustment of the free play is required, keeping the supply pressure at the pre-set value of 9,5bar ±0,5bar, simply rotate the Dual Drive Inline Adjusting Tool knurled knob as required to get an as close as possible lever free play of 3mm/6mm
10. Once set, check about leakage. To make sure not even a minimal leakage ispresent after the setting, close the gas supply and observe the pressure gauge of the Dual Drive Inline Adjusting Tool for variation
11. If a steady pressure is observed with no drop, close the gas supply, purge the regulator and install the plug onto the bajo fitting
12. If nevertheless the regulator appears suffering a leakage, the regulator needs to be disassembled to check the condition of the lever, the O-Rings and the valve seat

8.5.4 BDR - BIAS ADJUSTMENT

The regulator on field maintenance can be done with the regulator installed onto the helmet, whilst for the scheduled overhauls, the regulators must be removed from the helmet and disassembled.

BDR Bias Adjustment required tools:

- 6mm Flat Blade Screwdriver on Torque Wrench
- 8mm Allen Key
- 24mm Open End Attachment on Torque Wrench
- 19mm wrench
- 19mm torque wrench
- Balance Spacer, with Two O-Rings, Installed
- Wooden Dowel Rod

1. Unscrew the bent tube from the side-block
2. Unscrew the bent tube from the banjo fitting
3. Remove the bent tube
4. Unscrew the 4 screws of the regulator cover. The four screws once loosen shall remain in position due to their design

5. Remove the cover to expose the inner parts
6. Remove the diaphragm and inspect it carefully for any punctures, tears. If damages are detected, replace accordingly. Check the regulator interior for foreign matters, clean as required

7. Remove the Banjo plug, remove the Seeger, remove the Teflon® flat gasket. Slide out the banjo fitting, attention not to lose the Teflon® flat gasket

CAUTION

NOTE: For the removal of the Banjo plug always use two wrenches: one to block the Banjo Adapter and one to unscrew the Banjo plug

8. With the 19mm wrench, unscrew and remove the Banjo adapter. Attention not to lose the O-Ring

9. By means of the flat blade screwdriver carefully loose and slide the lock clip from the regulator main tube

10. With the 24mm open end wrench lose the packing nut for 1 turn then, while fully depressing the lever arm, grab the regulator adjustment knob and pulling straight, extract all the regulator valve mechanism components in a single assembly

11. Now, separate the adjustment knob from the main tube, paying attention to the transfer pin that may fall from the shaft's end

12. With the adjustment knob separatedfrom the main tube, check for the adjustment knob packing-nut O-Ring integrity

13. Check O-Ring for wear and replace accordingly. If found in good condition, put it aside for cleaning and lubrication

14. Remove the lever arm clip

15. Gently pull one leg and then the other of the lever and remove it

16. Slide the balance spacer, spring, and inlet valve assembly out from the main tube

17. Unscrew the adjustment nipple, turning it out from the main tube. By means of the wooden dowel rod, push it free. Check the inlet nipple O-Ring for damage, since even small cuts or excessive wear may cause leakage

18. Check all parts for damage or wear and replace accordingly

19. Clean all parts and replace if damage or excessive wear is detected. For normal overhaul, replace all soft goods. O-Rings and all moving parts should be lubricated applying a light film coating of Christo Lube®. Krytox®, Fluorolube®, Tribolube® are also acceptable. The main adjustment knob assembly does not require disassembling

20. If not already done, reassemble the O-Ring onto the adjustment nipple, making sure that the O-Ring has been properly lubricated with Christo Lube® or other lubricants as per previous point

21. Reinstall the two O-Rings onto the balance spacer, paying attention not to overlubricate them

22. Open the lever arms just enough to re-insert it onto the main tube slots

23. Carefully look for the 4 “wings” of theinlet valve assembly. They are towardsone end and opposite there is a bore thatcreates the balanced chamber

The valve assembly must be inserted in the main tube with the wings that have an additional wall for the lever arm towards the bottom of the regulator tube

24. Using the balance spacer with the two O-Rings installed, insert the first O-Ring into the open end of the inlet valve stainless steel tube and stop at the secondO-Ring. Align and insert the inlet valveinside the main tube and, if properly done, the lever should lift. If it does not happen, it means that the valve has been inserted incorrectly

25. Holding the inlet valve in position, compress lightly the arms of the lever and slowly extract the balance spacer. The inlet valve, lightly squeezed by the pressure applied to the lever arms, should remain in position. In case the valve comes out, repeat as required until the valve remains in place

26. Now install the balance spacer c/w the relevant spring and O-Rings into the main tube. Check the balance spacer is properly positioned inside the main tube by pushing on the end of the spacer and slightly rotating it with your fingertip: it should move inward, engaging the hole in the inlet valve

27. Apply a light coating of grease to the transfer pin and re-install it at the end of the balance spacer. Screw in the adjustment knob assembly onto the end of the main tube just until it stops. Screw in the assembly by hand and then turn it back for three complete turns

28. Reinstall the clip onto the main tube, ensuring that the pin on the clip is correctly engaged with the hole on the main tube

29. Check the clip is correctly positioned with the square opening on the main tube exposed

30. Apply a light coat of grease to the O-Ring and insert the adjustment nipple inside the main tube. Using a flat blade screwdriver, slowly screw the nipple into the tube. As soon as a movement on the lever is seen, stop screwing in the nipple

31. Check the main tube O-Ring has been installed and slightly lubricated, depress the lever down and carefully insert the main tube assembly inside the regulator. Check the threaded side of the assembly is fully outside of the regulator body. Check the lever arms are correctly oriented, with relevance to the regulator topside

32. Lubricate the Banjo adapter O-Ring with a light coat of silicone grease, screw in the adapter nut and the O-Ring by hand. At completion, check again for lever arms

orientation and, applying the correct torque, with a N. 24 Open End Attachment on Torque Wrench tight the adapter nut

33. Tighten the packing nut at the knob adjustment side at specified torque, asper § "*11 Appendix 1 - Torque Tables*". Turn in the knob until a click can be heard and then turn back for three turns: this brings the system to its typical optimum adjustment
34. Check the regulator setting supplying the recommended air pressure of 9,5bar ±0,5bar, checking the lever arms free play when pressurized. If N. 26 above has been properly followed, the regulator should be close to adjusted if not already adjusted
35. Re-install the lock clip onto the main tube, re-install the diaphragm and the cover assembly. Tighten the cover screws at specified torque value as per § "*11 Appendix 1 - Torque Tables*"
36. Check regulator functions as per § "8.5 Balanced Demand Regulator, § *8.5.2 BDR Test for Optimum Performance*"
37. Connect the bent tube at the BDR adapter and at the side-block connection, make sure the Teflon® O-Ring is in position at the side-block connection
38. Tighten both connection at the specified torque as per § "*11 Appendix 1 - Torque Tables*"

8.6 BDR REMOVAL FROM HELMET

For the BDR removal from the air-POD, ensure to have at ready the following toolset:

- N. 17 Open-End Attachment on Torque Wrench
- N. 22 Open-End Wrench
- N. 22 Open-End Attachment on Torque Wrench
- N.36 Socket wrench
- 6mm Flat Blade Attachment on Torque Screwdriver
- Medium Blade Screwdriver

1 Remove the bent tube, as per § "*8.4 Bent Tube Assembly, § 8.4.2 Bent Tube Removal"*

2 Remove the screws, the plates and the spacers from the BAFFO™ on both side of helmet air-POD, see § *"8.8 BAFFO™ Exhaust System"*

3 Remove the nose pad as per § *"9.4.5 Face Port Removal, § 9.4.2 Nose Block Device Removal*"

4 Remove the Oral/Nasal mask as per § "*7.8 Monthly Maintenance, § 7.8.6 Oral/Nasal mask*"

5 With the specific mounting nut removal tool, unscrew the regulator mounting nut from the helmet interior. Remove the O-Ring

6 Cut the tie-wrap holding in position the exhaust collector with the regulator and detach it from the regulator. For detailed removal procedure, see § "*8.8.1* BAFFO™ *Exhaust System Removal*"

7 Pull out from the helmet the BDR and BAFFO™ assembly

8 With the BDR and BAFFO™ system in your hand, cut the tie wrap securing together the BAFFO™ system and the BDR exhaust port. By pulling, detach the BAFFO™ system from the BDR body

8.6.1 BDR DISASSEMBLY

Required tools:

- 24mm Open End Attachment on Torque Wrench
- 6mm Flat Blade Attachment on Torque Screwdriver
- Mini Flat Blade Screwdriver

1. Follow § *"8.5 Balanced Demand Regulator, § 8.5.4 BDR-Bias Adjustment"* step from 1 to 12, for bent tube, adapter, regulator cover, diaphragm, lock clip, main tube and packing nut removal

2. First step for the adjustment knob separation from the packing nut, is the adjustment shaft removal

CAUTION

IMPORTANT NOTE: never attempt to separate the adjustment knob from the packing nut without removing the adjustment shaft as first step.

3. While holding the packing nut, clockwise rotate the adjustment knob; the adjustment shaft shall move outward, away from the packing nut. The shaft may not fall out so, after ten full turns on the adjustment knob, a small screwdriver can be inserted into the outer end of the adjustment knob to push out the adjustment shaft from the packing nut.

As required, to facilitate the extraction of the adjustment shaft, a mild dish soppy solution can be used to wet the packing nut and the adjustment knob helping the extraction.

4. Extracted the adjustment shaft, the adjustment knob and the packing nut can be separated. Making use of the soapy solution, wet the rubber knob and the packing nut then, grab with one hand the packing nut and the adjustment knob with the other hand and bend to separate. The adjustment knob will pop out loose from the retaining boss of the packing nut

5. Carefully remove the bearing washer and adjustment shaft O-Ring from the packing nut and discard the O-Ring

6. Follow "§ *"8.5 Balanced Demand Regulator, § 8.5.4 BDR-Bias Adjustment"* step from 13 to 20 for lever arm bearing clip, lever arm, balance spacer, spring, inlet valve assembly and adjustment nipple removal

7. Removed the balance spacer, using anO-Ring pic, remove the two O-Rings

8. Remove the O-Ring from the main tube

CAUTION

NOTE: carefully inspect and make sure about the O-Ring condition. If any sign of damage, deterioration or excessive wear is detected, replace the O-Ring.

This is an important seal, if this O-Ring leaks it may seem that the inlet valve seat and the adjustment nipple are not sealing properly, but this may not be the case.

9. Holding the regulator body firmly in your hand, remove the exhaust valve from the regulator body

10. Check parts for damages or excessive wear and replace accordingly

11. Clean and sanitize all parts, apply a light coat of Christo Lube® all moving parts

8.6.2 BDR – RE-ASSEMBLY

Required tools:

- 17mm Open-end Attachment on Torque Wrench
- 22mm Torque Wrench
- 22mm Open-end Wrench Attachment on Torque Wrench
- 30mm Flat Blade Attachment on Torque Screwdriver
- 6mm/10mm Flat Blade Screwdriver

8.6.3 REINSTATING THE ADJUSTMENT KNOB

1. Lubricate with Christo Lube® and install the large O-Ring over external packing nut groove and the small O-Ring into the internal packing nut groove

2. Install bearing washer on the top of the O-Ring and press down until it is flat

8.6.4 ADJUSTMENT KNOB INSTALLATION

1. Start by applying a light coat of Christo Lube® in the groove of the adjustment knob where it presses into the packing nut

2. Pushing and twisting the knob insert it into the packing nut. Hold the knob in position and helping with a screwdriver, push the rest part of the knob inside the packing nut

3. By Christo Lube® lubricate and insert the threads of the adjustment shaft into the adjustment knob. Push the end of the adjustment shaft and at the same time, rotate counterclockwise the adjustment knob to engage the threads. Continue turning until the adjustment knob stops

4. Lubricate the packing nut larger O-Ring with Christo-Lube® and install into the external O-Ring groove of the packing nut

8.6.5 BDR ASSEMBLY

1. Before the BDR all parts repositioning, make sure that no foreign matter is present inside the regulator body

2. Position the new exhaust valve inside the regulator body

3. Position the O-Ring onto the main tube, lubricating with Christo Lube® or other equivalent Oxygen compatible lubricant

4. To prevent damage to the main tube O-Ring during the re-installation, lubricate the internal area of the regulator with Christo Lube®

5. Position the O-Ring onto the adjustment nipple, lubricate with Christo Lube®

6. Re-install the two O-Rings of the balance spacer, lubricate with Christo Lube®

7. Continue as per main tube installation procedure starting on step N. 20 on

8. Re-install the diaphragm, cover assembly and cover retaining screws. Tighten screws as per § *"11 Appendix 1 - Torque Tables"*

9. Completed all re-assembly operations, test the regulator in accordance with § *"8.5 Balanced Demand Regulator, § 8.5.2 BDR Test for Optimum Performance"*

8.6.6 BDR RE-INSTALLATION ON HELMET

Tools required:

- 17mm Open-end Attachment on Torque Wrench
- 22mm Open-end Wrench Attachment on Torque Wrench
- 22mm Open-end Torque Wrench
- 32mm Socket
- 6mm inch Flat Blade Attachment on Torque Screwdriver

1. Start with the reinstallation of the regulator to the *BAFFO™* ™ main exhaust system

2. With a tie wrap, fix the regulator to the main exhaust system of the *BAFFO™* and cut the excesses of tie wrap

3. Insert the tube on the exhaust main body onto the tube of the air POD of the helmet and, at the same time, align and insert the mounting tube of the regulator into the relevant hole on the air POD. Once done, install a tie wrap and cut off the excesses

4. Install the O-Ring and with the specific tool, the regulator mount nut. Do not fully tighten the nut at this time
5. Control and make sure, the rubber tubes are properly installed on the water dump on the air POD

6. Re-install the bent tube assembly as per § *"8.4 Bent Tube Assembly, § 8.4.4 Bent Tube Reinstallation"*

7. Following the specified torque and the specific tool, tighten the regulator mounting nut, See § "*11 Appendix 1 - Torque Tables*"

8. Re-install the Oral/nasal mask as per § *"7.8 Monthly Maintenance, § 7.8.6 Oral / Nasal Mask"*

9. Re-install the nose block device as per § *"9.4 Face Port, § 9.4.7 Nose Block Adapter Reinstallation, § 9.4.8 Nose Block Device Reinstallation"*

10. Reinstall the screws, the plates and the spacers of the *BAFFO™* on both side of helmet air-pod. Tighten the screw at the specified torque as per § "11 *Appendix 1 Torque Tables*"

8.7 STANDARD AIR POD

DRASS D-ONE helmet is characterized by the "POD" that has been designed to support the installation of the regulator and the exhaust system.

Normal air standard usage does not foresee the Air Pod removal, AIR POD removal must be considered only to carry out the routine

annual overhaul or in case of helmet reconfiguration for different dive techniques.

The helmet is at present delivered with the Standard Air Pod, but in near future other pods shall be available in order to offer the helmet with different configurations.

In details the POD that shall be available are:

- Air Standard Pod (standard configuration)
- Gas Reclaim Pod (under development)
- Gas Reclaim Pod and Rebreather (under development)

8.7.1 POD REMOVAL

The pod is made of stainless steel 316L and is very durable, the only part of the air pod that must be replaced at least once per year is the gasket that seals the air pod with the helmet shell. During the annual overhaul, as a routine, the gasket should be replaced.

In case of helmet reconfiguration, the pod gasket must be inspected and if in doubt, and/or signs of wear, chips or cuts are detected, it must be replaced accordingly.

The twin valves of Helmet exhaust system can be replaced without the pod removal and, besides the annual overhaul and helmet reconfiguration there are no other parts that need the pod removal for maintenance and / or repairs.

The pod is fixed to the front side of the helmet by means of 8 Allen screws and a shaped gasket, with a ridge for the centering on the pod side, is inserted between the helmet shell and the pod for proper sealing.

The following steps to be undertaken for the pod removal.

Tools required:

- 3mm Allen key (Ball end is helpful)
- 2,5mm Allen key
- 2 x 17mm open end wrenches
- 1 x 22mm open end wench

1. Remove the bent tube, unscrewing the nut at the side block and the nut at the regulator banjo connector. During removal of the bent tube pay attention not to lose the Teflon® flat gasket at the side block. For detailed removal procedure, see § *"8.4 Bent Tube Assembly, § 8.4.2 Bent Tube Removal"*
2. With the 2,5mm Allen Key, unscrew the 4 Allen screws retaining the port and starboard *BAFFO™* wings. In doing so attention not to lose the two retaining plates (one for each side) and the 4 spacers (2 for each side). For detailed removal procedure, see § *"8.8 BAFFO™ Exhaust System, § 8.8.1 BAFFO™ Exhaust System Removal"*
3. Detach the oral/nasal mask from the Balanced Demand Regulator mounting nut, no need to remove it, See *Monthly Maintenance, § "7.8.6 Oral / Nasal Mask*
4. Remove the 8 Allen screws holding the pod in position and exerting a light pull, detach the Air Pod from the helmet

Air pod, Demand Regulator Assembly and BAFFO™ Exhaust System, are now separated from the helmet.

8.7.2 POD MAINTENANCE

1. With a "scotchbrite®" type sponge and a 50% solution of fresh water and vinegar, clean the helmet shell interface with the pod removing any trace of dirt, previous applied lubricant, leaving the flat surface shiny and perfectly cleaned
2. With the same water/vinegar solution and the "scotchbrite®" type sponge, clean the pod surface interface with the helmet
3. Inspect the gasket looking for signs of wear, cuts, chips and, if any, replace the gasket. If the gasket is in good condition, clean it and remove any trace of previous lubricant, dirt, particles that may have deposited

8.8 POD REINSTALLATION

1 Apply a light coat of lubricant on the gasket and reinsert the gasket ridge in the pod relevant seat

2 Made sure the gasket is properly seated in the groove of the pod, install the 8 screws through the pod and gasket. This will help to keep the gasket in position properly aligned with pod seat

3 Align the pod/gasket with the helmet and starts to screw in the 8 screws. Do not tighten the screws

4 Once all screws are inserted and the Air Pod/helmet shell configuration is achieved, with a cross pattern start to screw in all screws, see § *"11 Appendix 1 - Torque Tables"*

5 With a torque wrench and N. 4 Allen key insert complete the 8 screws tightening as per required torque, see § *"11 Appendix 1 Torque Tables"*

6 Reinstall the oral/nasal mask on the regulator mounting nut dedicated seat

7 Reinstall the two screws, spacers and retainer plate on both side of the *BAFFO™* wings, for detailed procedure, see § *"8.8 BAFFO™ Exhaust System, § 8.8.2 BAFFO™ Exhaust System Reinstallation"*

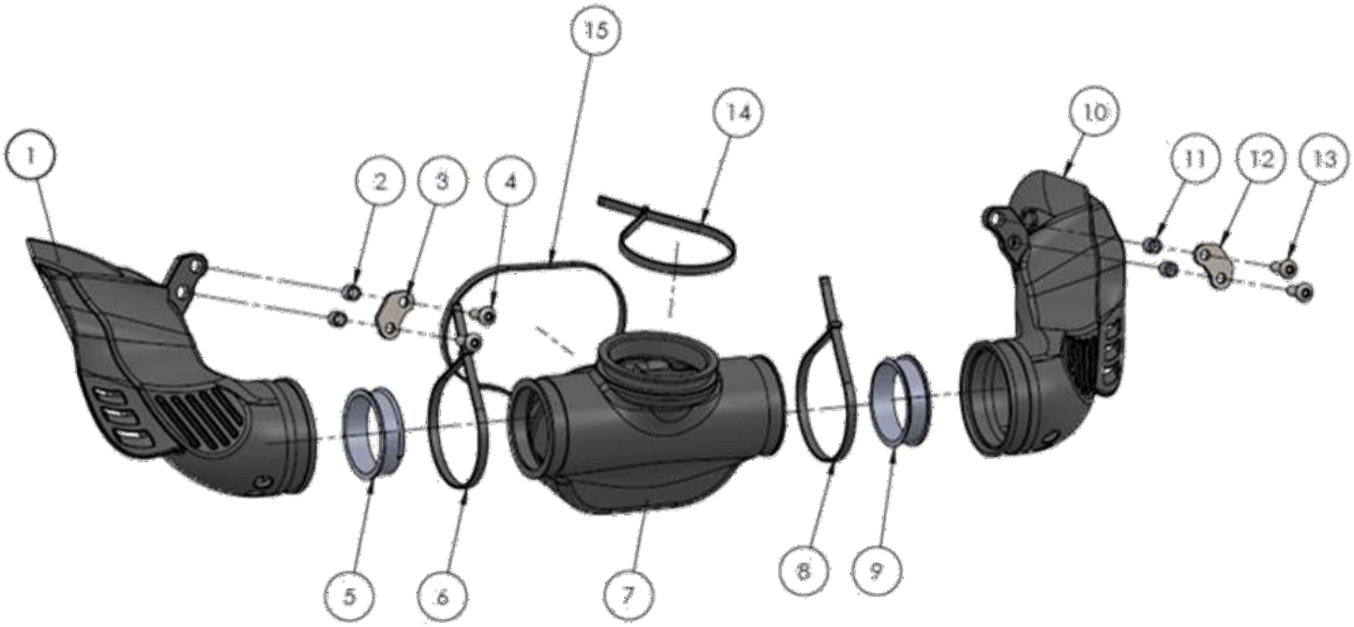
8 Reinstall the bent tube, for detailed procedure, see § *"8.4 Bent Tube Assembly, § 8.4.4 Bent Tube Reinstallation"*

8.9 BAFFO™ EXHAUST SYSTEM

In underwater activities, the diver's breathed out air, needs to be correctly conveyed and diverted to the helmet external in an effortless way.

During demanding activities, the volume of air ventilated can be massive, and the large amount of CO_2 enriched exhaled gas must be properly governed in order to facilitate the diver in the exhalation phase and preventing the possible CO_2 buildup. Divers should not exert any specific effort during the

respiration, the respiratory effort should be as close as possible as the one experienced at surface. If the inspiration effort is governed by the Balanced Demand Regulator technology, the exhalation is governed by the helmet exhaust system denominated "*BAFFO™*".



The *BAFFO*™ exhaust system allow for a very low exhalation resistance providing great comfort to the divers. Its design allows for the exhaled gas to be conveyed and diverted at the lateral/back side of the helmet and, in doing so, the bubbles produced by the exhaled gas does not disturb the visual field of the diver busy and absorbed by the ongoing working activities.

The BAFFO™ system is fixed to the helmet and Balanced Demand Regulator via the exhaust collector (7) by means of tie-wraps and at the two BAFFO™ wings (1 / 10) that are fixed to the air-Air Pod by means of two Allen screws (4 / 13), one retainer plate (3 / 12) and one spacer (2 / 11) on each side. The two BAFFO™ wings (1 / 10) are connected to the exhaust collector (7) by means of a collector bush (5/9) insertion and a tie wrap to fix it, on each side.

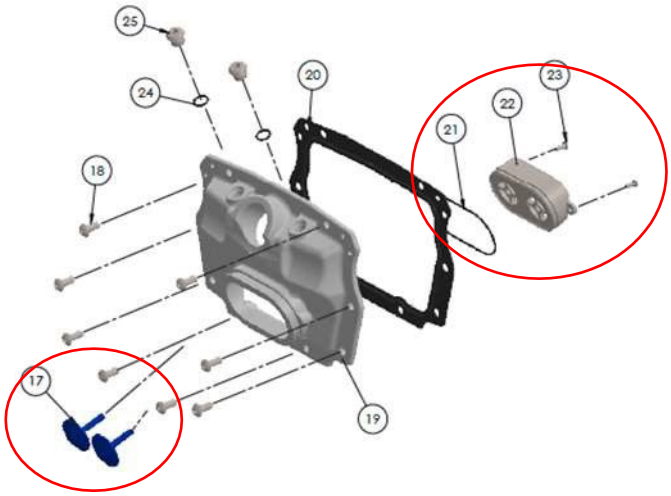
The BAFFO™ exhaust system is composed by:

- 1 Exhaust Collector (7)
- Exhaust Collector Bushes (5 / 9)
- BAFFO™ Exhaust Starboard and Port Wings (1 / 10)
- The 2 Retainer Plates (3 / 12)
- The 4 Spacers (2 / 11)
- Screws (4 / 13)
- Tie Wraps 5mm x 300mm (6 / 8 / 14 / 15)

Although the BAFFO™ Exhaust System comprises only the above-mentioned parts, the exhaust twin valves assembly, composed in turn by the following parts

Valve Seat (22)
2 Mushroom Exhaust Valve (17)
O-Ring (21)
2 x M3 x 8 Screws (23)

and installed at the Air Pod, is herein described since the Exhaust Valves replacement, when required, is more easily and better performed removing only the BAFFO™ Exhaust System to get an easier access.



8.9.1 BAFFO™ EXHAUST SYSTEM REMOVAL

The BAFFO™ exhaust system, thanks to its simple design, does not require a specific maintenance. The need for its removal is when the configuration of the helmet requires to be changed replacing the air pod with the reclaim and/or rebreather pod, or in case a rubber part of the exhaust system has suffered a damage, cutting, abrasion or else that may suggest its substitution.

Required tools:

- 2,5mm Allen key
- Small cutting pliers

1. With the 2,5mm Allen key remove the 4 Allen screws (4 / 13), two for each side, holding the two BAFFO™ wings connected to the air pod

2. In doing so, attention no to lose the two retainer plates (3 / 12) one for each side and the four spacers (2 / 11), two for each side

3. With the small cutting pliers, cut the tie-wraps, one for each side, holding the Port and Starboard BAFFO™ wings connected with the Exhaust Collector
4. Pulling out, detach the two BAFFO™ wings from the exhaust collector

5. Remove the two collector bushes

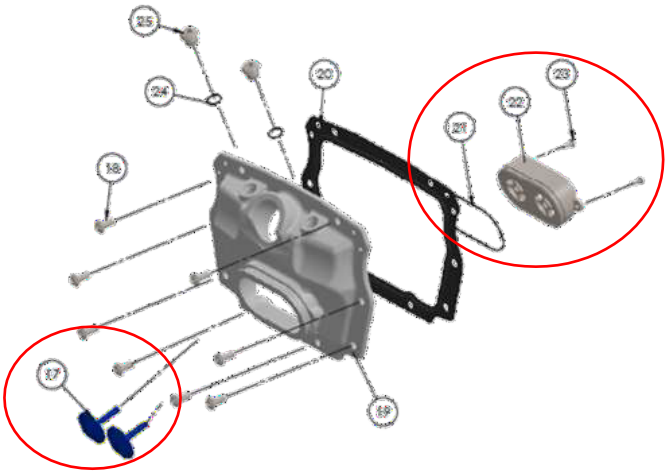
6. With the small cutting pliers, cut the tie-wrap holding in position the exhaust collector with the helmet Air pod and the tie-wrap between the Balanced Demand Regulator and the exhaust collector
7. Exerting a strong firm pull, pull out and detach the exhaust collector from the Air Pod and Balanced Demand Regulator

The BAFFO™ Exhaust System is now totally detached from the helmet

8.9.2 WATER DUMP / EXHAUST VALVES REMOVAL

As mentioned in the general description, having removed all parts of the BAFFO™ Exhaust System, is now possible to more easily access the Water Dump/Exhaust Valves assembly.

Maintenance to the two exhaust valves (17) is an operation that is routinely carried out during the Annual Overhaul as per Module_M1A Annual Overhaul, Maintenance, and Inspection Checklist, or is executed in case of needs, as required



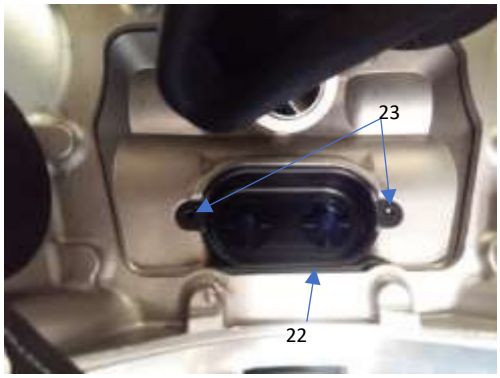
For the exhaust twin valve removal, the following tools are required:

- 1 x 2,0mm Allen key
- 1 x 2,5mm Allen Key
- 1 x Small cutting pliers

1. Capsize the helmet, remove the head cushion if present and open completely the chinstrap to gain access to the valve seat

Remove the oral/nasal mask from the mounting nut. No needs to totally remove the oral/nasal mask

2. By the 2mm Allen Key, remove the two Allen screws (23) holding in position the Valve Seat (22)

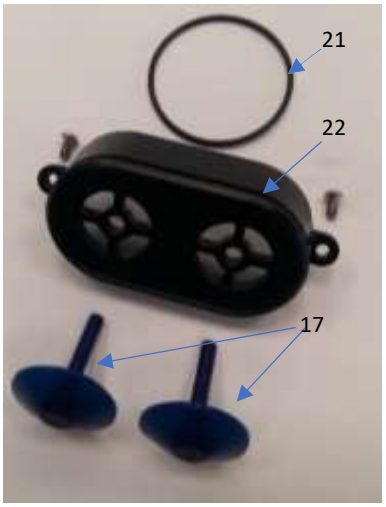


At this point, if all the BAFFO™ Exhaust System removal as per § 8.9.1 has been pursued, continue with the next step (**3)** of this procedure else, if the BAFFO™ Exhaust System removal as per § 8.9.1 has NOT been executed but only the Water Dump/Exhaust Valves need to be replaced and / or maintained, consider to execute the § "*8.9.1* BAFFO™ *Exhaust System Removal*" procedure from point 1 on

3. With the Twin Valve Seat exposed, gently push it in, towards the helmet interior removing it from the air pod receptacle

4. Turn the helmet and collect the twin Valve Seat

5. With a soft rag and a mild clean detergent, clean the Air Pod receptacle deputed to the twin Valve Seat installation, removing any trace of dirt
6. With the Twin Valve Seat in your hand, remove the two mushroom valves
7. With a proper tool, remove the O-Ring (21) from Twin Valve Seat (22)
8. Inspect the Valve seat for damage, if any
9. Inspect the O-Ring for wear, cuts, abrasion and replace accordingly



10. In case of Annual Overhaul, replace the two mushroom valves and the O-Ring as scheduled. If not, inspect and re-use or replace accordingly.

8.9.3 WATER DUMP / EXHAUST VALVES REINSTALLATION

1. Apply a light coat of lubricant on the O-Ring (21) and reposition it on the valve seat (22)
2. Re insert the two mushroom valves (17) in the relevant seat
3. Reinsert the valves seat assembly in the air pod receptacle

4. Screw in the two Allen screws with the 2mm Allen key. Apply proper torque value as per § "*11 Appendix 1 - Torque Tables*"

8.9.4 BAFFO™ EXHAUST SYSTEM REINSTALLATION

Required tools:

- 2,5mm Allen key
- Small cutting pliers
- Tie wraps 5mm x 300mm

1. Slightly lubricate and reposition the Exhaust Collector engaging the relevant Balanced Demand Regulator and air pod receptacles
2. Slightly lubricate and insert the two Collector Bush inside the Exhaust Collector lateral positions
3. Reposition the two BAFFO™ wings, port and starboard
4. Align the upper side of the BAFFO™ wings with the relevant holes on the air pod
5. Insert the spacers, two for each side into the rubber hole of the BAFFO™ wings
6. Position the two retainer plates one for each side and insert the two Allen screws on both side of the BAFFO™ wings
7. Tighten the 4 screws as per indicated torque, see § "*11 Appendix 1 - Torque Tables*"
8. Position and tie the two tie-wraps to fix the Exhaust Collector in position in position with the relevant Balanced Demand Regulator and Air pod positions
9. Position and tighten the two tie wraps on the connection between the Exhaust Collector and the two BAFFO™ wings. Trim the tie wraps as close as possible

9 MECHANICAL SYSTEM MAINTENANCE

9.1 GENERAL

Correct maintenance and repairs of DRASS helmet non breathing components are described in this chapter. A good maintenance and repairs are fundamental for the divers' comfort, good performance of the job done and safer diving.

9.2 HELMET SHELL INSPECTION

The helmet is made using stainless steel 316L and is extremely durable. However, in case of misuse or other, it can be damaged. Helmets that suffered damages, can be repaired, but the repairs must be carried out by an appointed DRASS technician trained by DRASS.

- Inspect the helmets outside shell looking for cracks, depression or gouges. In case of findings, if the helmet has suffered gouges deeper than 1,5mm/2mm the helmet should not be used. All repairs to be carried out by a DRASS trained technician and cracks or fractures must be repaired only by a certified stainless-steel repair technician.

9.3 HANDLE

9.3.1 GENERAL

The handle is made of stainless still and for a comfortable helmet handling, a rubber pad is installed creating a cushion for the comfort providing a better grip during the helmet transportation and handling.

The pad is composed by two rubber halves joined by two flushed screws.

The handle assembly is installed onto the helmet top shell by means of a set of three Allen screws at the front and a set of two Allen screws and a push plate at the back.

The Handle design has been conceived, besides the basic function of helmet handling and transportation, also to provide a safe and convenient system to keep the helmet in correct and convenient position during usage or storage. The two slots, one at the back and one at the front of the handle, have been designed with an alignment that allow the insertion of a 10mm round peg.

Once the peg is inserted, the helmet is kept in an appropriate position suitable for the helmet rinse and dry during the work phases such as but not limited to diver change-out or small maintenance intervention, and for the helmet long storage.

The friction produced by the helmet weight between the handle embossed rubber finishing and the peg inserted, keep the helmet safely in position, allowing a proper helmet storage. In such a way this enable a safe system to hang the helmet avoiding the usual ropes or other divers' system for a tidier bell-internal/workplace.

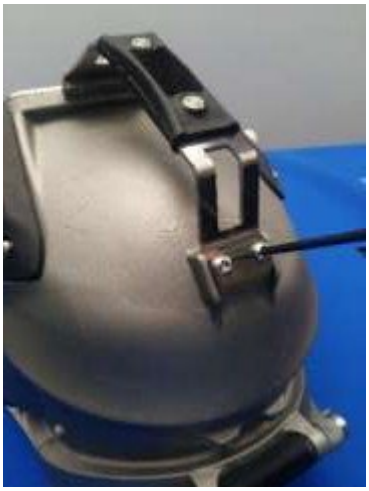
9.3.2 HANDLE REMOVAL

Required Tools:

- Torque screwdriver with:
- Allen key 3mm insert
- Allen key 5mm insert
- Allen key 6mm insert

1 With the 5mm Allen key, Unscrew the three Allen screws at the handle front

2 With the 6mm Allen Key unscrew the two Allen screws at the back and remove the push-plate



3 Detach the handle from the rear support, the handle is free from the helmet

9.3.3 HANDLE REPLACEMENT

1. Position the handle onto the helmet, make sure the buttonholes at the back side of the handle properly engage with the relevant position
2. Install the push plate and the two 6mm. Allen screws
3. Install the three front 5mm Allen screws
4. By a torque screwdriver, tighten firmlythe two Allen screws at the back and the three Allen screws at the front of the Handle

For the handle front and rear Allen screws tightening torque refer to § "*11 Appendix 1 - Torque Tables*" for correct torque value.

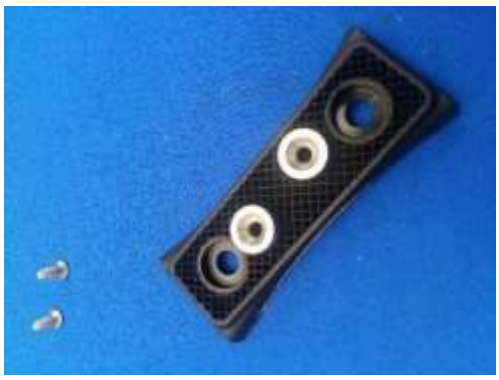
9.3.4 HANDLE GRIP RUBBER

The embossed rubber grip of the handle can be easily replaced with the handle still inplace or removed.

9.3.4.1 HANDLE GRIP RUBBER REMOVAL

1. With the 3mm Allen key, unscrew the 2 Allen screws placed at the handle lower side, towards the helmet shell

2. Detach the two halves of the handle rubber
3. Remove the two spacers from the handle rubber lower side
4. Remove the two blind nuts from the handle rubber upper side



9.3.4.2 HANDLE RUBBER REPLACEMENT

The two Allen screws, the two spacers and the two blind nuts can be re-used

A set of ironware can be purchased from DRASS or an authorized DRASS dealer.

1. Reinstall the two blind nuts on the upper half of the handle rubber and reposition it onto the stainless-steel helmet handle
2. Reinstall the two spacers on the lowerhalf of the handle rubber and reposition itonto the stainless-steel helmet handle

3. Screw in the two small Allen screws placed at the handle rubber lower half and firmly tighten them with the N. 3Allen keys, see § "*11 Appendix 1 - Torque Tables*" for correct torque value.

9.4 FACE PORT

The face port is the lens that allow viewing, it is made of resistant plastic polycarbonate.

Small scratches on its outer surface tend to disappear once underwater, due to intrinsic characteristics of the material itself. The plastic polycarbonate refractive index is similar, has a value close to the value of saltwater and, underwater, the scratches are drastically reduced. However, if nicks and scratches deeper than 1,5mm are present, the face port must be substituted. It is an operation that can be easily and safely done.

9.4.1 FACE PORT REMOVAL

Removal/Replacement of the Face port require the removal of the following parts:

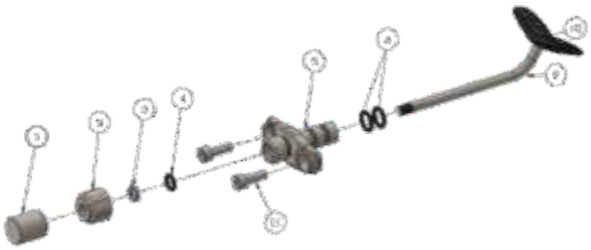
- The Nose block Device
- The Nose block Adapter
- The Face Port Retainer

9.4.2 NOSE BLOCK DEVICE REMOVAL

Required Tools:

- 11mm open end wrench
- Soft jaw pliers or Slip joint pliers and a soft rag or cloth

1 Remove the nose block knurled knob (1). In doing so, use the soft jaw pliers or the rag/cloth with normal pliers, in order not to damage the chrome finishing of the knurled knob
2 Remove the packing nut (2) and slip the O-Rings (3 / 4) from the nose block shaft (9)
3 Slip off the nose block shaft from the helmet interior

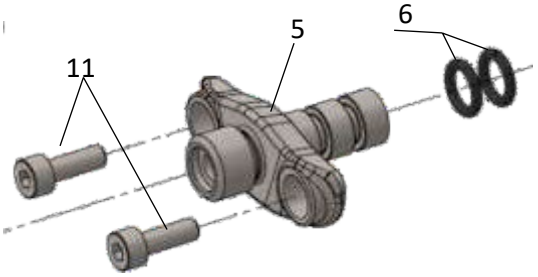


9.4.3 NOSE BLOCK ADAPTER REMOVAL

Required Tools:

- 4mm Allen Key

The nose block adapter (5) is the guide where the nose block device shaft slides.

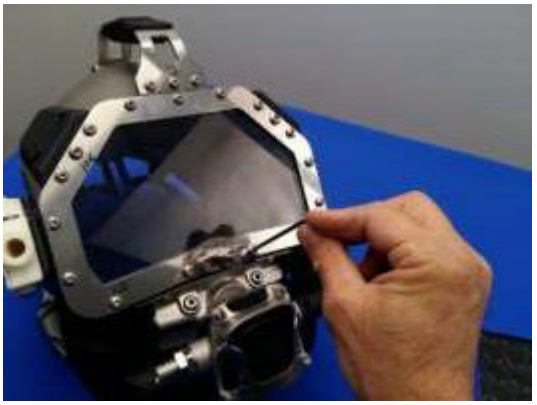


it is fixed onto the face port retainer/helmet shell by means of two 4 x 12 Allen screws (11) and the sealing with the helmet shell is achieved by means of two O-Rings (6).

During the nose block adapter removal, inspect the two O-Rings (6)

In case of detected anomalies, damages, pinching, abrasion or cuts, replace the two O-Rings.

1 With the 4mm Allen key, unscrew the 2 Allen screws (11) fixing the Nose Block Adapter (5) at the face port retainer
2 Remove the nose block adapter (5).
3 When removing the nose block adapter attention not to damage the two O-Rings (6)



9.4.4 FACE PORT RETAINER REMOVAL

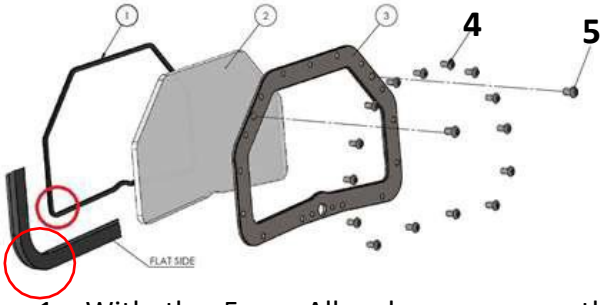
Required Tools:

- 5mm Allen Key
- 6mm Allen Key

The port retainer is a sturdy element made of stainless-steel that usually does not need a replacement. It is the helmet most common component that is replaced in case of corrosion produced by cutting/welding jobs

In the lower side of the port retainer there is the hole where is positioned the nose block adapter, the guide for the nose block device.

Removed the Nose Block Device and the Nose Block Adapter, make ready to remove the Face Port Retainer.



1 With the 5mm Allen key, unscrew the fifteen small Allen screws (4) from the face port retainer

2 With the 6mm Allen key, unscrew the two large Allen screws (5) from the face port retainer

3 Remove the face port retainer (3)

9.4.5 FACE PORT REMOVAL

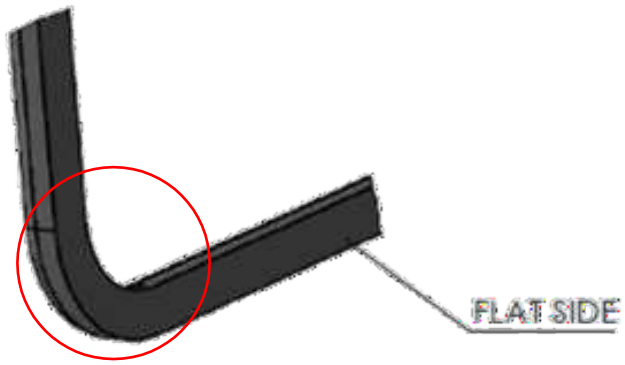
1 Pushing from the helmet interior, remove the old/damaged face port (2)

2 Remove the face port gasket (1)

9.4.6 FACE PORT AND PORT RETAINER REINSTALLATION

1 Carefully clean and ensure that the face port gasket seat is perfectly clean andfree from any possible particles

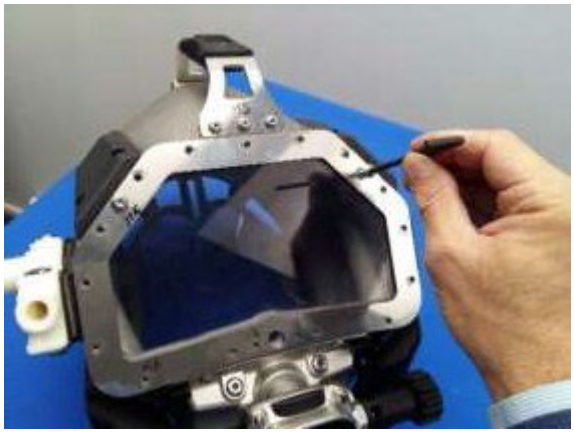
2 Lubricate the face port gasket with Christo lube® and reinsert it inside the relevant seat making sure that the gasket flat side is towards the face port



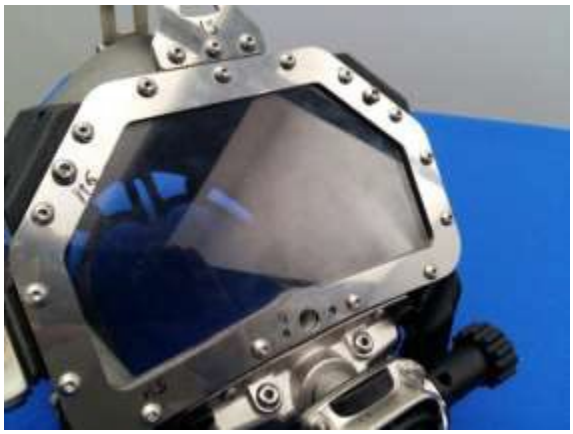
3 If after inspection the gasket is found damaged or show signs of excessive deterioration/wear, pinching, abrasion or cut, substitute with a new one, part number *140-309*

4 When face port gasket in position, place the new face port in position,

5 Position the face port retainer and start to insert the seventeen screws, do not tighten



Allen screw at position 5 (x2)



9.4.7 NOSE BLOCK ADAPTER REINSTALLATION

1 With the nose block adapter in your hand, remove the two O-Rings

2 Inspect and clean the two O-Rings seats of the nose block adapter

3 After inspection and cleaning, lubricate with Christo lube® and reinstall or replace the two O-Rings onto the nose block adapter, accordingly

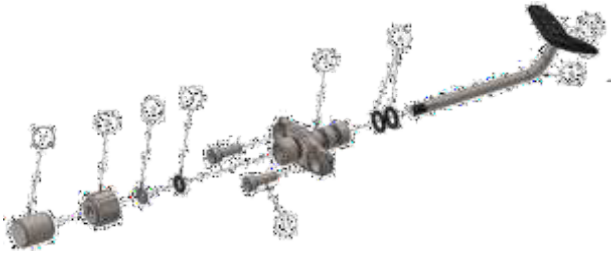
4 Reinsert the nose block adapter in its position onto the face port retainer

5 Insert the two Allen screws holding in place the nose block adapter, do not tighten

9.4.8 NOSE BLOCK DEVICE REINSTALLATION

1 From the helmet interior, slide in the nose block device shaft

2 Slide in the O-Rings on the nose block device shaft



3 Reposition and tighten, the packing nut. Attention not to overtighten, the shaft should smoothly move back and forth

4 If it is too tight or too loose, loosen or tight the packing-nut accordingly

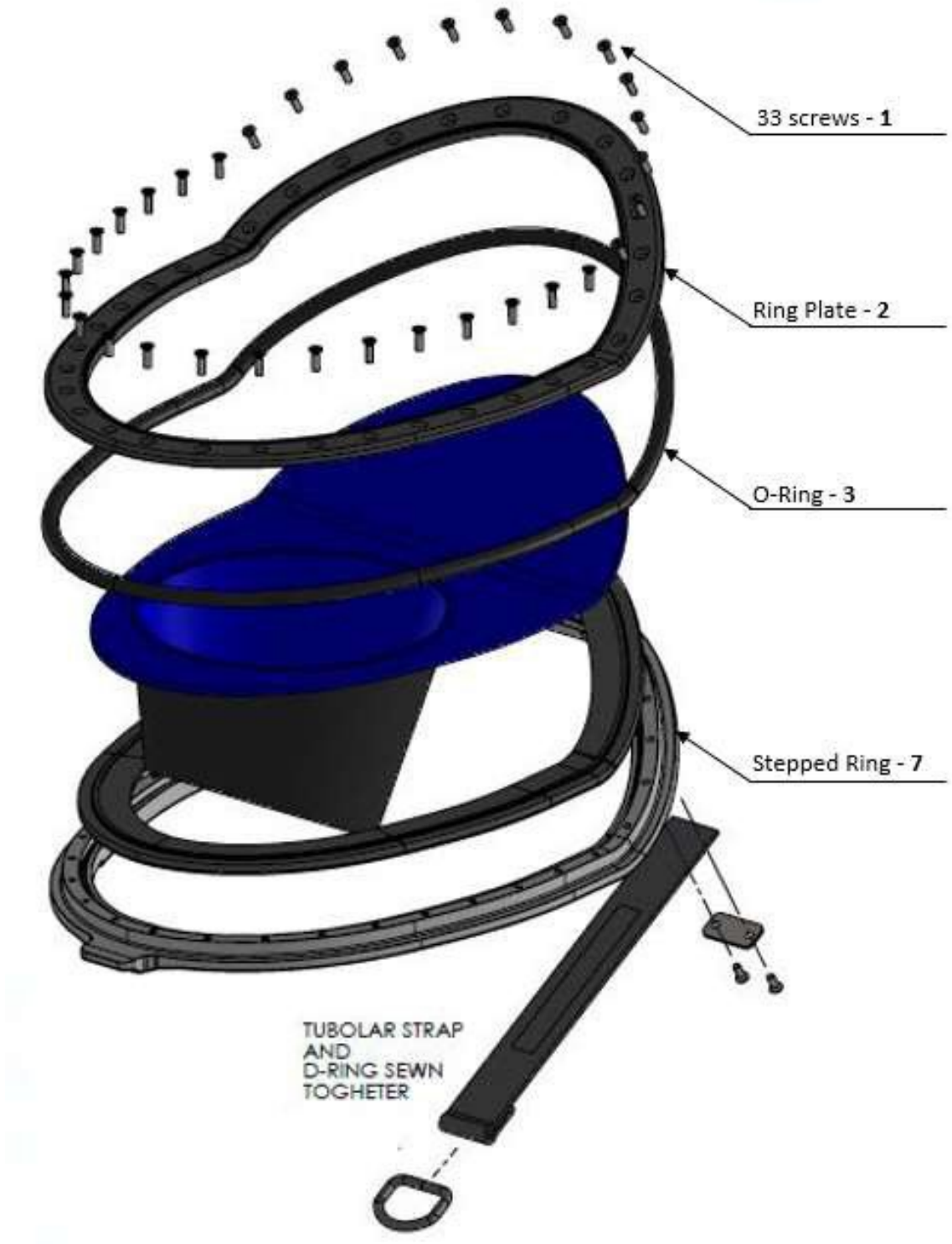
5 Reposition the knurled knob on the nose block device threaded end

6 With a torque screwdriver and relevant Allen key insert, tighten all positioned 17 screws at the specified torque in a cross pattern see § "*11 Appendix 1 - Torque Tables*" for correct torque value.

9.5 NECK RING ASSEMBLY

The neck ring is a complex assembly that, beside the helmet shell, is the second most important component of the helmet.

It ensures and supports the systems that grant the sealing of the helmet once the helmet is donned by the diver and supports the Neck Dam that ensures the helmet sealing with the divers' neck.



The outer circumferential O-Ring (3) fits inside a surface of the neck ring as well as the neck-dam that is in turn positioned inside the parts composing the neck ring.

The lower side of the helmet has a recessed machined seat where the neck-ring assembly tightly fit, ensuring the sealing with the outside. it is locked in position by the Locking

Collar that engages with the two locking pull pins, one on each side.

At the back of the helmet on the locking collar there is the neck-pad that needs to be adjusted to match each diver neck size. The neck-pad assembly once closed, present a smaller opening than the divers' head, preventing any possible helmet dislodging with consequent helmet flooding and likely, diver's drowning.

The head cushion, the neck-pad, thechinstrap and the neck-dam, all together firmly secure the helmet and, at the same time, provide good fit and comfort.

9.6 NECK DAM

Helmet sealing against the diver's neck is obtained by means of the cone-shapedneck-dam.

The circumferential O-Ring in the neck ring and the neck dam, integral part of the neck ring, provide the required sealing against the helmet shell and the diver's neck, keeping the gas inside the helmet.

The high-quality neoprene chosen, allow for an unusual softness and comfort even during prolonged dives, the neck dam accurate design and manufacturing, is tailored to suit different sizes of neck.

The non-allergenic material remain comfortable and soft with a smooth sensation throughout the neck dam life cycle and the softness of the neoprene does not produce a scratching sensation, annoyance to the neck whilst providing proper helmet sealing.

A well-maintained neck dam can ensure that the performances are maintained and, a bit of attention is required for the neck dam proper service.

9.6.1 NECK DAM FITTING

The Neck dam when new, may be a bit uncomfortable at surface, but once in the water, due to compression of the neoprene foam, will loosen slightly.

The neck-dam is cone shaped and every time you replace it or when brand new, the neck-dam might be too tight and some trimming may be required to fit your neck.

In case of needs, if too tight, small adjustment can be made to the neck-dam, to make it larger suiting different neck sizes by trimming or, as already seen in § *"5.3.2 Trimming the Neck Dam",* to loosen the neck dam tightness stretching it a little bit, it can be slid over a bottle or other suitable diameter and letting it sit overnight.

Neck dam trimming can be easily done with the help of the Tender. Hold the edge of the neck dam parallel and with a long scissor cut a thin portion of the neoprene, making trims of no more than 3/5mm at a time to avoid over trimming.

Once finished the neck dam should fit as tight as not to leak and consider that the neck dam may be slightly snug at surface and once underwater, should fit comfortable since the neoprene foam cells under pressure will break down loosening over time.

As already seen in § *"5.3.2 Trimming the Neck Dam"* a proper fitting neck dam can ensure comfortable long dives,

9.6.2 NECK-DAM DAILY MAINTENANCE

A proper well-maintained neck dam can ensure that the performances are maintained and, a bit of attention is required for the neck dam proper service.

On a daily basis, carry out a thorough inspection of the neck-dam neoprene looking for holes, punctures that may develop into larger holes.

Make sure about the correct positioning of the neck-dam, if it has pulled away from the retaining rings assembly or show other signs of deterioration that may impede the neck dam correct function.

Check the screw (1) of the ring plate for tightness. Check the circumferential O-Ring (3) of the neck-dam ring assembly looking for tears, cracks or nicks, ensure it is in good condition, and replace accordingly as required.

9.6.3 MONTHLY MAINTENANCE

On a long Commercial Diving Project or when the helmet is used for more than 20 diving days per month or, every 2 months if the helmet is used for 10 diving days per month or less, the “monthly maintenance” should be carried out.

The monthly maintenance should be also performed anytime the helmet service is under question and/or as suggested by the daily maintenance routine.

9.6.4 NECK DAM REMOVAL

Required tools:

- #1 Phillips insert on torque screwdriver

1. Remove the circumferential O-Ring (3) on the outside of the neck ring assembly
2. Unscrew and remove all the 33 screws (1) from the neck dam ring plate
3. Detach and separate the neck dam ring plate (2) from stepped ring (7)
4. Remove the neck dam
5. Discard the old neck dam
6. Inspect and clean all parts

9.6.5 NECK DAM REINSTALLATION

- #1 Phillips insert on torque screwdriver

1. Inspect and make sure the neck collar ring (5) of the new neck dam is clean and free from dirt or particles

2. Position the new neck dam inside the stepped ring (7)
3. Make sure about neck-dam orientation: during the positioning follow the angled shape of the new neck dam to match the stepped ring

4. With your thumbs, gently push neck collar ring of the neck dam inside the relevant seat on the stepped ring (7)

5. Made sure the new neck dam neck collar ring is properly seated inside the stepped ring (7) relevant seat, position the ring plate onto the stepped ring/neck dam assembly

6. With the torque screwdriver with the N.1 insert, reposition the 33 screws (1)
7. When all screws are in position, with the torque screwdriver, using a cross pattern, tighten all 33 screws at specified torque, see § *"11 Appendix 1 - Torque Tables"*
8. Inspect and make sure the outer circumferential O-Ring (3) is clean and free from dirt. Make sure that no indentation or other defects that may compromise the O-Ring function are not present. If any or if in doubt, replace the O-ring

9. Slightly lubricate the O-Ring and reinsert it around the neck ring assembly
10. Make sure the O-Ring is properly inserted inside the relevant seat

9.6.6 NECK DAM ASSEMBLY O - RING SEAL

9.6.6.1 REPLACEMENT

Beside the replacement in case of evident damage, even if apparently in good state, the O-Ring (3) of the neck dam assembly must be replaced every year as per Module M1A *"Annual Overhaul, Maintenance, and Inspection Checklist"*

The O-Ring make the seal between the helmet and the neck dam ring assembly.

To replace the O-Ring (3), removed the old one, lubricate the new O-Ring with a light coat of silicone grease and stretch it over the bottom of the sides of the neck dam ring assembly. Make sure it is properly seated

9.6.7 NECK DAM PULL STRAP

The pull strap (33) during the usage may deteriorate, get fringed. By means of a hot iron is possible to singe it and prevent further deterioration. However, in case of needs replacing it, is a simple operation.

9.6.7.1 NECK DAM PULL STRAP REMOVAL

– #2 Phillips screwdriver

1. Unscrew and remove the two screws (34) securing the strap plate (35) to the stepped ring

9.6.7.2 NECK DAM PULL STRAP REPLACEMENT

1. Position the new pull (33) strap and position the strap plate (35) over it

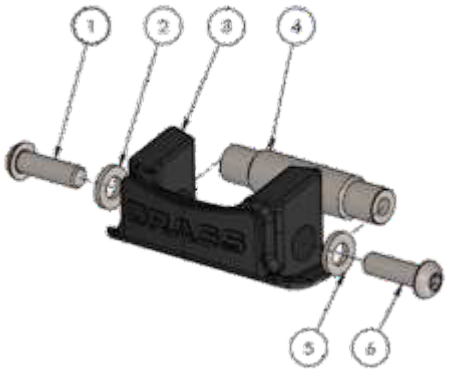
2. Screw in the two screws (34) through the strap plate up to head of screws are flushed with the plate. Attention not to overtighten refer to § "*Appendix 1 - Torque Tables*" for correct torque value

9.7 NECK RING CATCHER

The neck ring catcher placed in the front lower side of the helmet shell is where the flap of the neck ring assembly is engaged when the helmet is donned.

It is a simple receptacle with a transversal stud bolt that is used to engage the flap of the neck ring and, being made of rubber (3), acts also as a bumper protecting the helmet lower front side during the handling.

Inserting the neck ring assembly flap in the catcher, creates a proper alignment for the correct closure of the helmet.



It is a simple mechanism that does not require a specific maintenance. A proper rinse to eliminate any particle of sand or other foreign matter is enough for the good maintenance of the neck ring catcher system.

9.7.1 NECK RING CATCHER REMOVAL

Required tools:

- 4mm Allen Key

1 Unscrew the two Allen screws (1/6) on each side of the neck ring catcher assembly
2 The neck ring catcher bumper (3) is free to be detached from the helmet shell
3 Remove the pin (4) from the rubber bumper

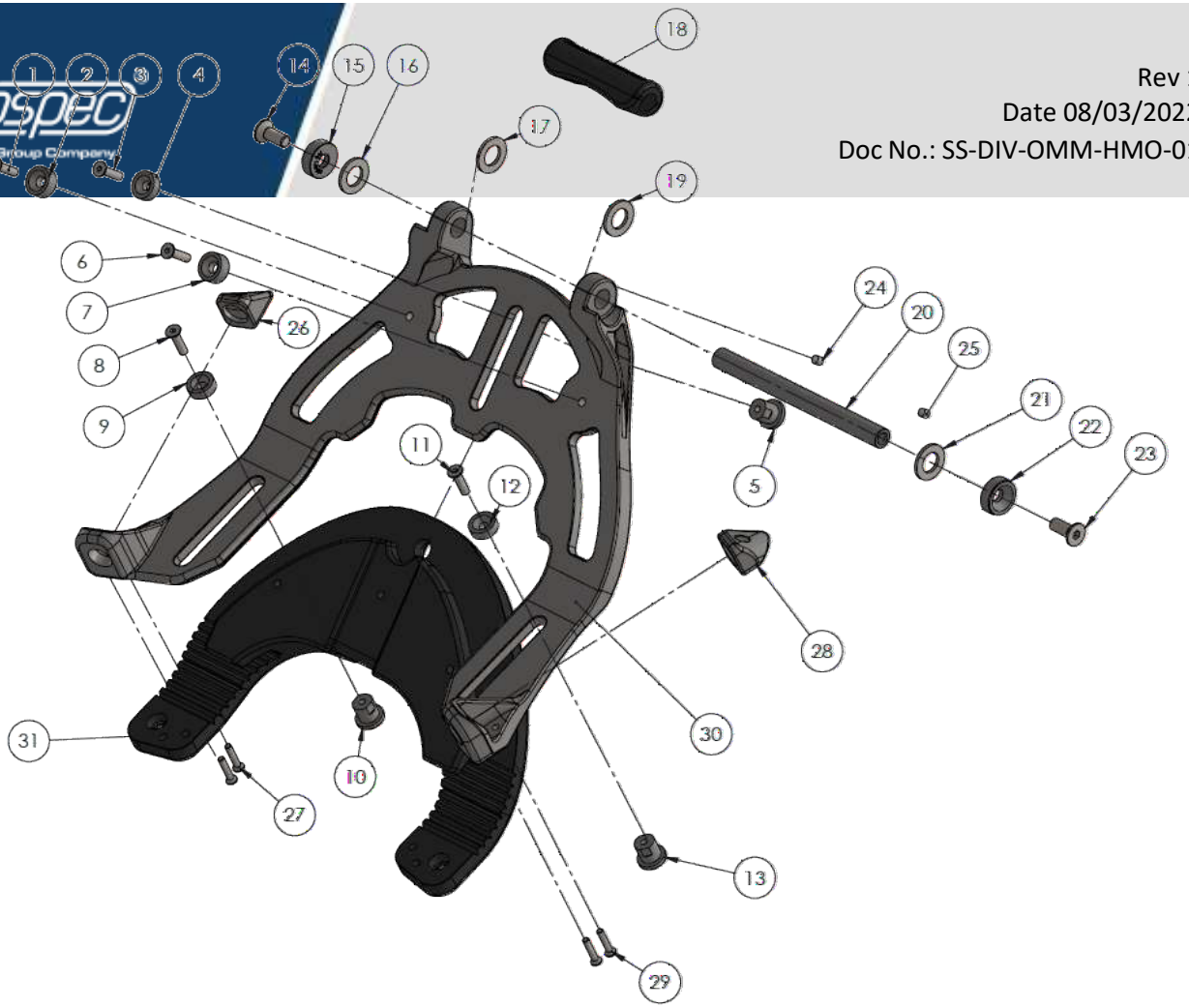
9.7.2 NECK RING CATCHER REINSTALLATION

1 Inspect and clean the rubber bumper and the pin, remove any trace of dirt, sand or other particles
2 Slightly lubricate the pin (4) and reinsert inside the rubber bumper (3)
3 Reposition the rubber bumper inside the neck ring catcher receptacle
4 Reposition the pin aligning it with the holes for the Allen screws
5 In case the bumper is damaged or worn out, consider the replacement
6 Insert and tighten the two Allen screws (1/6). Tighten the screws at the specified torque, refer to § "*Appendix 1 - Torque Tables*"

9.8 LOCKING COLLAR ASSEMBLY

The locking collar is the system that supports the helmet locking system once the helmet is close.

The two pull pins once engaged, secure the helmet with the neck ring that is in turn secured and comfortably kept in position onto the Divers head by the Neck Pad and the chin strap, preventing any possible dislodgement.


1
2
3
4
14
15
16
18
17
19
6
7
26
8
9
24
20
25
21
22
23
11
12
5
28
31
10
30
27
13
29

9.8.1 LOCKING COLLAR REMOVAL

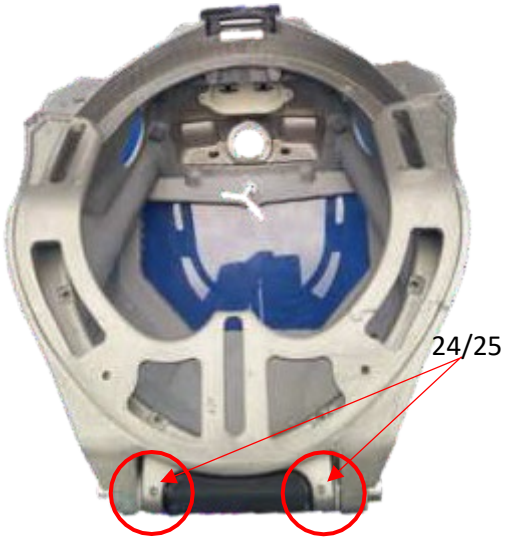
The locking collar may need to be replaced in case of misuse or careless handling.

Required tools:

- 2mm Allen Key
- 2 x 4mm Allen key
- 4mm Allen key insert attachment on Torque Wrench

For replacement and /or maintenance of the locking collar proceed in the following way:

1. Capsize the helmet and locate the 2 grains fixing the hinge axis
2. With the 2mm Allen key, unscrew and remove the two grains (24 / 25)



3. Removed the two grains, with the two 4mm Allen keys, one on each side of the locking collar hinge, engage the relevant Allen screws (14 / 23)

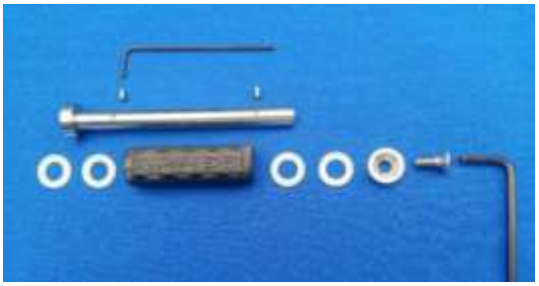
CAUTION

IMPORTANT: before engaging and unscrewing the two lateral Allen screws (14 / 23) for the locking collar hinge removal, remember to remove the two grains (24 / 25). Else, the system can be damaged.

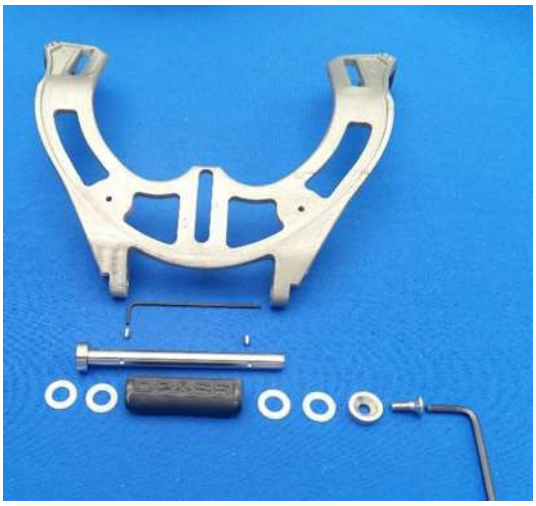
4. Unscrew and remove the two Allen screws paying attention not to lose the two Teflon® washers outside and the two Teflon® washers inside the locking collar hinge (16 / 17 / 19 / 21) and the two spacers (15 / 22)

5. Remove the screws and the hinge axis(20)
6. If one of the two Allen screw/bushing remain in position on one side, extract the hinge axis/bushing Teflon® washer and screw assembly simply pushing with the Allen key inside the free bore, where thescrew/bushing assembly has been removed

7. Remove the hinge axis freeing the central black pad (18)
8. Remove the black pad (18)
9. Continue the hinge axis (20) extraction until free



10. Detach the locking collar (30) from the pull pins if engaged and remove the locking collar



11. Clean all parts that are intended to be reused

9.8.2 LOCKING COLLAR DISASSEMBLY

Required tools:

- N 10 Slot blade attachment on torque screwdriver
- N. 22 Open end wrench

1. Before disassembling the locking collar, mark the screws position relevant to the neck pad position in order to further reposition it at the same position once completed the required intervention
2. Unscrew and remove the three Allen screws holding the neck pad position locking system
3. Slide and remove the neck pad off the locking collar
4. If the neck pad needs to be replaced, remove and save the screws T-washers and adjustment nuts for reuse

9.8.3 LOCKING COLLAR REASSEMBLY

Required tools:

- 2mm Allen Key
- 2 x 4mm Allen key
- 4mm Allen key insert attachment on Torque Wrench

1. Inspect and replace as required the Teflon® washers
2. Insert and replace as required the neck pad, if damaged
3. Capsize the helmet and position the locking collar hinge between the helmet eyes, do not engage the locking collar with the pull-pins
4. Take the hinge axis and insert the first Teflon® washer
5. Insert the hinge axis and as soon as it is passed through the locking collar hole, position the second Teflon® washer
6. Engage and pass through with the hinge axis the relevant helmet hole
7. Position the black pad and continue with the hinge axis insertion up to hinge axis protrusion from the second helmet hole
8. Position the third Teflon® washer and engage the remaining locking collar hole
9. Completed the hinge axis insertion position the last Teflon® washer
10. Position the second bushing and Allen screw

11. Tighten the assembly with the two Allen keys as per specified torque, see § *"11 Appendix 1 – Torque Tables"*
12. Completed the tightening of the hinge axis, position the grains
13. With one Allen key rotate the hinge axis assembly until one of the grains is engaged
14. Engaged the first grain, insert the second grain and, ensured both grains are properly engaged with the relevant seats, tighten the two grains with the N.2 Allen key at specified torque, see § *"11 Appendix 1 – Torque Tables"*
15. Engage the locking collar with the pull-pins and check the correct functioning

In case of doubt or for further information, contact DRASS.

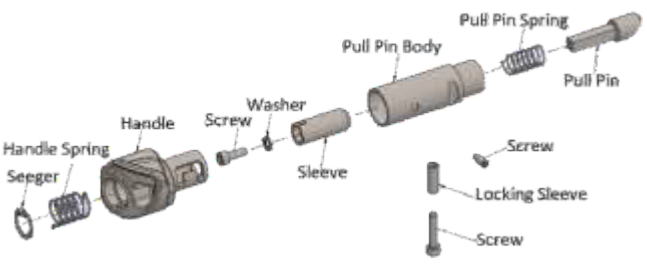
9.8.4 NECK PAD

For the neck pad description and setting, see section *"5 Operative Instructions, § 5.3.3 Neck Pad and § 5.3.4 Neck Pad Adjustment"*.

9.9 HELMET PULL PINS

The two pull pins are an important safety system of your helmet. Purpose of their function is the safety locking of the helmet. If the pull pins do not work properly, a maintenance of the system is required.

If notwithstanding the maintenance done to the pull pins system they continue to fail, the helmet must be returned to DRASS or to a DRASS authorized dealer for further investigation / repairs.



9.9.1 GENERAL

The helmet once donned is hold in position by means of the locking collar, open and closing of the locking collar with the helmet shell, is done by means of a latching system made with an intrinsically safe double action operated pull-pin system.

The two pull-pins locking system, one on each side of the Helmet, keeps the neck-dam-ring/helmet-assembly safely together secured.

Activation of the pull-pin system require the following maneuvering:

- A Rotation to unlock the system
- A firm forward pull
- A further rotation to fix each Pin in open position

When donning the helmet, if the two locking pins are left in the closed position, once the locking collar is engaged, they will simply snap to the locked position.

Opening of the helmet, require the double action described to disengage the pins from their locked position thus preventing any inadvertent mis-maneuvering.

In the unlucky event of both pull-pins system breakage, the dislodging of the helmet from the locking collar, due to the bubble of air inside, that pushing upwards might cause a situation leading to serious injuries, drowning and death, is totally prevented.

The intrinsically safe pull pins system, keeps the pins in the closed position, ensuring the safe latching between the locking collar and the helmet shell.

Further to that, considering the up thrust caused by the helmet interior bubble of gas that may push upward the helmet shell,

the Neck Pad
the Chinstrap

synergic action makes the helmet dislodging a very unlikely, if not impossible, event.

If the locking pull pins system get damaged, blocked or else, once at surface or in the diving bell, the Tender, inserting a pin in the hole placed at the back of each pull pin system and pushing forward, can easily release the pull pin and open the Helmet.

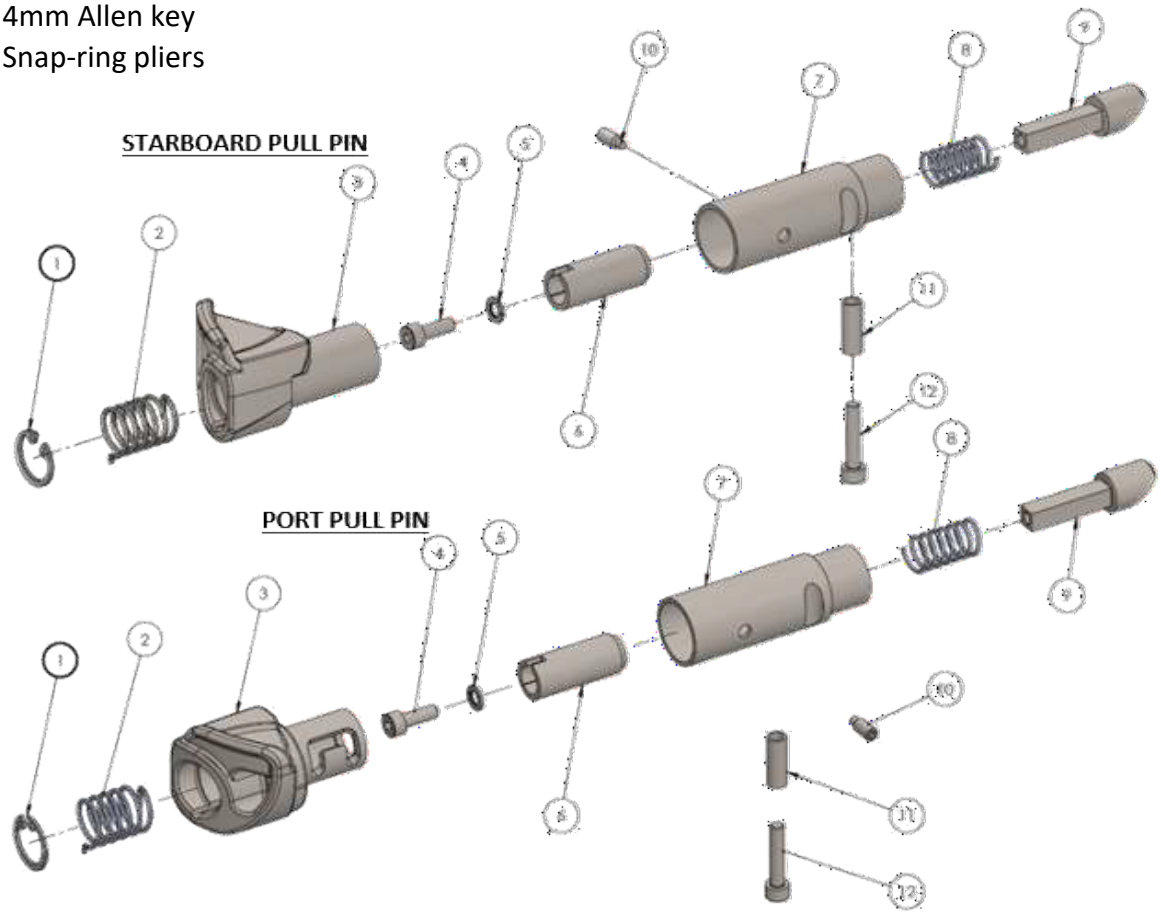
9.9.2 PULLPINS REMOVAL

Pull-Pins are a simple mechanism that do not require a specific maintenance. A simple rinse in fresh water is enough to keep the system clean and ensure correct functioning.

Required tools:

- 4mm Allen key
- Snap-ring pliers

1 With the snap-ring pliers remove the internal Seeger (1) and spring (2)
2 With the Allen key unscrew and remove the lateral screw (10) and the locking sleeve screw (12)
3 Remove with care the screw and washer retaining the sleeve. In doing so, attention to the springs (2/8) that may pop out the mechanism. Extract all internal component
4 The pull pin body mechanism can now be cleaned properly
5 Repeat the above for the other side pull pin



9.9.3 PULLPINS REINSTALLATION

1. After a thorough cleaning of all parts, insert the pull pin in the sleeve
2. Reinsert the pull pin body in its seat centering the retaining lateral hole with the Allen screw
3. Insert the locking sleeve Allen screw
4. Insert the handle and insert the fixing Allen screw with the washer
5. Tighten the lateral Allen screw
6. Tighten the sleeve screw
7. Reposition the internal Seeger

9.10 CHINSTRAP

The chinstrap is the strap that secures the helmet under the diver chin. When the helmet is donned, diver to totally slack the chinstrap before positioning his head inside the helmet. Once the helmet is properly donned, before the neck dam ring positioning, diver to tighten the chinstrap as required under his chin in order to further keep the helmet in position. Tightening of the chinstrap is a personal matter that may differ from diver to diver. Some may prefer it very tight other may prefer some slack. Whichever the case it helps to keep the helmet in position and enable the helmet rotation with the divers' head. It is a consumable component and when its substitution is required do the following steps.

9.10.1 CHINSTRAP REMOVAL

NOTE: The chinstrap is replaced as a complete unit: Chinstrap/Press studs/Fixing plate/Screws

- #1 Philips screwdriver

1 Remove the two screws holding the chinstrap press studs

2 Remove and discard the worn-out chinstrap

3 Clean the threaded holes

9.10.2 CHINSTRAP REPLACEMENT

NOTE: The chinstrap is supplied as a complete assembly with a new set of screws

Required tools:

- #1 Philips screwdriver
- Thread lock Loctite® 248 medium strength stick

1 Install the new chinstrap making use of the new screws supplied as a kit with the new chin strap

2 Make sure the new chinstrap is in the same configuration as the old one. The chinstrap should be installed to pull to the right when the helmet is donned

3 With a torque screwdriver, tighten the two screws at the specified torque value, refer to § "*11 Appendix 1 - Torque Tables*".

9.11 PRESS STUDS

Press studs to fasten and secure the head cushion, are all secured by screws and are positioned along the helmet shell neck ring.

Some of the press studs utilized for the head cushion fixation, are an integral part of the Chinstrap and the Earphone Retainer and they are supplied together with the relevant parts.

To ensure that the press studs remain in position during the utilization, a light coat of

thread lock, Loctite® 248, must be applied on each screw and the proper torque value must be applied, refer to *"11 Appendix 1 - Torque Tables""* for correct torque value.

9.11.1 PRESS STUDS REMOVAL

Required tools:

- #1 Philips screwdriver

1 Remove the head cushion

2 Unscrew the screws relevant to each press stud(s) that is meant to be substituted

9.11.2 PRESS STUDS REINSTALLATION

Required tools:

- #1 Philips screwdriver
- Thread lock Loctite® 248 medium strength stick

1 After the removal of the intended press stud(s) the same can be replaced with new ones. In case of chinstrap or earphone retainer(s) press-studs substitution, the press-studs are an integral part of the components and cannot be replaced separately

2 Before press-studs installation, clean thoroughly and properly the relevant surfaces and threads removing any trace of dirt, encrusted salt. If required, make use of a solution of freshwater and vinegar and scrub the thread with a soft brush. At cleaning completion, before the new press stud reinstallation, make sure that the threads are dry

3 Align and insert the base of press stud(s) holding L shaped plate with the relevant slot on the helmet shell

4 Apply a light coat of thread lock Loctite® 248 on the screw(s) thread(s)

5 Once ready reinstall and tighten the screw(s), refer to § "*11 Appendix 1 - Torque Tables*" for correct torque value

9.12 HEAD CUSHION

9.12.1 HEAD CUSHION FOAM

Every helmet is supplied with a standard head cushion and If required by the diver, the head position can be better tailored to suit the Helmet inner design.

When the foam starts to crumble it must be replaced. A crumbled, loose head cushion can create discomfort to the diver. Moreover, the loose head cushion will cause oral/nasal mask poor fitting, resulting in an increased CO_2 buildup in the helmet.

To check the foam integrity, don the helmet and see if moving the head, the helmet follows accordingly or not. Replace the foam as required. Part number xxx-xxx.

9.12.2 FIT TEST OF HEAD CUSHION

The helmet if properly don, should follow the diver's head movement. To make sure that no more padding or other adjustments are required to get the helmet proper fitting:

1. Verify the neck pad has been properly set for the diver's size and comfort
2. Place the head cushion inside the helmet and fix it to the relevant snaps
3. Don the helmet and, moving the head, evaluate if it is correct or adjustments are required
4. Make sure the oral/nasal mask is properly sealing onto the diver's face and the helmet moves accordingly to the diver's head movement

9.12.3 REMOVAL OF THE HEAD CUSHION

The head cushion is fixed inside the helmet by press studs and its removal is done by gently separating the press studs one at a time.

9.12.4 HEAD CUSHION BAG STUFFING

Depending on diver's preferences and comfort, the foam of the head cushion, can be stuffed inside the cushion bag in different ways. Every diver has his own specific requirement and the foam can be trimmed and the cushion bag stuffed depending on fit desired. The eggshell side of the foam is usually placed outward, against the helmet shell. The eggshell foams are supplied leftand right in order to keep the egg shapeoutside towards the helmet shell.

1. Open the zipper at the back of the head cushion bag
2. Detach the upper strip fixed with Velcro® used to adapt the head cushion bag to the thickness of the inserted foam pads

3. Start inserting either the right or left egg-shaped foam on relevant side of the head cushion bag, keeping the egg shape outside, toward the helmet shell

4. Both foam pads inserted, ensured they are in correct position, close the zipper

5. Reposition the head cushion bag size adapter as required

9.12.5 TRIMMING

In case the head cushion resulted too tight, the eggshell surface of the foam can be trimmed to get a better fit

9.12.6 INSPECTION AND CLEANING

Detach from the relevant press-studs the head cushion, wash it in a solution of mild soap. Gently brush the fabric with a soft nylon brush and complete with a spry of sanitation agent. Rinse in fresh water, squeeze out the excess of water and let it dry. Remove the inside foam only if strictly necessary, it will dry given enough time without removing the cushion foam.

Inspect the foam of head cushion. If wear, crumbling of foam is noted, replace with new ones

To hang the head cushion during the drying period, a convenient strap is supplied. Provided by a press studs that can be engaged on every stud present on the head cushion, allows the hanging in a proper way.

9.13 COMMUNICATION SYSTEM

9.13.1 GENERAL

The helmet is equipped with a high-quality microphone/earphone set that, depending on users' needs and convenience, can be set-up in 2 wires or 4 wires (Round Robin) configuration. The helmet is sold with the DRASS standard configuration of 4 wires.

The wiring is conveyed to a comms. pod on the right side of the helmet from where the cable or connector exit with an ergonomic 90° angle, in line with the helmet contour.

The comms exit can be equipped or by a normal pigtail with a RM4 4M connector or by a waterproof connector bulkhead connector MCBH4

Proper and clear two-way communications between the diver and the surface is of paramount importance in the commercial diving. DRASS helmet communication system however robust, reliable and uncomplicated, anyhow require a regular and careful maintenance to ensure functioning.

9.13.2 EARPHONE INSPECTION

For the earphone maintenance, the head cushion must be removed to get access to the earphone retainers, one on each side of the helmet.

Carefully extract the earphones from the retaining system to carry out inspection and maintenance.

1 With the earphones extracted, remove the rubber front cover, the earphone protector and then remove the rear cover making it slide along the wire

2 Look for presence of moisture and, if detected, dry the covers and then dry the earphone. As required, some proper electronic detergent can be used for the moist removal from the earphone

3 Inspect the wire connections at the earphone. They should be sound and solid with no cracks or other visible damage

4 Inspect the mylar diaphragm of the earphones for punctures, damages that may prevent their correct functioning. Replace as required

5 Smoothly push in the mylar diaphragm, it should freely move. Make sure the diaphragm can move back and forth, as a piston. If gently pushing-in the diaphragm is not possible or difficult, if a rubbing or scratching during the gentle pushing is detected, it means that the small moving-coil of the speaker is seized or is starting to seize

6 If during the inspection, the above point 5 is ascertained, the sound produced by the earphone can be either or drastically reduced or not being present at all. In these cases, in trying to restore the loudspeaker functionality before replacement, an attempt can be done applying some electronic detergent inside the earphone magnet and the moving coil annulus

7 Apply a large amount of the contact cleaner in the loudspeaker air gap keeping it in straight position. Allow the detergent to work for several minutes then, gently exert a light pushing, piston movement to the mylar diaphragm, checking for smoothness of movement if any. The application of the electronic detergent, depending on gravity of situation, by lubricating the annular gap where the moving coil slides, may restore the situation allowing the diaphragm possibility to move smoothly back and forth again. If this is not the case and the diaphragm results to be blocked or the sound has not improved even after the detergent application, the earphone must be replaced

8 Check the earphones rubber covers, front and rear for damages, punctures or excessive wear and replace accordingly

9.13.3 COMMUNICATION ASSEMBLY REMOVAL

No tools are required for this operation.

The system should be checked daily, making sure it is installed correctly and is soundly tightened.

To check the system, loose by hand the mounting nut about 3mm/6mm counterclockwise and then retighten by hand. The proper seal of the module is achieved by simply hand tightening the system that does not require further tightening, since excessive tightening torque may cause parts failure.

In case of need, the communication system replacement can be done as follows:

1 Remove the earphones from the relevant retainers

2 Pull out the microphone from the oral/nasal mask

3 Unscrew the communication mounting nut from the outside of the helmet body

4 Unscrewed the large plastic nut, gently push the communication module inside the helmet interior. Remove the O-Ring

5 As a set, the communications assembly can be replaced entirely for a rapid turnaround.

9.13.4 COMMUNICATION ASSEMBLY REPLACEMENT

1 Lubricate slightly and reinstall the O-Ring onto the communication module

2 Insert the communication module from the helmet interior towards the outside, with the waterproof connector assembly pointing backwards, towards the rear of the helmet

3 By hand, screw-in the communication mounting nut. Tighten by hand until it is firmly against the helmet. Never use a wrench to tighten it

4 Reposition the earphones inside the earphones' retainers

5 Properly route the earphones' wires in order not to create a hindrance to the diver's visual. Make sure the left earphone's wire, is routed and tucked between the lower side of the oral/nasal mask and the helmet shell

6 Connect the Helmet to a suitable communication system and make sure about the correct working

7 Loud and clear communication to and from the Helmet should be heard

9.13.5 MICROPHONE REPLACEMENT

Required tools:

- 3mm Flat Blade Attachment on Torque Screwdriver
- Tie Wrap Cutter

1. Remove the entire communication assembly as per § *"9.12.3 Communication Assembly Removal"*
2. Remove the rubber cover
3. Remove the screws and washers from the communication module
4. Lift the terminal lugs out of the communications module. Take note of the position of the terminal wires
5. Install the terminals for the replacement microphone. Note that the wires must go on separate terminals, just as before
6. Reinstall the microphone inside the oral/nasal mask

9.14 EARPHONE REPLACEMENT

In case only one or both earphones are damaged and need to be substituted, the replacement can be done without the need to completely remove the communication module.

The earphone can be replaced by simply removing the tie-wrap inside the covers, unscrewing the wire posts and replacing the necessary component(s).

Note that the earphones' front cover is more delicate than the back one, and damage may occur if improperly handled.

9.14.1 REMOVING EARPHONE SPEAKER

Required tools:

- #1 Philips screwdriver

1 Remove the front earphones' cover, the clear one, and slide it down along the wire

2 Remove the Earphone protector that is simply held in position by the front cover

3 Remove the back cover from the earphone and slide it along the wire

4 Cut the tie-wrap holding the wire to the earphone

5 Loosen the screws holding the wires

6 Remove both wires, the red and the black from the earphone

9.14.2 EARPHONE SPEAKER REINSTALLATION

Before connecting the new earphone(s), make sure the covers are in place along the wire.

1 Loose the screws from the earphone's posts by two to three turns in order to further allow the wire's ends insertion

2 When the screws at the earphone posts are loose enough, insert the wire leads inside the relevant terminal place and tighten the screws

3 Make sure the black wire is inserted inside the left terminal and then tighten the screws

4 With the tie-wrap fix the communication wire at the earphone speaker structure. The tie-wrap should grab the outer grey sheath and should not touch the red or black wire

5 The tie-wrap should be installed in such a way that the head should face aside or away from the speaker backside

6 Once wire properly fastened to the earphone speaker, cut the tie-wrap excess and replace cover set and earphone protector

7 At completion, test for proper function

9.15 WATERPROOF CONNECTOR

DRASS helmet communication system is equipped by a waterproof connector that, if the helmet is mishandled receiving a rough handling, may suffer failure.

In the following, the procedure to replace the waterproof connector.

9.15.1 WATERPROOF CONNECTOR REMOVAL

Required tools:

- N. 19 Open End Wrench
- 3mm Flat Blade Attachment on Torque Screwdriver

1 As per § "*9.12.3 CommunicationAssembly Removal*", remove the communication assembly

2 Remove the rubber cover

3 Remove the screws and washers from the communication module

4 Remove the microphone and earphones wire terminals from the communication module interior

5 Making use of the N. 19 open end wrench, unscrew the waterproof connector from the communication module

6 Detach and gently pull the connector from the module

9.15.2 CONNECTOR REPLACEMENT

1. Insert the new waterproof connector inside the communication module
2. Screw the waterproof connector into the nut, tightening until firmly snug
3. Making use of the N.19 open end wrench, tighten the waterproof connector
4. Place the waterproof connector wires in the connector, see scheme
5. Route the earphone wires into the module
6. Using the washer and screw, install the black wire from the right (short) earphone and the red wire from the left (long) earphone
7. Using the washer and screw, install the black wire from the left (long) earphone and the red wire from the right (short) earphone
8. Position the microphone wires inside the module
9. Using the washer and screw, install the red and white microphone wires into the module
10. Slide the O-ring down the waterproof connector wire and install it over the communications module

10 DRASS D-ONE ACCESSORIES

10.1 BUMPER PLATES

DRASS D-ONE helmet comes equipped with two lateral polyurethane plates that act like bumpers. These bumper plates can be removed and in place can be installed brackets for the video camera and light.

If using DRASS dedicated video camera and light, opportune mounting brackets are part of the supplied kit.

If helmet owner intends to install his own or aftermarket video camera and light, the two supporting brackets design are left to the owner.

The mounting brackets used for the video camera and light installation, will be soon improved to support the under development DRASS new patented system DMSM™ (Diver Monitoring System Module), that enable the routing of the two cables inside the helmet preventing the usual deterioration of the connectors.

10.1.1 REMOVAL OF BUMPER PLATES

Required Tools

- 4mm Allen key
- Torque wrench with 4mm Allen Key insert

1. With the 4mm Allen key, unscrew and remove from each of the intended to be used mounting bracket, the 3 screws holding the bumper plates onto the helmet

2. If User intend to Install the DRASS video camera and light kit, the kit is engineered to make use of the three threaded holes, on each side of the helmet, holes used for the fixation of the bumpers plate
3. If User intend to install his own video system or other accessories, User to design the relevant brackets making use of the same three threaded holes on each side of the helmet
4. For Brackets correct torque value tightening, refer to § “9 Appendix 1 – Torque Tables”

10.1.2 REINSTALLATION OF BUMPER PLATES

As required, the two bumper plates can be reinstalled simply removing the accessory previously installed.

1. Remove the accessory(ies) installed on helmet side(s)
2. Clean the helmet shell with a “scotchbrite®” type sponge removing any trace of dirt, spot of oxidation
3. If not already done, clean the inner surface of the polyurethane bumper plates
4. Apply a light lubricant to each of the three Allen screws that hold the bumper plates
5. Reposition the bumper plates and screw in the three Allen screws tightening with a torque wrench and an Allen key 4mm insert to the specified torque. See § “9 Appendix 1 – Torque Tables”

10.1.3 SUGGESTED FIRST STAGE REGULATOR

Perfect companion of the DRASS D-ONE helmet is a certified first stage regulator fitted with a safety relief valve will bleed off the excessive gas pressure.

Setting point up to 9.5 bar over ambient pressure, minimum flow rate as per EN 250.

11 APPENDIX 1 – TORQUE TABLES

Components *"Blow Apart Reference #"* refers to relevant blow apart drawing

11.1.1 HANDLE

Blow Apart Drawing #	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
140-200	140-205	M4 x 12 ISO 10642	*2*	*5*	*1,7*
140-200	140-208	M5 x 10 ISO 7380	*3*	*9*	*3,4*
140-200	140-209	M6 x 10 ISO 7380	*2*	*8*	*5,9*

11.1.2 PORT VIEW ASSEMBLY

Blow Apart Drawing #	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
140-300	140-302	M5 x 10 ISO 7380	*15*	*4*	*3,4*
140-300	140-310	M6 x 10 ISO 7380	*2*	*5*	*5,9*

11.1.3 NOSE BLOCK ADAPTER

Blow Apart Drawing #	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
140-400	140-408	M4 x 12 ISO 4762	*2*	*11*	*1,7*

11.1.4 LOCKING COLLAR ASSEMBLY

Blow Apart Drawing #	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
140-500	140-507	M3 x 16 ISO 10642	*4*	*27/29*	*1,35*
140-500	140-508	M4 x 16 ISO 10642	*5*	*1/3/6/8/11*	*3,0*
140-500	140-515	M4 x 6 ISO 4027	*2*	*24/25*	*3,0*
140-500	140-505	M6 x 16 ISO 10642	*2*	*14/23*	*10,4*

11.1.5 NECK RING ASSEMBLY

22	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
140-600	140-626	M3 x 8 ISO 10642	*7*	*17/24/26/*	*1,0*
140-600	140-631	M3 x 8 ISO 7380	*2*	*9*	*1,0*
140-600	140-606	M3 x 10 ISO 7046	*33*	*1*	*1,0*
140-600	140-622	M3 x 12 ISO 7984	*2*	*10*	*1,0*

11.1.6 STARBOARD PULL PIN ASSEMBLY

Blow Apart Drawing #	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
141-100	141-110	M4 x 10 ISO 4028	*1*	*10*	*1,7*
141-100	141-105	M4 x 12 ISO 4762	*1*	*4*	*1,7*
141-100	141-109	M4 x 20 ISO 4762	*1*	*12*	*1,7*

11.1.7 PORT PULL PIN ASSEMBLY

Blow Apart Drawing	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
141-200	141-110	M4 x 10 ISO 4028	*1*	*10*	*1,7*
141-200	141-105	M4 x 12 ISO 4762	*1*	*4*	*1,7*
141-200	141-109	M4 x 20 ISO 4762	*1*	*12*	*1,7*

11.1.8 CHINSTRAP ASSEMBLY

Blow Apart Drawing #	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
141-400	141-903	M3 x 6 ISO 7046	*2*	*3/11*	*1,0*

11.1.9 NECK RING CATCHER ASSEMBLY

Blow Apart Drawing #	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
141-500	141-504	M6 x 20 – ISO 7380	*2*	*1/6*	*5,9*

11.1.10 SNAP ASSEMBLY

Blow Apart Drawing #	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
141-900	141-903	M3 x 5 ISO 7046	*6*	*4*	*1,0*

11.1.11 PORT SIDE BUMPER ASSEMBLY

Blow Apart Drawing #	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
142-700	142-702	M5 x 10 ISO 7380	*3*	*2*	*3,4*

11.1.12 PORT COVER ASSEMBLY

Blow Apart Drawing #	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
142-800	142-802	M5 x 10 ISO 7380	*3*	*3*	*3,4*

11.1.13 STARBOARD COVER ASSEMBLY

Blow Apart Drawing #	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
142-900	142-802	M5 x 10 ISO 7380	*3*	*1*	*3,4*

11.1.1 SECOND STAGE REGULATOR ASSEMBLY

Blow Apart Drawing #	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
150-000	151-012	M4 x 8 ISO 7380	*2*	*32*	*3,0*
150-000	151-008	M4 x 10 ISO 7380	*2*	*31*	*3,0*

11.1.2 SIDE BLOCK ASSEMBLY

Blow Apart Drawing #	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
140-700	140-626	M3 x 8 ISO 10642	*1*	*21*	*1,35*
140-700	140-631	M3 x 8 ISO 7380	*2*	*22*	*1,35*
140-700	140-735	M5 x 16 ISO 4762	*1*	*53*	*6,1*
140-700	140-724	M5 x 30 ISO 4762	*2*	*54*	*6,1*

11.1.3 ONE WAY VALVE ASSEMBLY

222	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
140-700	140-742	Seat to Body	*1*	*1*	*148*
140-700	140-741	Body to Side Block	*1*	*7*	*35/40*

11.1.4 AIR TRAIN ASSEMBLY

Blow Apart Drawing #	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
141-000	141-004	Side Block Screw	*1*	*3*	*1,0*

11.1.5 AIR POD ASSEMBLY

Blow Apart Drawing #	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
142-000	140-631	M3 x 8 ISO 7380	*2*	*23*	*1,0*
142-000	142-212	M4 x 12 ISO 7380	*4*	*1/13*	*1,7*
142-000	142-113	M5 x 12 ISO 7380	*8*	*18*	*3,4*

11.1.6 EXHAUST SYSTEM ASSEMBLY

Blow Apart Drawing #	Part #	Description	Qty.	Blow Apart Reference #	Torque in Newton Meters
142-200	142-212	M4 x 12 ISO 7380	*4*	*4/13*	*1,7*

11.1.7 TORQUE SPECIFICATIONS - NOTES

NOTE 1: Use Teflon® tape for two to two and a half wraps, starting two threads back from the pipe thread end of the fitting to avoid getting Teflon® tape in the valve. Tighten pipe thread using standard pipe threading procedures.

NOTE 2: DRASS recommends that torque tools be calibrated annually.

(Allowable deviation: ± 8%).

*The screws may need adjustment after several dives.

12 APPENDIX 2 – MAINTENANCE AND INSPECTION PROCEDURES

12.1 GENERAL INSPECTION

DRASS can assure its helmet is made following the highest standard, however, routine inspection and scheduled maintenance, can grant that this sensitive important piece of your gear remain fully operational.

Most of the items composing the helmet have a long-lasting life before a replacement become necessary, others, according to their service life may require a replacement, and further others, to ensure the correct functionality, have a maintenance period that needs to be followed by the Users, to ensure the helmet proper functioning.

Besides the Helmet foreseen scheduled maintenance, a minimum standard for the care of the helmet is established inagreement with the activities carried out, by the type of usage done. Diving in contaminated waters, sandblasting or welding/cutting activities, suggest for an increased maintenance, and replacement of rubber parts may be necessary.

The Diver, accustomed with his helmet and/or the Diving Supervisor, shall instruct the Competent Person to apply the proper care required.

A helmet used in fresh water requires a different maintenance approach than a helmet used in saltwater.

Anyhow, regardless to the usage, a helmet should be fully cleaned and inspected yearly, and all rubber parts lubricated and/or substituted accordingly as per Helmet scheduled maintenance "*Module M1A_Annual*".

Diving in presence of fuel oil, chemicals, may cause a more rapid degradation of the helmet rubber parts, that may swell, become soft or break.

Whenever the integrity of a part or a component of the helmet is in doubt, replace it. In any case all parts have a service life and sooner or later a replacement is required.

12.2 COMPONENTS / PARTS REUSAGE

In case a part or a component is inspected between scheduled maintenance intervals, it is possible to reuse the O-Rings, provided an accurate visual inspection ensure they are fit for purpose.

All O-Rings must be replaced as per scheduled maintenance periods, even if they are apparently in good state. All O-Rings must be lubricated with appropriate lubricant before reinstallation, see following § "*1.3 O-Ring care".*

12.3 O-RING CARE

When carrying out helmet maintenance, the various O-Ring need to be removed to allow a proper cleaning.

Make sure not to damage the O-Rings and the relevant seats during the removal as well as during the repositioning.

For the O-Ring removal, start with your finger and, if it is too tight, do not use a screwdriver, but make use of appropriate tools made of brass or plastic.

In doing so is prevented the possible scratching of the O-Ring seat that may cause and improper sealing even with the installation of a new O-Ring, that may lead to leakage

During the maintenance, inspect and ensure the O-Rings are in good condition, before re-usage. O-Rings can be re-used after a thorough clean and inspection to ensure that no damage or wear can affect their sealing. In case, discard and substitutes with new ones.

For the re-usage of O-Rings, the old grease must be removed. Place the O-Ring and all soft goods in a basin and wash them with a mild detergent solution to remove all old grease. At the end, rinse the cleaned materials with fresh water and use a softcloth to wipe them an let dry in air. Once dried, check for any cuts, abrasion or deformities and, after lubrication with new grease, reinstall or replace accordingly.

Never re-use a deformed, pinched, blistered or showing other signs of deterioration, O-Rings. In case of doubt, always replace them.

During maintenance, do not mix different brand of grease, in case of doubt, clean properly the O-Ring and lubricate with a single type of grease before reinstallation.

12.4 TEFLON® USAGE

DRASS DRASS D-ONE helmet consider the usage of Teflon® tape only at the side block on the threads of the umbilical NPT adapter.

No other part requires the use of Teflon® tape.

Beware of liquid sealant usage, use only Teflon® tape.

When applying Teflon® tape use it in a clockwise direction and apply 1 - 1 ½ wraps; using more may cause the excess Teflon®tape to travel into the breathing system; do not overtighten when installing.

12.5 USE OF LUBRICANT

DRASS supply its helmet perfectly clean, lubricated with an Oxygen compatiblegrease, (DRASS make use and suggest using Christo lube®) and the helmet can be safely utilized with enriched oxygen mix up to 50%.DRASS reckon that their helmets, used with a low-pressure supply, typically <17bar, does not pose significant increased risk of fire or ignition inside the helmet. If the helmet is well kept and cleaned according to maintenance specifications, the helmets do not require a specific cleaning, oxygen specialized cleaning that are normally performed when using regulators, valves, pipes in high-pressure oxygen systems.

Based on years of experience, helmets used for mixed gas diving are less prone to be contaminated with oil or particulate than helmets used for air diving only.

As a thumb rule, helmets utilized with air and oxygen enriched breathing mixes, should be cleaned and inspected more frequent and with greater care.

All internal components deputed to the gas flow such as, demand regulator, bent tube, side block, defogger air train, are kept clean and free from hydrocarbon contaminant or particulates and, every time the equipment is depressurized, the exposed/open ports and fittings, should be plugged to prevent foreign material contamination.

All components should be cleaned as per maintenance manual procedure at least yearly and/or whenever there is a suspect of contamination.

Proper daily cleaning of helmets, at the end of the diving activities, helps to keep the helmet in good service order, and helmets utilized in contaminated or polluted waters require an accurate cleaning and sanitation after each dive.

DRASS recommends to always use the same lubricant for their helmets' lubrication, whatever the chosen one, do not mix lubricants.

Always apply approved lubricant sparingly and make sure the chosen lubricant is approved for oxygen use. DRASS recommends and lubricate all helmets during the assembly with Christo® lube.

DRASS recommends that all repairs should be carried out by a Competent Person with only genuine DRASS spare parts.

Users that intend to carry out the required maintenance and repairs by themselves, should possess the knowledge and experience, always following the DRASS Maintenance Manual.

As a suggestion always keep the receipts of the replaced components for additional history of maintenance.

Whenever in doubt or should any question about procedures or components arise, contact an authorized DRASS dealer or DRASS at:

12.6 HELMET SUPPLY PRESSURE REQUIREMENTS

DRASS helmets can be used with different type of gas supply systems, provided that the system utilized can supply a 9,5bar over ambient pressure, typically =<15bar.

In § "*12.6.2 Table - 1 "Balanced Demand Regulator Pressure Settings*" are reported the optimum and maximum supply pressure up to -50msw.

12.6.1 WORK RATES

Divers' work rate is based on the Respiratory Minute Volume expressed in liter per minute.

Divers should never push the work rate beyond the normal labored breathing that lays in the 30 – 50 RMV.

When the diver reaches the 55 RMV he enters in the extreme range; fit divers can do 75 RMV for a short period of time, one to two minutes.

As a thumb rule, the divers' work rate should never be so heavy that divers cannot maintain a conversation with surface. Whenever the work rates hit the 40/55 RMV, moderately/heavy range, the diver should slow down.

According to studies made by the US Navy, there are limits that are depending on the type of work exerted, in the following, the U.S. Navy Diving Manual "*Relation of Respiratory Minute Volume and Oxygen Consumption Rate to Type and Level of Exertion*" Table extract:

WORK RATE AS RESPIRATORY VOLUME - RMV		
Workload	**RMV**	**Equivalent Land Based Exercise**
Rest	7 – 10 RMV	Standing still, sitting quietly
Light Work	10 – 20 RMV	Walking 3 km per hour
Moderate Work	20 – 37 RMV	Walking 6,5 Km per hour
Heavy Work	37 – 54 RMV	Running 12/13 Km per hour
Severe Work	55 – 100 RMV	Running uphill, Swim 1,2 Knots

Underwater, the inhalation/exhalation efforts increase due to the increased density of the breathing gas and resistive effort of the equipment. These may lead to an increase of CO_2 blood level since the diver cannot ventilate as freely as at surface.

Divers should keep their equipment properly maintained, in order to always have the best performance and know and understand their equipment capabilities and performance.

Periodic tests should be carried out to ascertain flow capabilities and limitations of the supply system, including umbilical, and the results should be known to everybody involved.

12.6.2 TABLE 1 – BALANCED DEMAND REGULATOR PRESSURE SETTINGS

Depth	**Regulator Setting BAR**	
meter	Optimum BAR	Maximum BAR
0 – 18	7	10
19 – 30	8,6	10,3
31 – 40	12	15,5
41 - 50	14	17

To fulfill the Regulation requirements, the supply pressure to apply to the regulator is calculated with 75L/min @a depth of 50msw.

It means that the air system utilized to supply the diver at the maximum allowed working depth of -50msw, should ensure not less than 450L/min (75 x 6) with a 3/8” (9.5mm) umbilical of 100 meters.

13 APPENDIX 3 - TROUBLESHOOTING

Proper usage and preventive maintenance can preserve the helmet from malfunction. Remediate of helmet problems can be easily done. In the following tables most possible operational issue.

13.1 COMMUNICATION MALFUNCTION

Symptoms	Probable Cause	Remedy
No sound at either communications box or helmet	Communication box. not on	Activate switch and adjust volume.
	Communications incorrectly hooked up.	Switch terminal wires.
	Communications not hooked up.	Plug into terminals
	Communicator not functional	Replace communicator.
	Broken/damaged comm wire	Check continuity replace wire or umbilical.
	Battery dead	Recharge / use alternate D.C. source
Communications weak or broken up.	Terminals in communications module corroded.	Clean terminals with wire brush. Terminals should be bright, shiny metal.
	Battery weak	Recharge / use alternate D.C. source
	Loose wire	Clean and repair.
Communications only work when wire is wiggled back and forth.	Break in diver's communication wire.	Splice wire if damage is minor. Replace wire if damage is major
Communications only work when connector is wiggled back and forth.	Break in waterproof connector.	If connector is suspect, remove from line and test line for integrity prior to replacing connector.
Diver speech weak or cannot be heard.	Microphone in helmet dead or damaged.	Replace microphone as per manual

13.2 ONE-WAY VALVE MALFUNCTION

Symptoms	Probable Cause	Remedy
One-way valve allows back-flow	Foreign matter in valve	Disassemble valve, clean and re-build. Replace if needed.
One-way valve does not flow any gas.	Foreign matter in valve	Disassemble valve, clean and re-build. Replace if needed.

13.3 SIDE BLOCK MALFUNCTION

Symptoms	Probable Cause	Remedy
Steady flow cannot be shut off. Hel-met free flows through defogger.	Seat assembly damaged or de-bris under seat.	Clean and/or replace seat assembly. Check - clean side block seal area.
	Side Block damaged by debris	Replace side block.
Steady flow valve will not flow gas.	No air in umbilical.	Turn air on to diver's supply topside.

	Foreign matter inside block or one-way valve.	Disassemble side block one-way valve and clean.
Steady flow valve knob hard to turn.	Valve stem bent.	Replace valve stem

13.4 WATER LEAKAGE INTO HELMET

Symptoms	Probable Cause	Remedy
Water leakage into helmet.	Exhaust valve damaged or stuck open.	Seat or replace valve
	Communications module O-Ring extruded or damaged.	Replace O-Ring
	Communications module not properly tightened.	Tighten module mount nut.
	Communications module damaged.	Replace.
	Binding posts or connector seal damaged.	Remove posts, clean and reseal with RTV sealant.
	Diaphragm damaged or not seat-ed properly.	Seat or replace diaphragm
	O-Ring in neck dam ring dam-aged or missing.	Replace O-Ring.
	Port retainer screws loose.	Replace neck dam.
	Neck dam torn or damaged	Replace neck dam.
	Hair caught between O-Ring and base of helmet.	Remove hair from this space
	Head cushion or chinstrap caught under O-Ring at neck dam.	Clear cushion or dam
	Regulator assembled improperly.	Check for proper assembly
	Damaged gasket	Replace gasket

13.5 DEMAND REGULATOR MALFUNCTION

Symptoms	Probable Cause	Remedy
Regulator continuously free flows.	Adjustment knob not screwed in	Screw in adjustment knob
	Bent tube damaged causing misalignment of nipple tube.	Check the inlet nipple and soft seat. Replace as necessary.
	Supply pressure too high	Adjust supply pressure lower than 10,5bar over ambient.
	Regulator out of adjustment	Adjust regulator
Regulator continuously free flows when underwater only	Neck dam turned down, or too large for divers' neck	Neck dam must be turned up. Replace neck dam with proper size.
	Hair caught between O-Ring and base of helmet.	Clean hair out.
	Neck dam torn	Repair or replace neck dam
	Poor seal in neck dam ring Assembly	Replace O-Rings
Regulator is hard breathing	Adjustment knob screwed too far in	Screw adjustment knob out
	Supply pressure too low	Increase supply pressure

Symptoms	Probable Cause	Remedy
	Regulator improperly set up	
Regulator does not supply gas.	Gas supply pressure too low	Increase supply pressure to minimum required for depth.
	Regulator is out of adjustment	Adjust regulator
	No gas in umbilical	Turn diver's gas supply on topside.
	Blockage in breathing system	Disassemble regulator, clean, and adjust.

13.6 EMERGENCY GAS SUPPLY VALVE

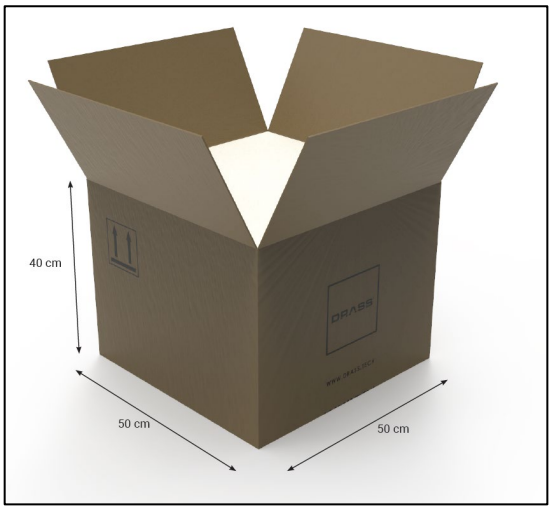
Symptoms	Probable Cause	Remedy
Bail-out bottle drained without diver opening EGS valve	Stem fails to seat in valve body	Replace EGS valve body.
	Debris under seat causing leakage.	Service valve
	Leaking over-pressure relief valve on bail-out regulator.	Service valve
	Leaking bail-out regulator on bottle.	Service regulator
	Leak in supply line 1st stage	Service regulator
Knob difficult to turn.	Stem bent	Replace stem.
Valve will not flow gas	Foreign matter in valve	Disassemble, clean, and reassemble.
	Stripped control knob	Replace knob

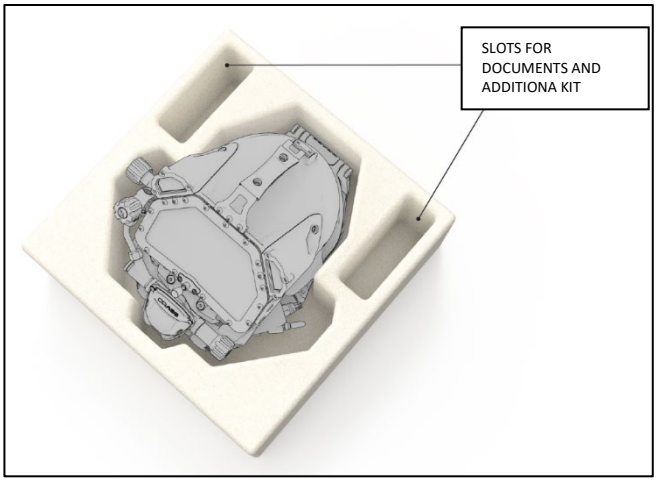
14 LIFE CYCLE

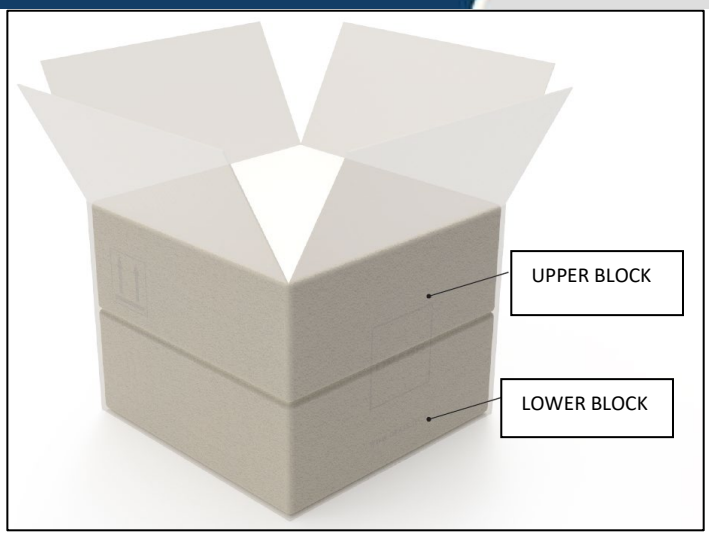
Helmet doesn't have any expiration date, unless periodic maintenances are executed and worn part replaced with manufacture original parts.

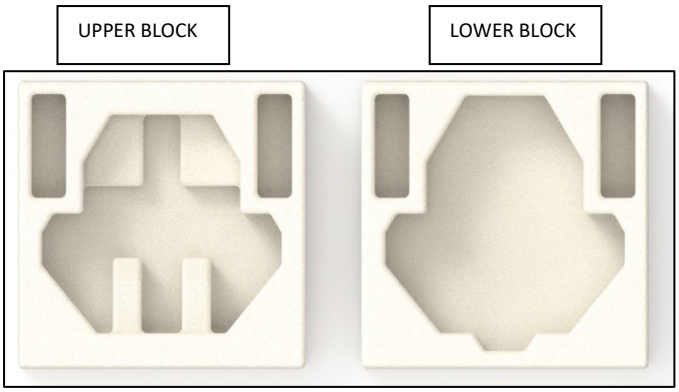
15 PACKAGING AND TRASPORTATION

Helmet must be transported in its original supplied packaging at any time






UPPER BLOCK
LOWER BLOCK


UPPER BLOCK
LOWER BLOCK