Crewsaver®

SERVICE MANUAL

CREWSAVER

IMMERSION SUIT

Crewsaver®

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Service bulletin and amendments register

No.	Description	Date
Issue 6	Pages 5 - 9 (Product leaflets) removed Page 19 New style Lifting Strop illustrated Page 30 Fitting instructions for new style Lifting Strop shown	June 2013
Issue 7	Page 4 Item 1.1.1 Amendment to arrangements for issuing the Service Manual. Page 4 Item 1.1.5 Page 16 Item 2.2 Requirement added for annual servicing of suits over 10 years old. Inclusion of Huayan Suits and Crewsaver Surface L ight (CSL)	March 2016

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1.1 Introduction

1.1.1. This Service Manual will be published on the Crewsaver website (www.crewsaver.com). Click on PARTNER LOGIN at the top of the screen. Personnel who have been trained in the servicing procedures for this limmersion suit will be issued with a Username and Password to enable them to access the download section. Each manual carries an Issue Number and records of issue are logged by Crewsaver to ensure that the service network maintains correct and up to date servicing information. Emails will be sent regarding any new Issues. Periodically service bulletins may be issued which will be published on the Crewsaver website (www.crewsaver.com). Emails will also be sent. It is the service station's responsibility to regularly check the website for any new bulletins and to ensure inclusion within the servicing manual. The service bulletin register at the front of the Manual should be completed.

1.1.2. The information referenced in each section follows a standard servicing procedure by which the inspection should take place.

1.1.3. This servicing manual details information to enable regular maintenance and the servicing to prolong the life of a Crewsaver Immersion / abandonment suit.

1.1.4. This manual should be used as a reference document following training in servicing procedures instructed by Crewsaver personnel. The manual also details the equipment and parts needed for correct maintenance to be performed.

1.1.5. Servicing should be carried out by an authorised service station once every three years. Immersion suits which are 10 years old and over should be serviced annually. See Section 2.2.

1.1.6. Regular servicing to be carried out by qualified personnel. Qualified personnel will have been trained by Crewsaver and issued with a servicing certificate which will be valid for a period of 3 years

1.1.7. In addition regular inspection of immersion suits should be performed on a monthly basis, as required by SOLAS regulation III/20.7. The procedure, detailed in 2.1 General Inspection, is recommended by the International Maritime Organisation and can be carried out on board the vessel or rig.

1.2.1 Product description (8800)

1.2.1.1 The Crewsaver Immersion Suit 8800 is LR approved, authorised by MCA and approved to SOLAS requirements as an abandonment/immersion suit. It is also approved to the relevant European standards and is CE marked.

1.2.1.2 The suit is manufactured from fire retardant 5mm Neoprene and each one is tested to ensure that it is watertight following production.

1.2.1.3 Each suit is supplied in its own bag which is printed with donning instructions. A separate instruction card is provided with each suit.

1.2.1.4 Four sizes are available:

SIZE	MEASUREMENTS
Child	Suit weight: 2.4kg. Chest: 59 - 90cm. Height: 110 - 150cm.
Universal:	Suit weight: 4.0kg. Chest: 76 - 116cm. Height: 140 - 184cm.
Large:	Suit weight: 4.5kg. Chest: 110 - 125cm. Height: 170 - 210cm.
Extra Large:	Suit weight: 5.3kg Chest: 120 - 141cm. Height: 188 -228cm.

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Figure. 1.01

Optional extras:
Crewsaver Buoyancy Plus.
Neoprene gloves.
Sea light.
Nylon lifting strop with stainless steel buckle.

1.2.2. 8808 Endurance 140

1.2.1. The Crewsaver Immersion Suit is GL approved, Designed to be worn without a lifejacket

1.2.2. The suit is manufactured from fire retardant 5mm Neoprene and each one is tested to ensure that it is watertight following production.

1.2.3. Each suit is supplied in its own bag which is printed with donning instructions and separate instruction card is provided with each suit.

1.2.4. Three sizes are available:

SIZE	MEASUREMENTS
Medium	Suit weight: 4.0kg. Chest: Max 110cm. Height: 150 - 170cm.
Large:	Suit weight: 4.5kg. Chest: Max 120cm. Height: 170 - 190cm.
Extra Large:	Suit weight: 5.3kg Chest: Max 130cm. Height: 190 -205cm.

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1.2.3 8800Mk2 Endurance Plus

1.2.3.1. The Crewsaver Immersion Suit is GL approved, Designed to be worn with a lifejacket

1.2.3.2 The suit is manufactured from fire retardant 5mm Neoprene and each one is tested to ensure that it is watertight following production.

1.2.3.3. Each suit is supplied in its own bag which is printed with donning instructions and separate instruction card is provided with each suit.

1.2.3.4. Three sizes are available:

SIZE	MEASUREMENTS
Universal	Suit weight: 4.0kg. Chest: Max 110cm. Height: 150 - 170cm.
Large:	Suit weight: 4.5kg. Chest: Max 120cm. Height: 170 - 190cm.
Extra Large:	Suit weight: 5.3kg Chest: Max 130cm. Height: 190 -205cm.

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1.2.4 8810 Endurance

1.2.4.1. The Crewsaver Immersion Suit is GL approved, Designed to be worn with a lifejacket

1.2.4.2 The suit is manufactured from fire retardant 5mm Neoprene and each one is tested to ensure that it is watertight following production.

1.2.4.3 Each suit is supplied in its own bag which is printed with donning instructions. A separate instruction card is provided with each suit.

1.2.4.4. Three sizes are available:

SIZE	MEASUREMENTS
Medium	Suit weight: 4.0kg. Chest: Max 110cm. Height: 150 - 170cm.
Large:	Suit weight: 4.5kg. Chest: Max 120cm. Height: 170 - 190cm.
Extra Large:	Suit weight: 5.3kg Chest: Max 130cm. Height: 190 -205cm.

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1.2.5. 8808 Latitude 140

1.2.5.1 The Crewsaver fabric Immersion Suit is GL approved, Designed to be worn without a lifejacket.

1.2.5..2 The suit is manufactured from Polyester+TPU and each one is tested to ensure that it is watertight following production.

1.2.5.3. Each suit is supplied in its own bag which is printed with donning instructions and separate instruction card is provided with each suit.

1.2.5.4 Three sizes are available:

SIZE	MEASUREMENTS
Medium	Suit weight: 4.0kg. Chest: Max 110cm. Height: 150 - 170cm.
Large:	Suit weight: 4.5kg. Chest: Max 120cm. Height: 170 - 190cm.
Extra Large:	Suit weight: 5.3kg Chest: Max 130cm. Height: 190 -205cm.

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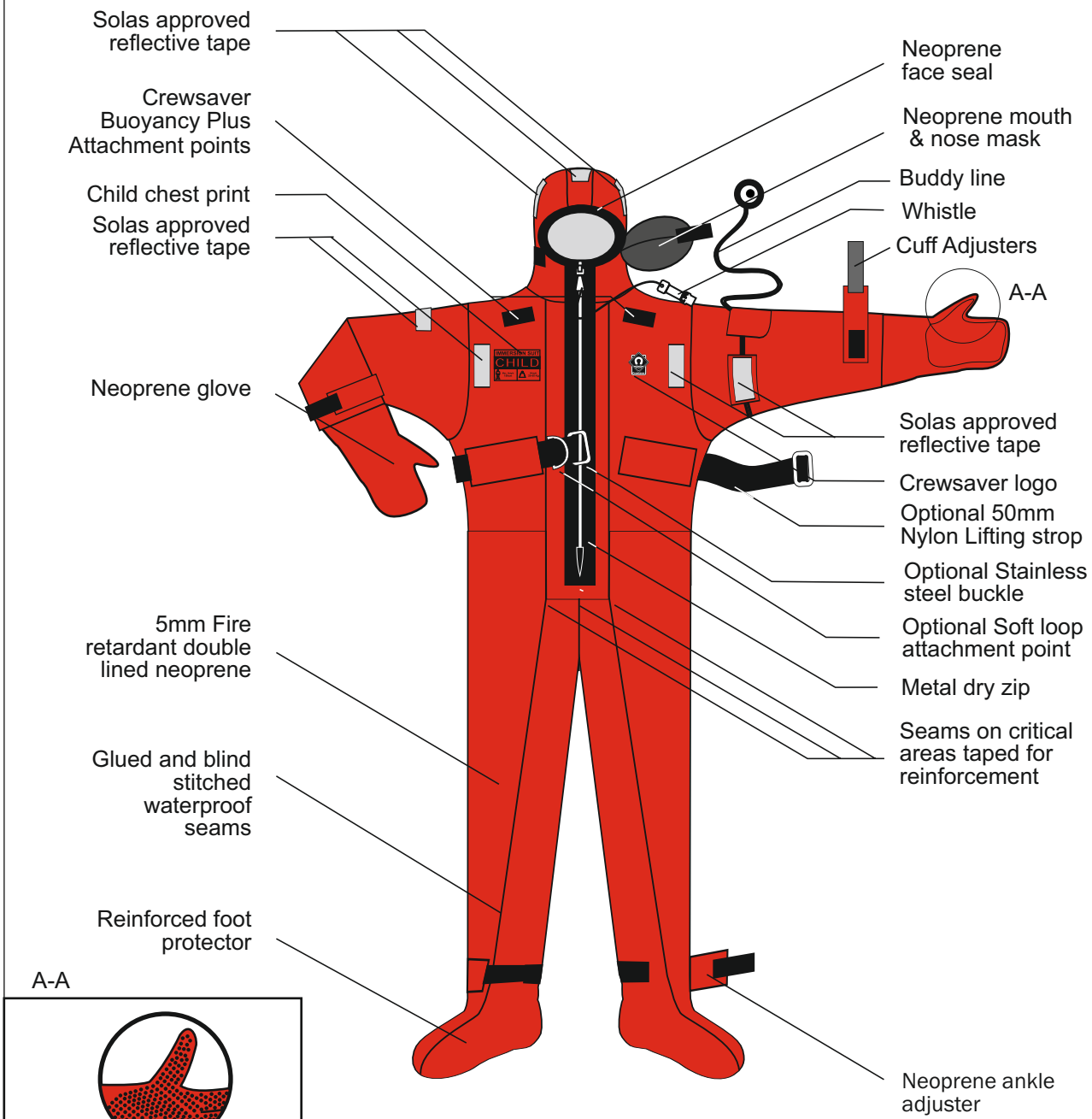
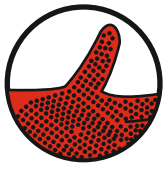
1.3 General features

1.3.1 Front view: Child size : 8800



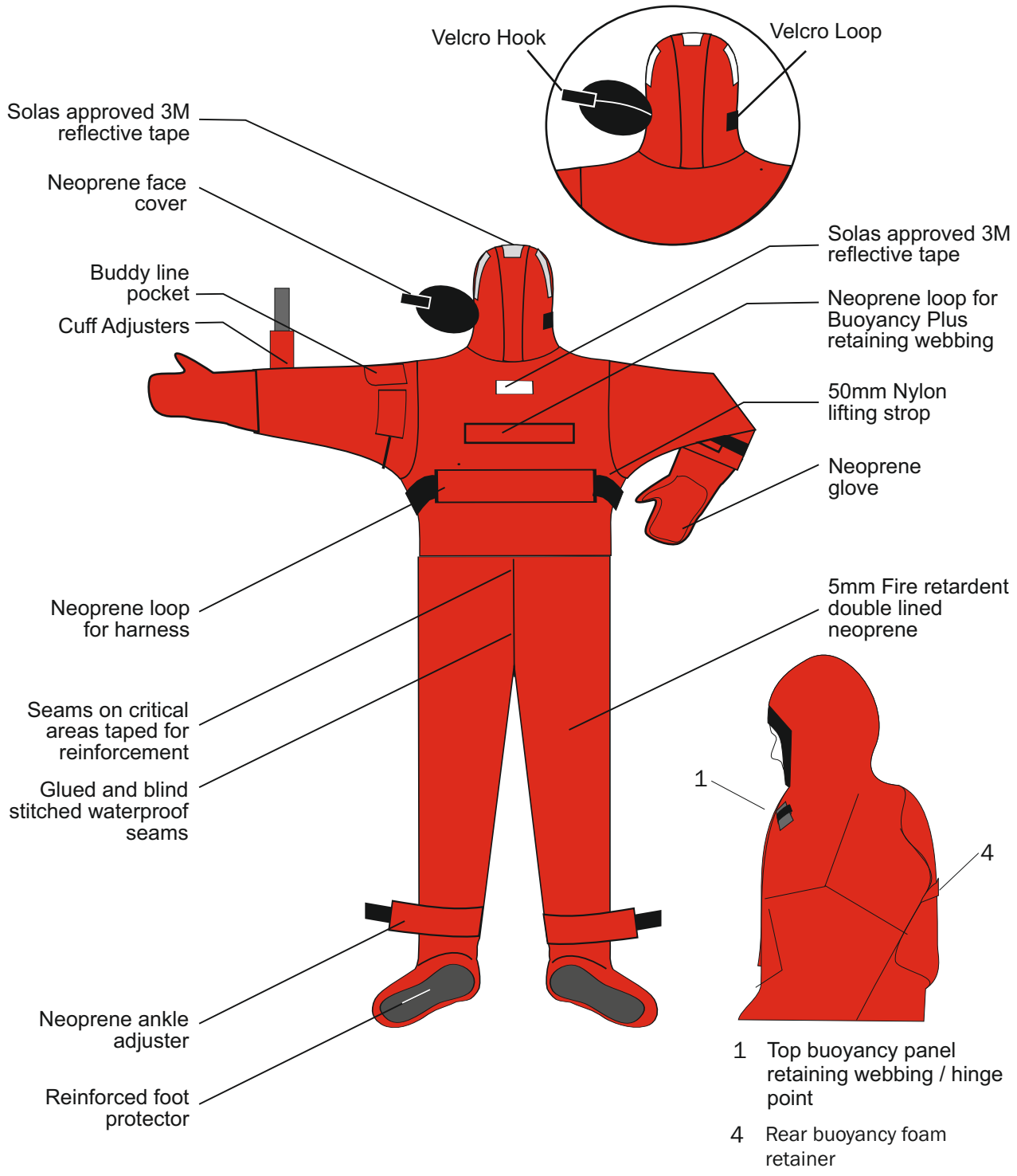
A-A



Spot print screen printed on to the palm of the 5mm neoprene glove - Gloves to be manufactured using 5mm double lined FR neoprene

1.3 General features

1.3.2 Rear view: Child size

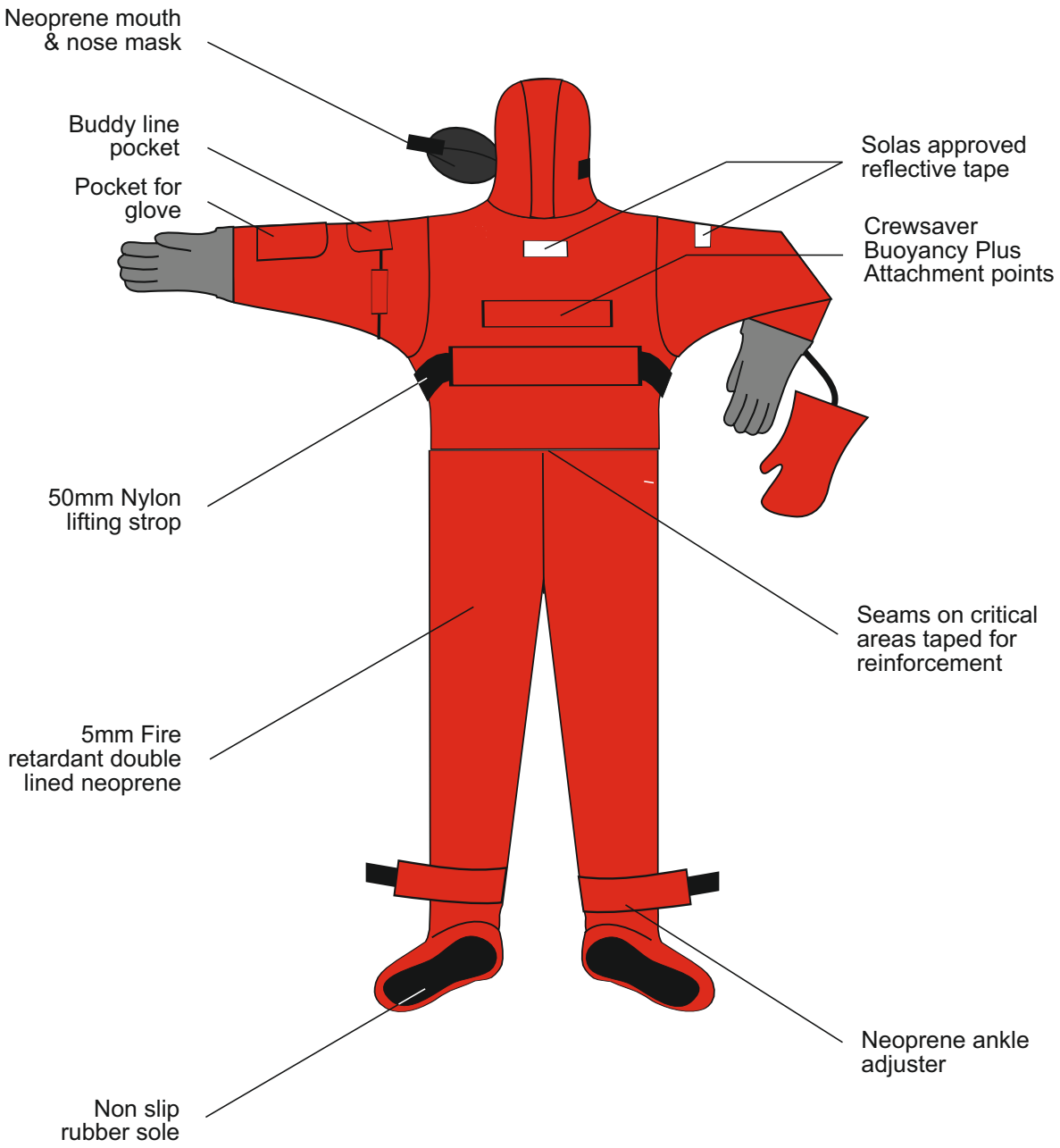


1.3 General features

1.3.3 Front view: Adult size 8800

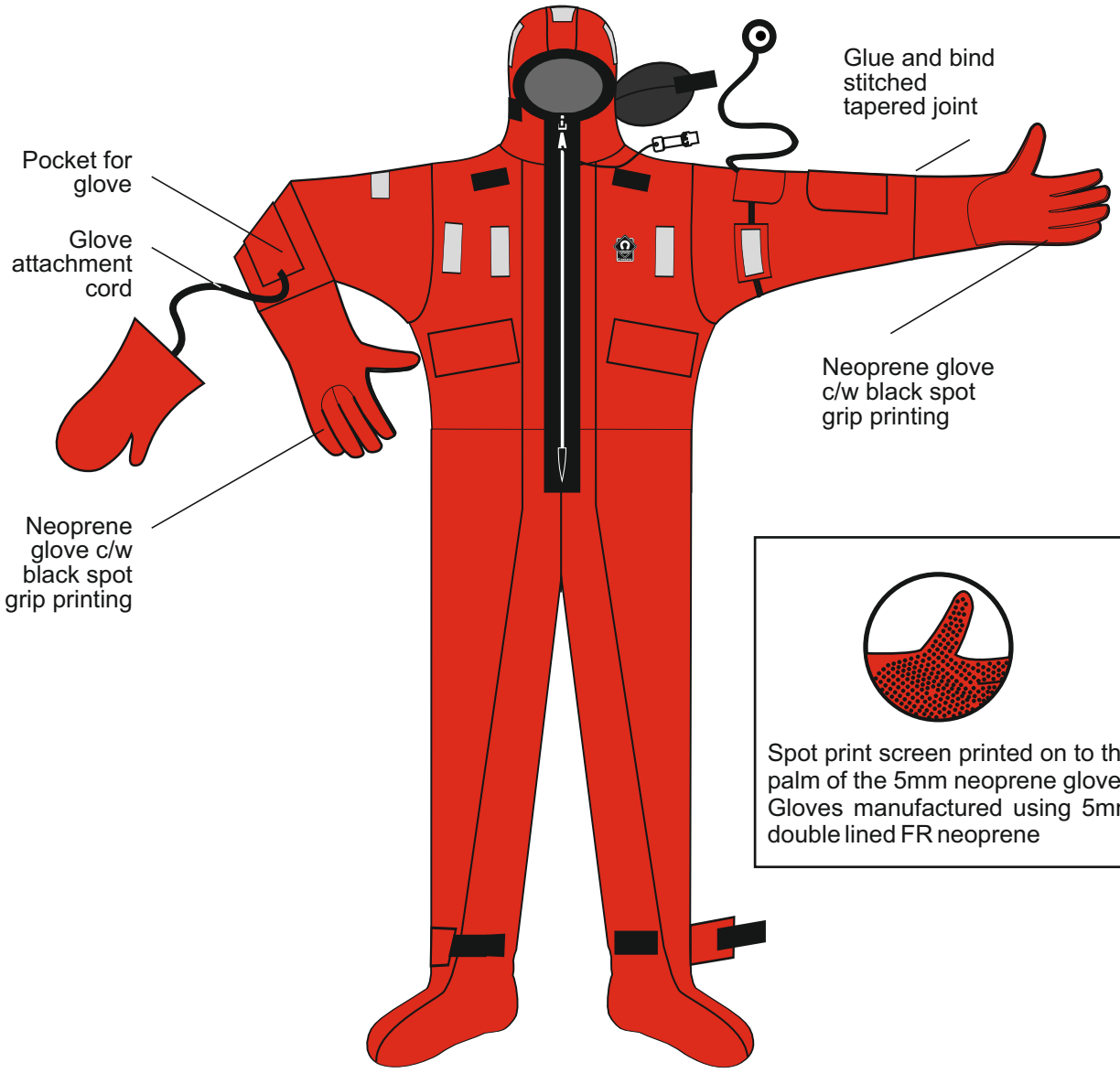
1.3 General features (continu(continued)

1.3.4 Rear view: Adult size



1.3 General features

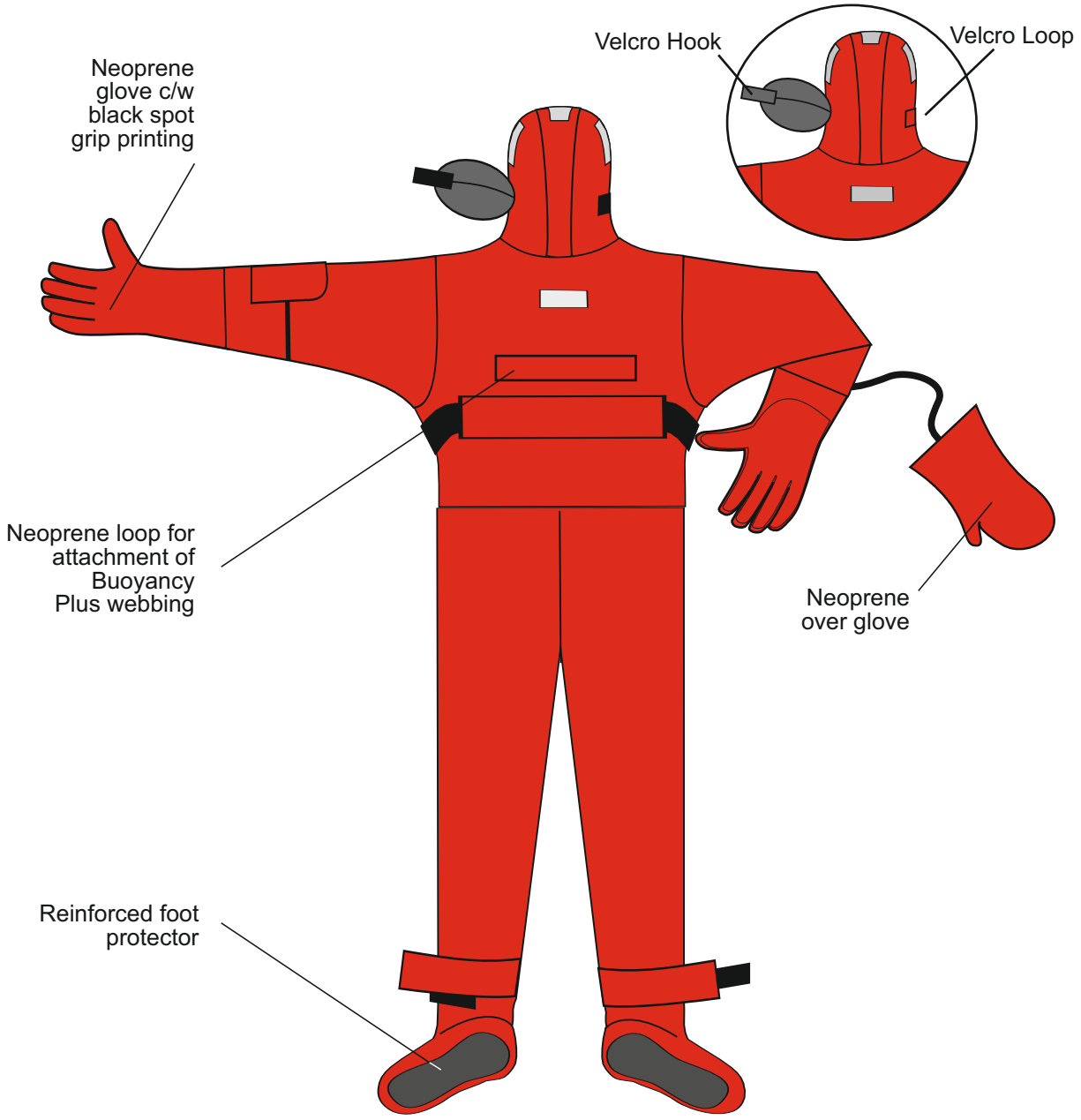
1.3.5 Front view: Adult size (neoprene gloves)



Spot print screen printed on to the palm of the 5mm neoprene glove - Gloves manufactured using 5mm double lined FR neoprene

1.3 General features (continued)(continued)

1.3.6 Rear view: Adult size (neoprene gloves)



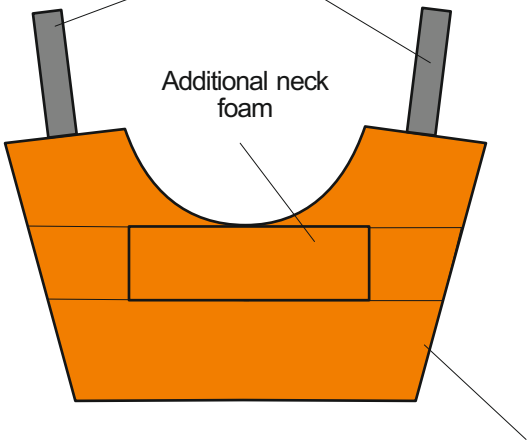
1.3 General features (continued)(continued)

1.3.7 Buoyancy Plus Adult and Child

Total Buoyancy 9.6kg (95N)

Webbing with Loop touch and close fastening

Additional neck foam

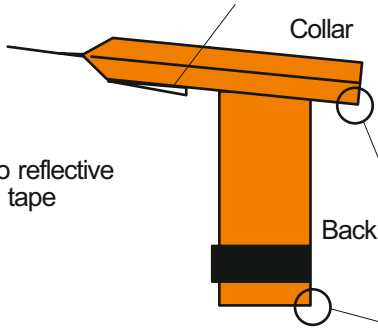


Main collar Foam

5mm gap in the stitching

Hook touch and close fastening for shoulder webbing

Collar



Retro reflective tape

Area for screen print

QCN number

Back foam attachment

5mm gap in the stitching for drainage

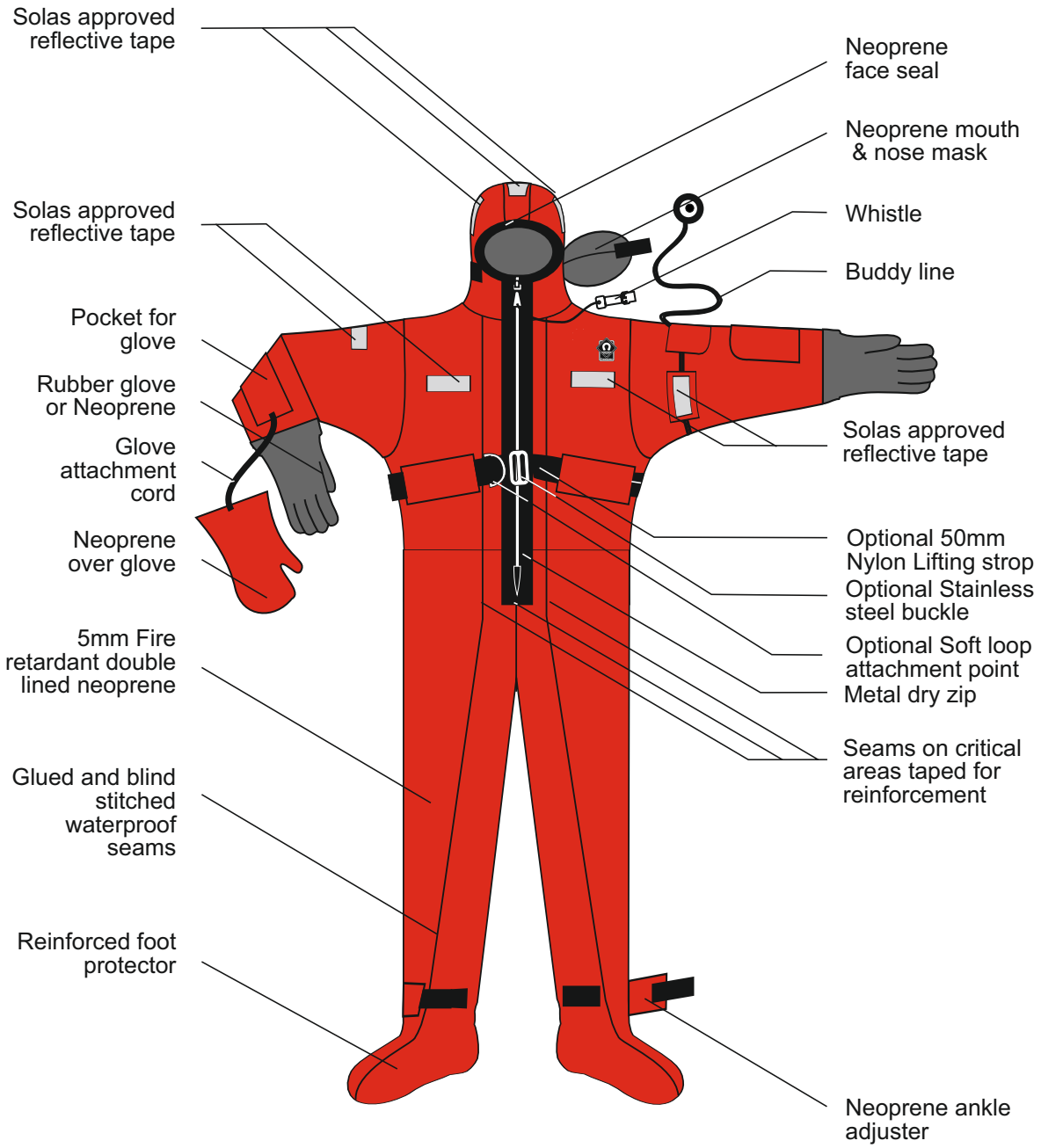
20mm webbing retainer

Back

5mm gap in the stitching for drainage

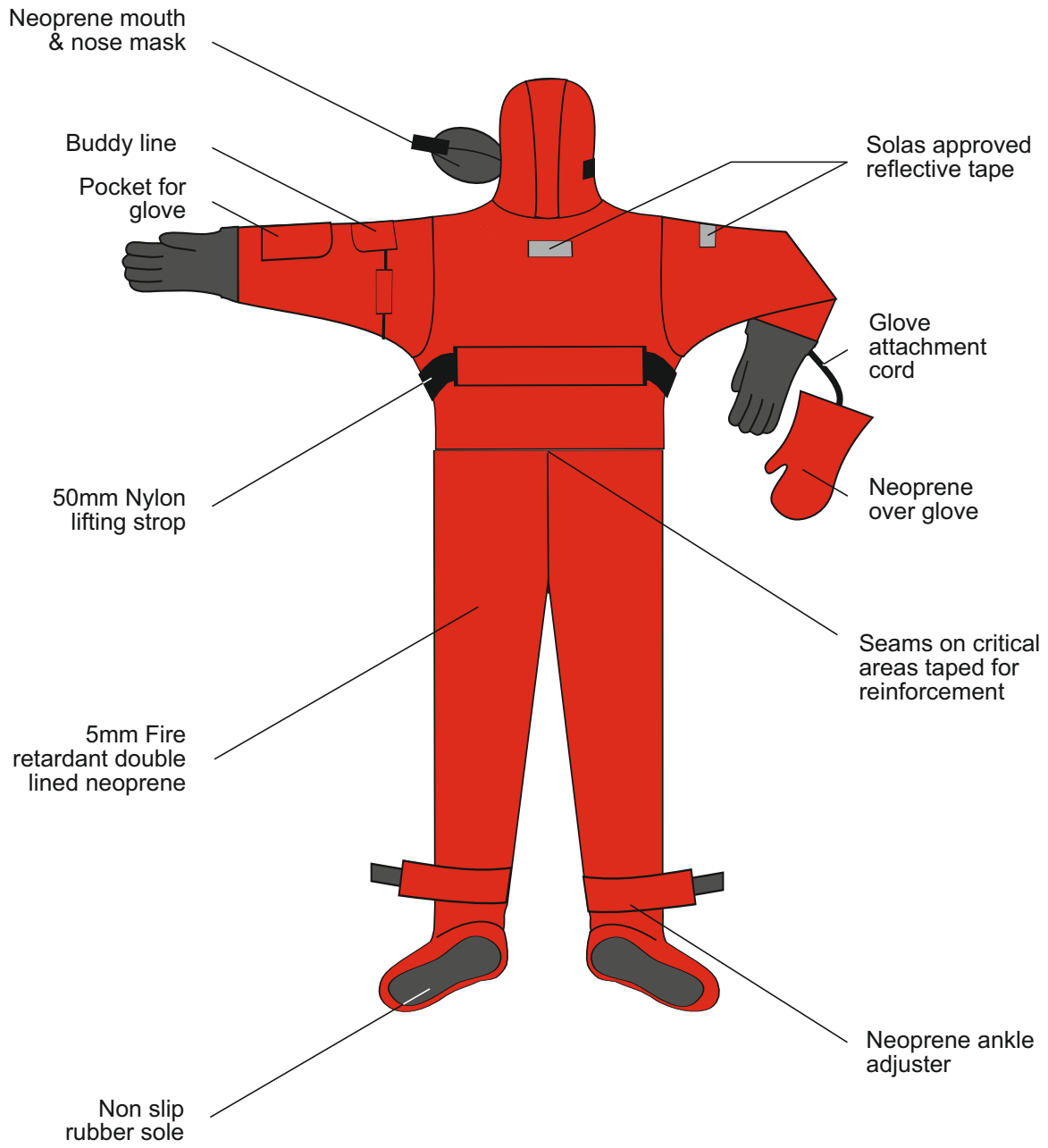
1.3 General features

1.3.8 Front view: (Adult pre 2006)



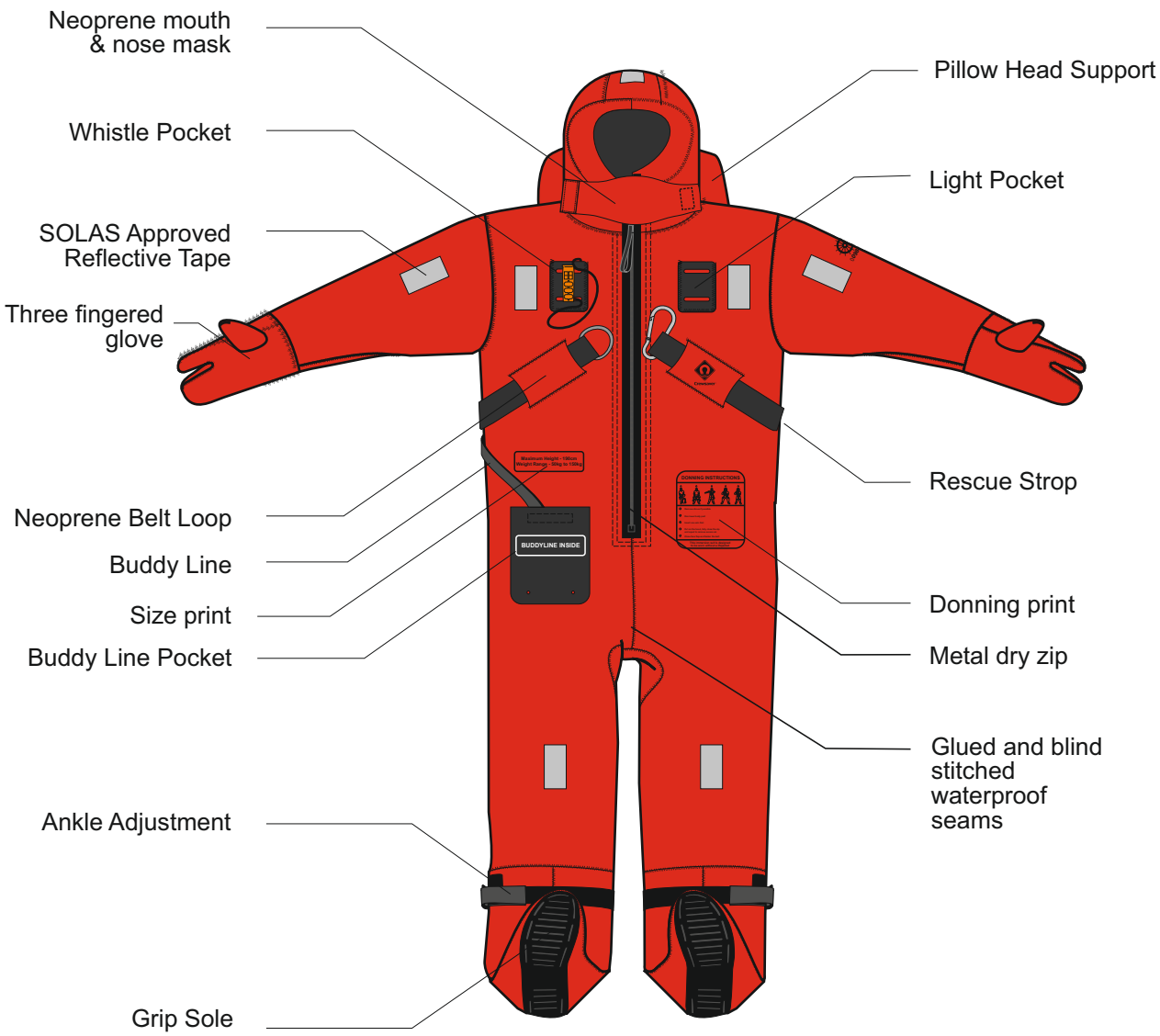
1.3 General features (continued)

1.3.9 Rear view (Adult immersion suit pre 2006)



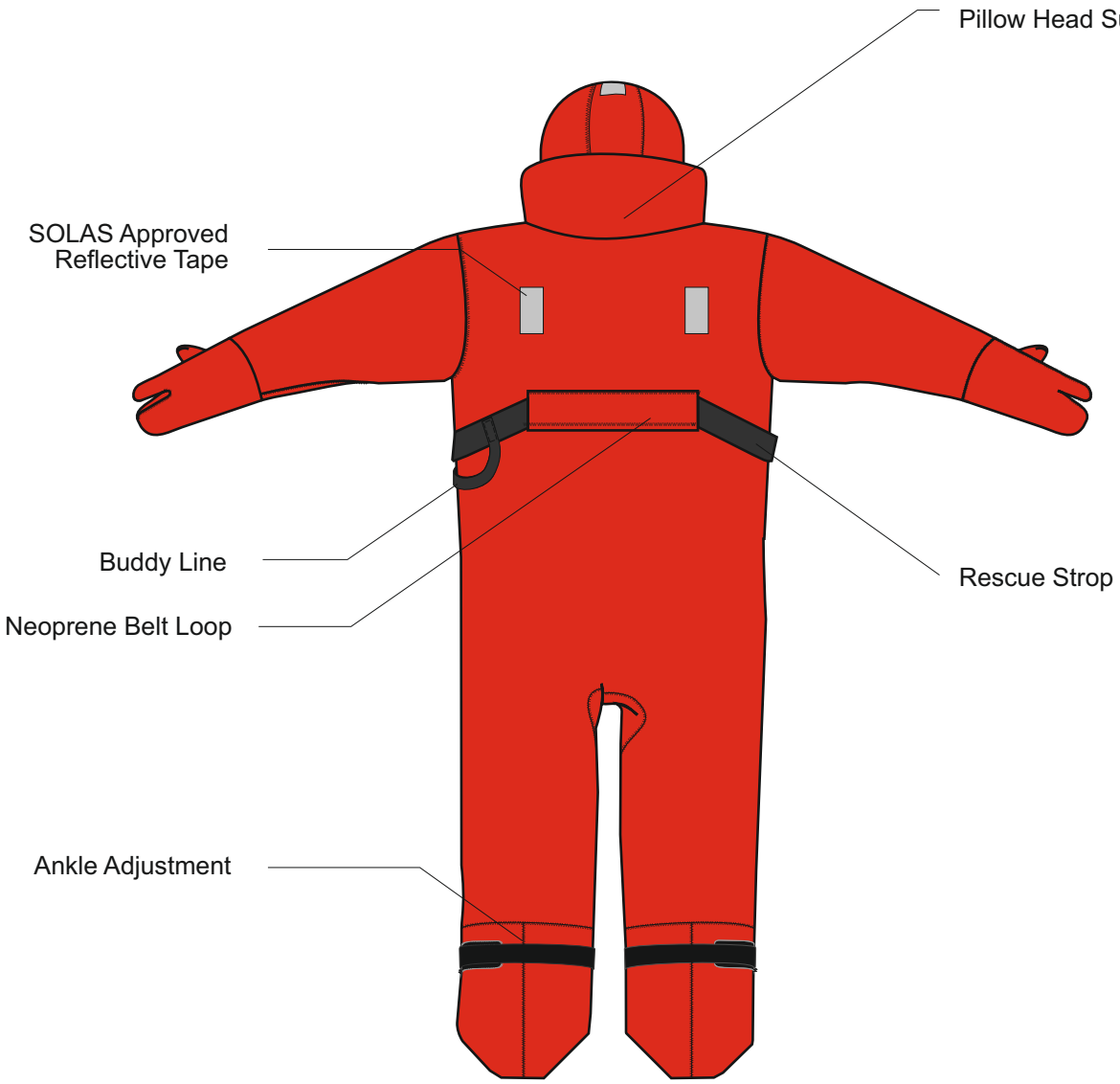
1.4 General features (8808 Endurance 140)

1.4.1 Rear View



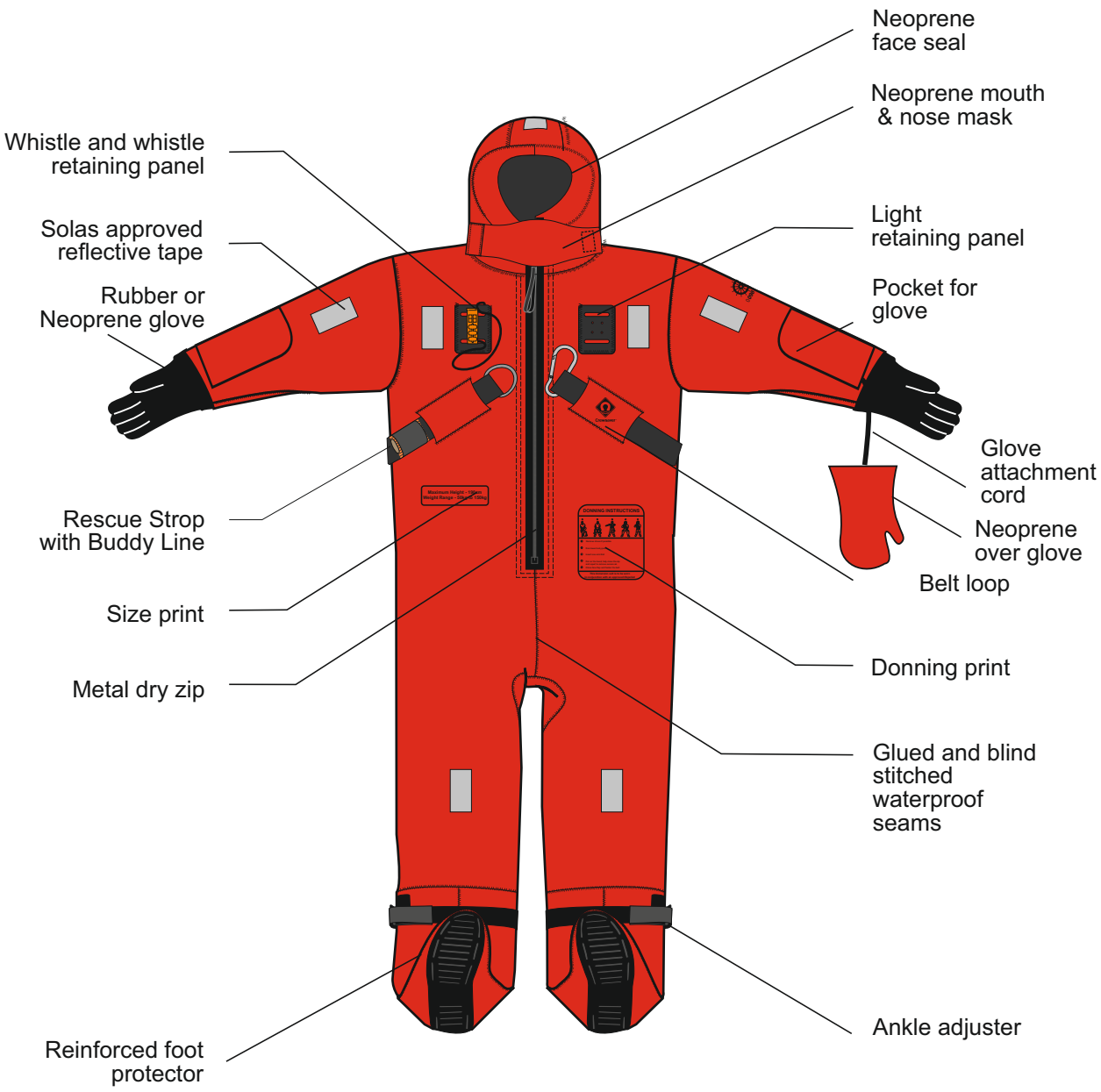
1.4 General features (8808 Endurance 140)

1.4.2 Front View



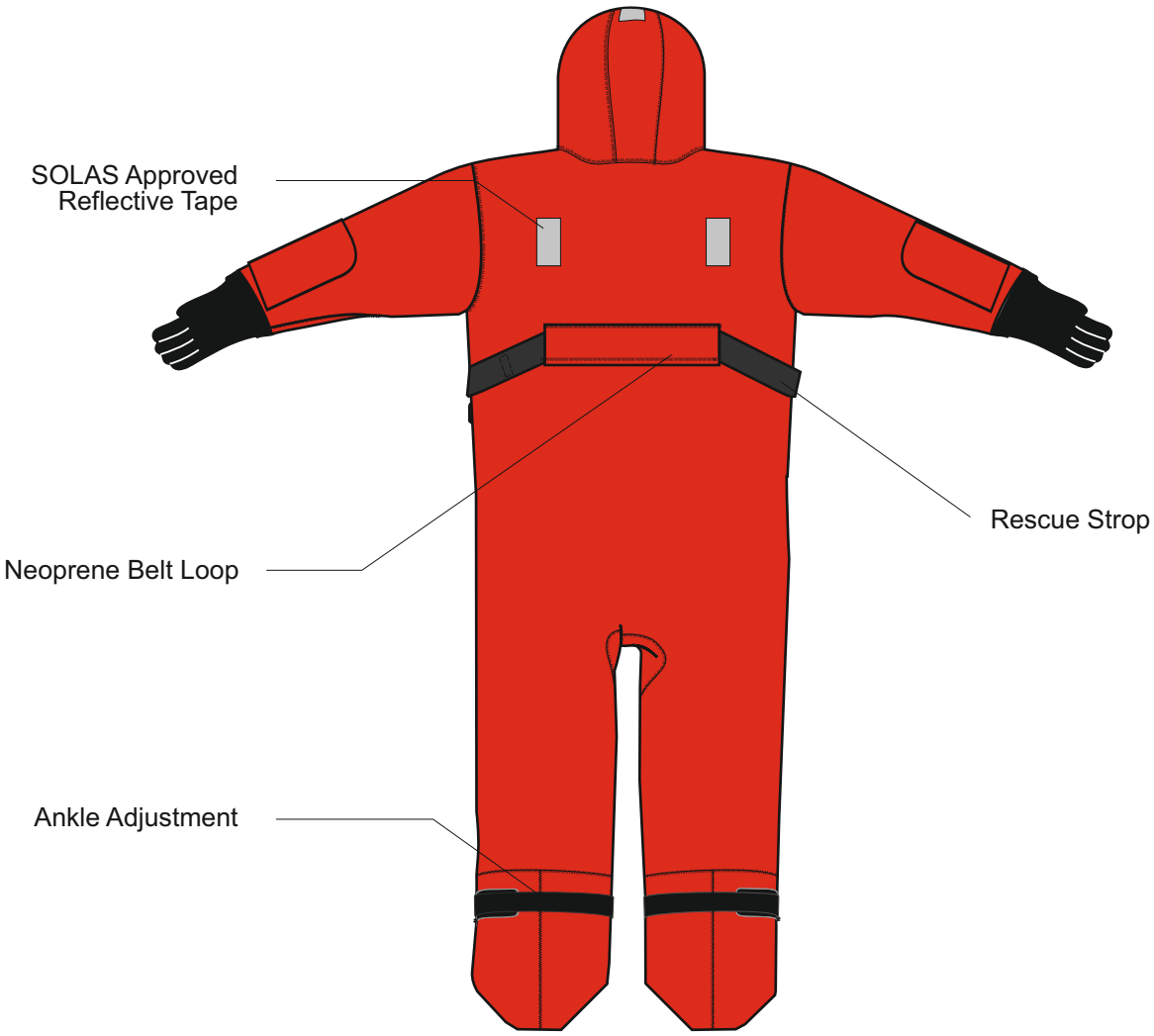
1.4 General features 8800Mk2

1.4.3 Front view



1.4 General features 8800Mk2

1.4.4 Rear view

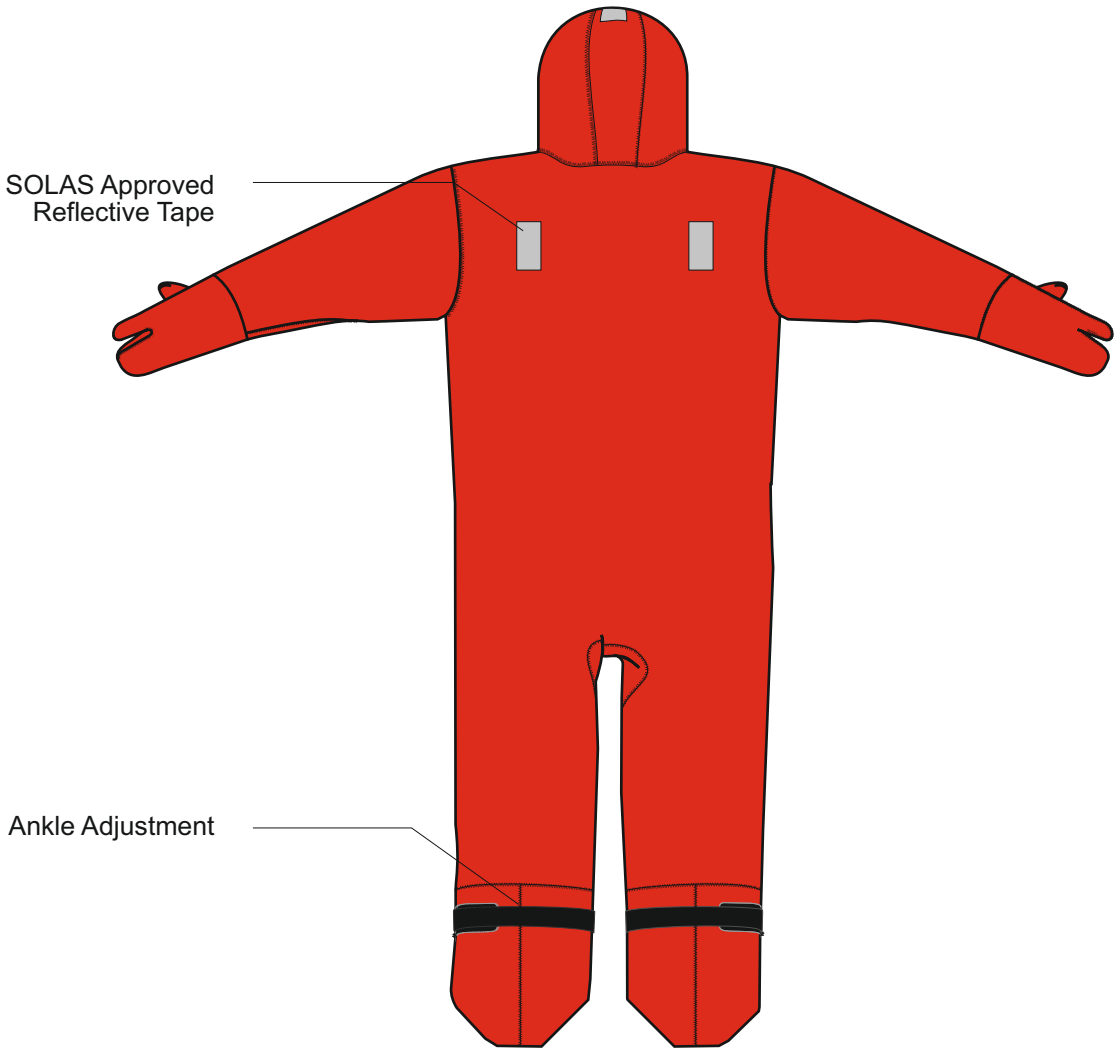


1.4 General features 8810 Endurance

1.4.5 Front view

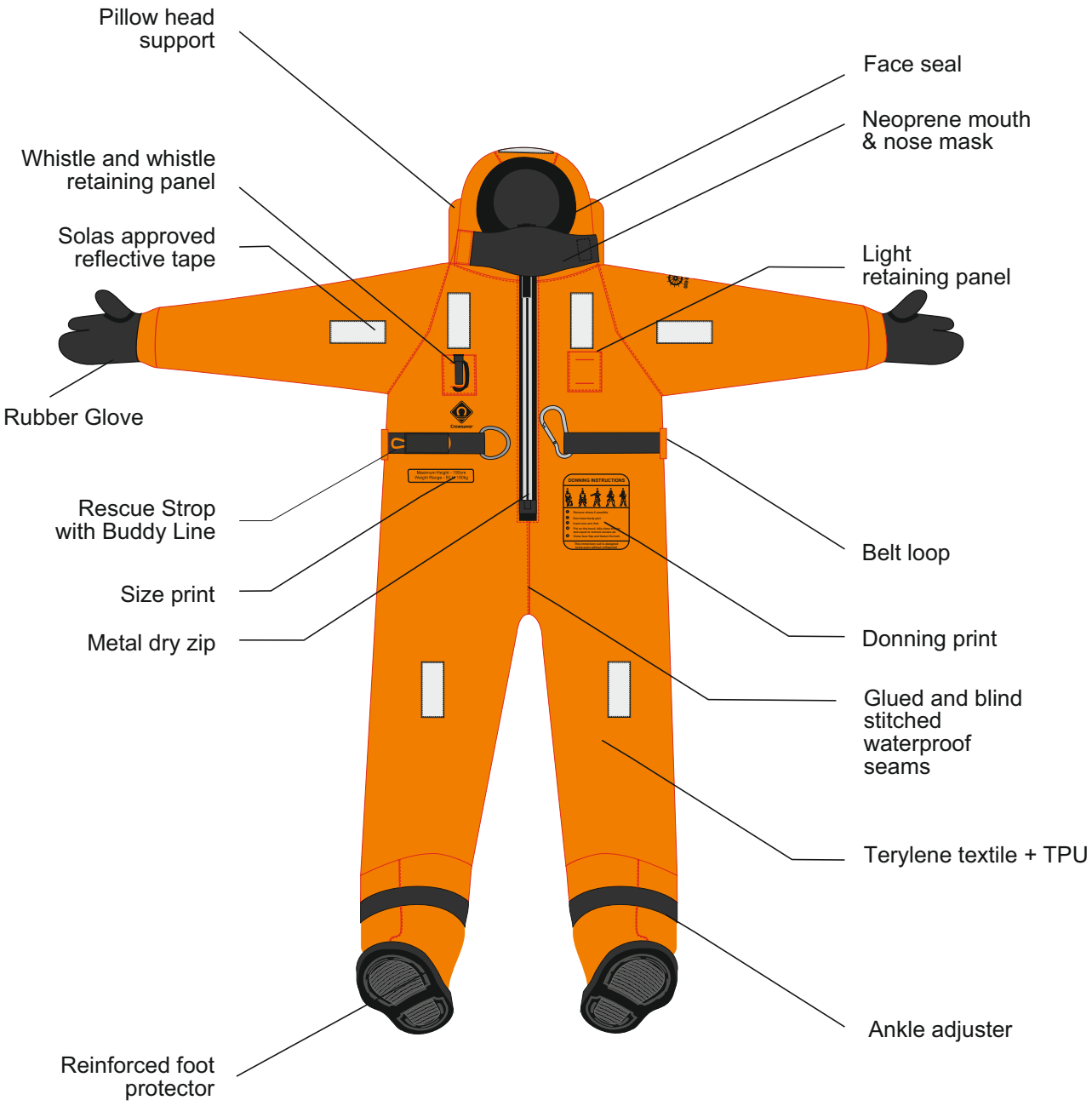
1.4 General features 8810 Endurance

1.4.6 Rear view



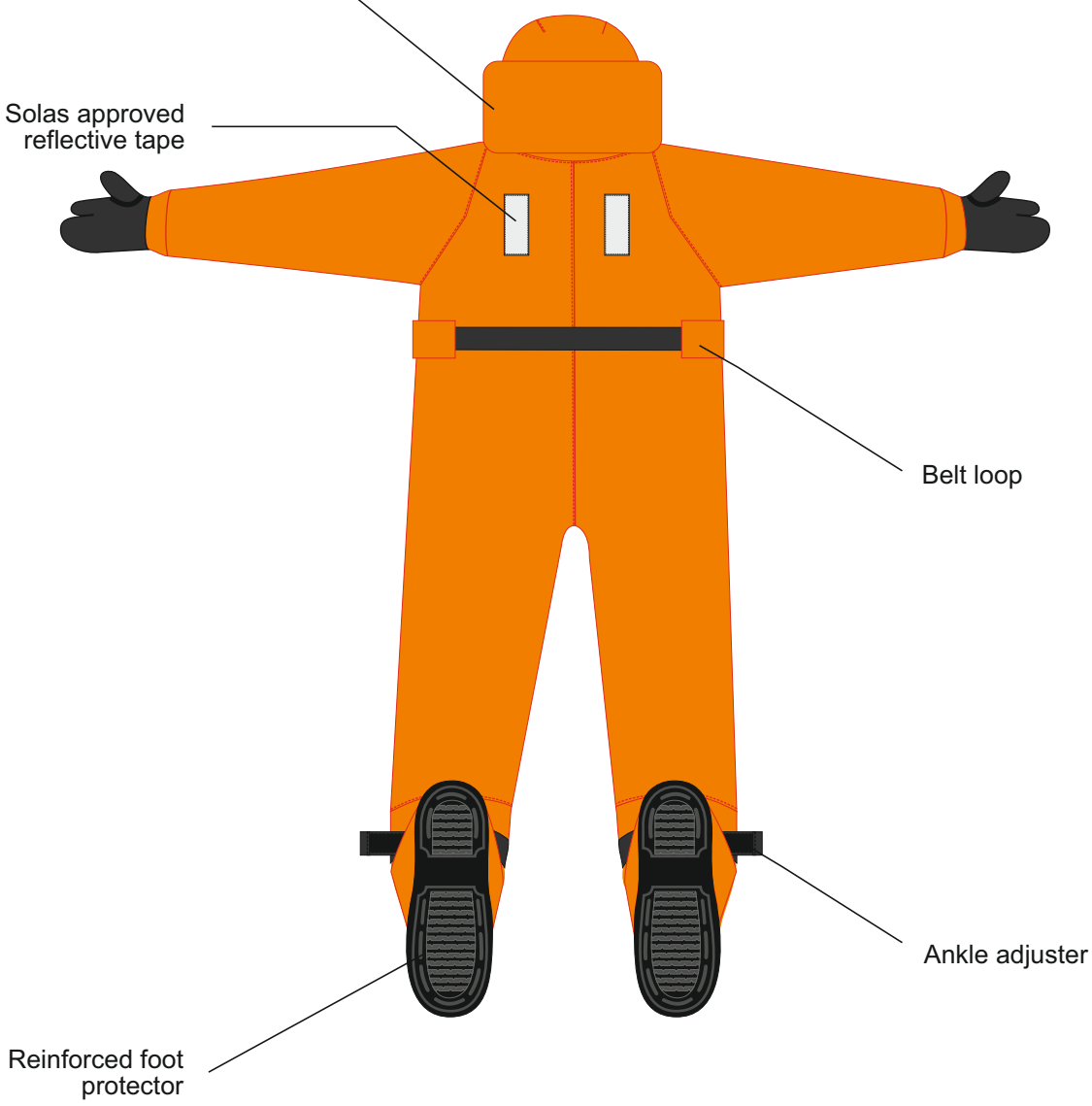
1.4 General features 8806

1.4.7 Front view



1.4 General features 8806

1.4.8 Rear view



2.1 General inspection requirements

Crewsaver Immersion Suits should be inspected on a monthly basis, as required by SOLAS regulation III/20.7. The following procedure is recommended by the International Maritime Organisation and can be carried out on board the vessel or rig by a Safety Officer or other responsible person.

2.1.1 Check the closures on the storage bag as well as the general condition of the bag for ease of removal of the suit. Ensure that the donning instructions on or in the bag are legible. Confirm that the suit is of the type and size shown on the bag.

2.1.2 Lay the suit on a clean dry flat surface. Make sure that the suit is dry inside and outside. Visually check the suit for damage. Rips, tears or punctures should be repaired at a suitable repair station authorised by Crewsaver.

2.1.3 Check the zip for ease of operation by sliding it up and down. Using beeswax, paraffin wax or Silicon to lubricate the front and back of the zip and the slide fastener. If the zip is not functional, the suit should be taken out of service and discarded.

2.1.4 Check the retro-reflective tape for condition and adhesion. If replacement is necessary this should be done by a suitable repair station authorised by Crewsaver.

2.1.5 Check the whistle and the expiry date of the light, if fitted.

2.1.6 Replace the suit in the bag with the zip fully open.

2.1.7 The opportunity should be taken during the monthly inspections for personnel to practice donning the immersion suits.

2.2 Additional items if fitted

2.1.8 Lifting strop.
Check the stitching for signs of damage. If any part of the stitching is broken the lifting strop must be replaced or returned to Crewsaver for repair.

2.1.9 Buoyancy Plus
Check the cover for any signs of damage, such as tears and cuts.

2.1.10 Check the webbings and the velcro and ensure that the buoyancy plus is fitted correctly and securely to the immersion suit.

2.1.11 Lights.
Check condition of light for signs of damage such as cracks, breaks.
Check date stamp and replace light if out of date or damage.

2.3 General servicing requirements

The following list outlines the basic procedure that must be followed when performing the service.

2.2.1 Immersion Suits which have been in storage, unused, for a period of three years should be subject to the following:

2.2.1.1 A visual inspection. Section 4.1
2.2.1.2 Inflation leak test. Section 5
2.2.1.3 Cleaning and waxing the front entry zip. Section 6.1
2.2.1.4 Tagging for re-inspection and record keeping. Section 8.1

2.2.2 The above procedure should then be repeated after a period of six and nine years. After ten years Immersion Suits should be serviced annually.

2.2.3 Immersion Suits which have been used should, immediately after use, be subject to the following:

2.2.2.1 Laundering if required. Section 3.1
2.2.2.2 A visual inspection. Section 4.1
2.2.2.3 A leakage test Section 5
2.2.2.4 Determination of need for repair or overhaul.
2.2.2.5 Any permitted repairs that are necessary.
2.2.2.6 Cleaning and waxing the front entry zip.

2.4 General service station requirements

An approved serviced station should be equipped with the following:

2.3.1 Facilities for carrying out the laundering procedures (see section 3).

2.3.2 A regulated dry air supply for carrying out the leakage tests (see section 5).

2.3.3 The following tools and additional materials will be required to carry out the necessary servicing procedures:

2.3.3.1 A face plug for sealing the immersion suit during leakage tests.
2.3.3.2 An inflatable arm for use when replacing gloves.
2.3.3.3 Adhesive for patches and gloves.
2.3.3.4 Adhesive for retro-reflective tape.
2.3.3.5 Beeswax, paraffin wax or silicon for lubricating the zip.
2.3.3.6 Torch or Aldis lamp for testing the retro-reflective tape.
2.3.3.7 Kimble Gun (To tag the buddy line)

2.3.4 All servicing must be carried out by personnel who have been trained by Crewsaver and hold a valid certificate.

2.3.4 The following page shows a copy of the Crewsaver Immersion suit servicing schedule. This sheet must be used to detail all actions / parts performed or used during the service. This sheet should be copied and filed. One copy should be presented to the customer signed and dated; detailing all serial numbers of the products serviced.

2.5 Service schedule

Crewsaver®

CERTIFICATE No.

IMMERSION SUIT SERVICING SCHEDULE

W/O No:

TYPE

CUSTOMER

VESSEL

LAST SERVICED BY

DATE OF LAST SERVICE

SERIAL Nos:

INSPECTION ITEMS	☑☒	COMMENTS
CONDITION		
CLEAN		
WAX ZIP		
BUDDY LINE		
WHISTLE		
RETRO TAPE		
FACE SEAL		
INNER SEALING TAPE		
GLOVES		
OVER SOCK / SOLE		
MARKING		
CARRY BAG		

TESTING	☑☒	COMMENTS
ZIP		
LEAK TEST		
LIGHT (if fitted) EXPIRY DATE:		

GENERAL SERVICE	☑☒	COMMENTS
WAX ZIP		
DRY		
CLEAN		
MARK SERVICE DATE		

ADDITIONAL ITEMS	☑☒	COMMENTS
HERMETICALLY SEALED BAG		
HARNESS / STROP		
LIGHT		
ADDITIONAL FLOTATION		

REPAIRED ITEMS	COMMENTS

SERVICED IN ACCORDANCE WITH MANUAL:

SERVICED BY:

DATE:

3.1 Cleaning and laundering

If required, each Immersion Suit should be laundered according to the following procedures. If a visual inspection is carried out whilst the suit is dirty, obvious damage may not be visible.

3.1.1 The light and lifting Strop (if fitted) should be removed prior to the cleaning of the suit.

3.1.2 The entire Immersion Suit may be gently hand-washed like a normal article of clothing. Do not machine wash or dry clean

3.1.3 If soiled with dirt, grease, oil or similar types of contaminants, the Immersion Suit should be cleaned with a concentrated soap solution (household washing up liquid) using a non-abrasive brush. Do not use Chemical cleaners

3.1.4 Once cleaned the Immersion Suit should be thoroughly rinsed in fresh water and hung up to dry naturally. Do not tumble dry

3.1.5 Both the inside and the outside of the Immersion Suit can be laundered according to the above procedures.

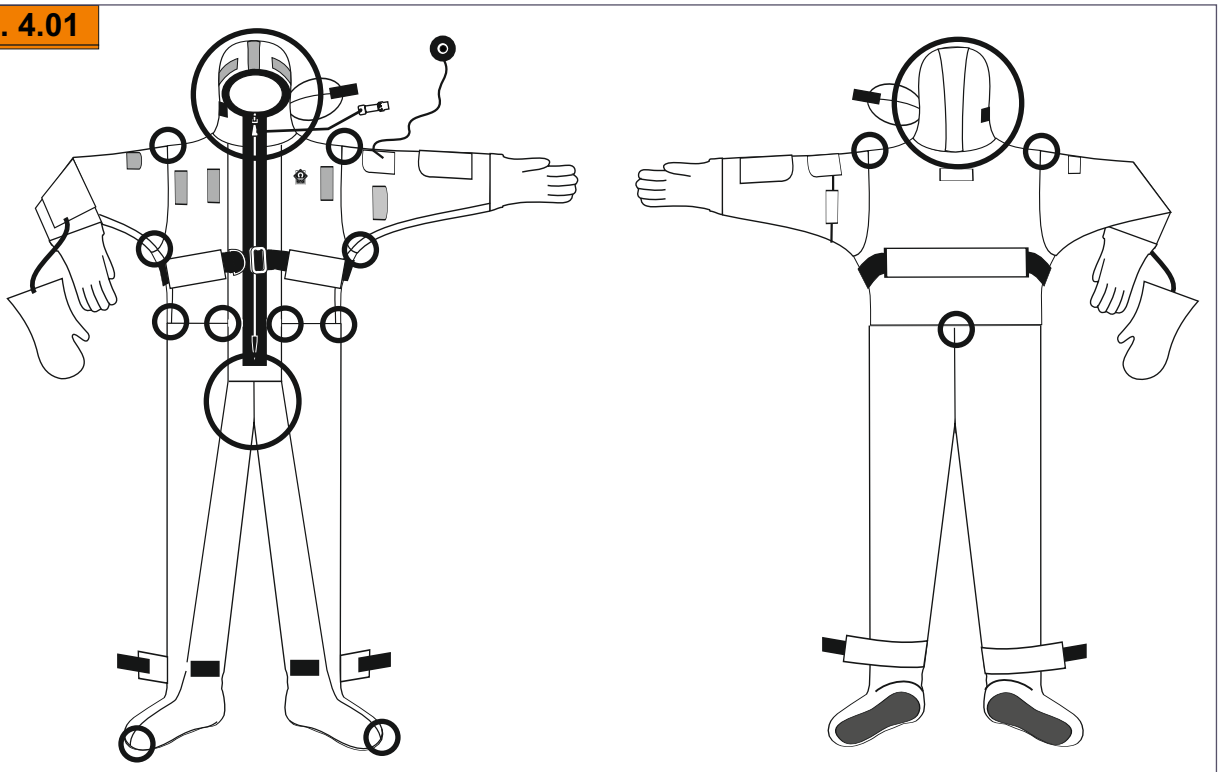
4.1 Inspection

VISUAL INSPECTION.
This section outlines what to check for and details particular areas that should be examined thoroughly

4.1.1. Inspect the closed cell neoprene material for any cuts, tears, flaws, runs or holes. Cuts with straight edges can be repaired provided that the cut is no more than 100mm in length. Tears and holes can be repaired using neoprene patches, subject to the following restrictions. The patches must overlap the damaged area by not less than 25mm. Circular patches must be no larger than 150mm in diameter and rectangular patches must be no larger than 150mm x 150mm. Flaws or runs in the woven fabric outer of the neoprene are acceptable if they do not leak and are less than both 1 cm in length and .5 cm in width.

4.1.2. Inspect glued and sewn seams for any apparent damage or deterioration. Figure 4.01 below shows the strengthened areas (circled) to which particular attention should be paid.

Figure. 4.01



4.1.3 Inspect the main front entry zip for any apparent damage such as corrosion, misalignment of teeth or slider jamming. Repairs to the zip cannot be carried out and the zip cannot be replaced therefore if the zip is damaged the suit should be declared as beyond economic repair.

4.1.4 Check all velcro and sewn accessory items for condition and security.

4.1.5 Check the presence of nine pieces of retro-reflective tape (See section 1.3 and 1.4 for positions). Check the retro-tape as follows:

4.1.5.1 Place a new piece of the same retro-reflective material next to, and on the same plane as, a representative piece of material fitted to the immersion suit.
4.1.5.2 Wipe both pieces of material with a wet cloth.
4.1.5.3 Using a powerful torch or “Aldis” lamp held at eye level, compare the performance of the two pieces of material from a distance of 10 meters.
4.1.5.4 If a noticeable deterioration in performance is observed then the retro-reflective material should be replaced.

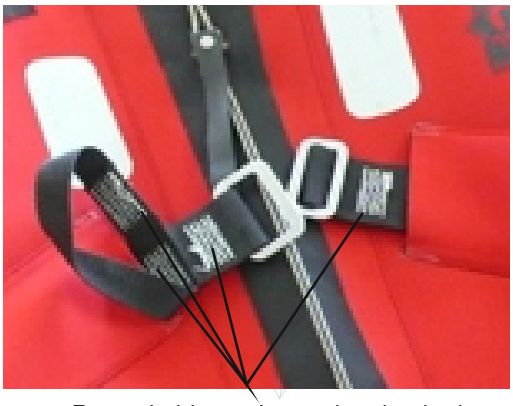
4.1 Inspection (continued)

4.1.6 Inspect the light, if fitted, for proper installation, attachment and operation.

4.1.7 Inspect the buddy line to ensure that it is correctly attached to the suit and that the rope/ cord is not frayed or damaged in any way. Check also the presence of the buddy line toggle. For replacement of the buddy line refer to page Section 7.2 page 37 Replacing the buddy line

4.1.8 If the suit is fitted with a lifting strop, check the webbing and stitching for any signs of damage.

Figure. 4.02



Four stitching points to be checked

Figure. 4.03

Four stitching points to be checked

4.1.9 Check the gloves for holes, tears or signs of delamination.

4.1.10 Check that the whistle is present and securely attached to the suit.

4.1 Inspection (lights)

4.1.11 The L6 light is shown below. To test this unit, press the manual activation point (Figure. 4.04, 4.05) and then return it to its original position (Figure 4.06). The battery is date stamped and should be replaced if the expiry date has been reached or if the expiry date is less than nine months from the date of service.

Figure. 4.04

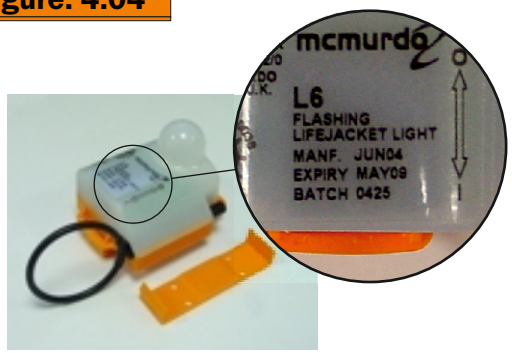


Figure. 4.05

Figure. 4.06

4.1.12 The DAN W1 light is shown below. To test this light, ensure that the dome is turned to the AUTO position. Using a paper clip, connect the two terminals (Figure 4.07), visible above the dome and check that the light operates. The battery is date stamped and should be replaced if the expiry date has been reached or if the expiry date is less than nine months from the date of next service (Figure 4.08).

Figure. 4.07

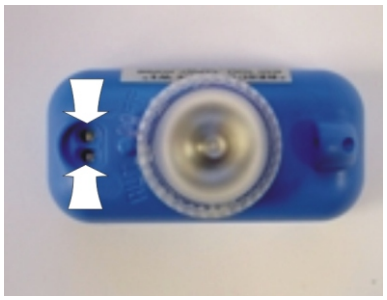
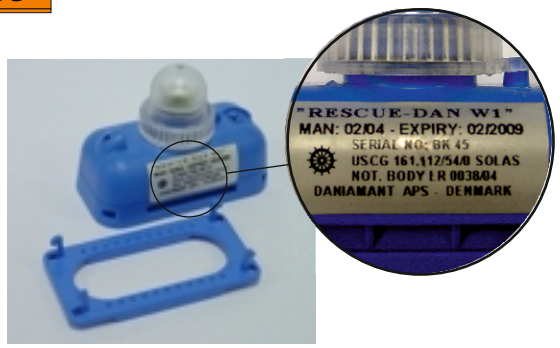


Figure. 4.08



4.1.13 The Crewsaver CSR light is shown below has two switch types. Figure 4.10 shows the toggle switch , supplied with CSL lights pre 2016 and figure 4.11 shows the button switch, supplied with the lights post 2016. The light has a batch stamp and expiry date of the battery (4.09). This should be replaced if the expiry date has been reached or if the expiry date is less than nine months from the date of next service.

Figure. 4.09

Figure. 4.10

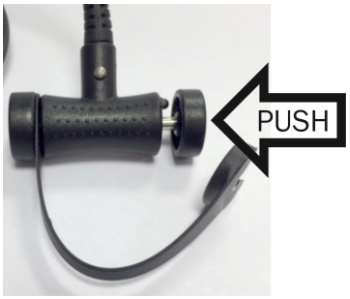


Figure. 4.11

4.1.14 Pre 2016 models. To test the light, Remove the safety clip and press the manual activation point (Figure. 4.10. the light should flash. Return the activation point to its original position and refit the safety clip. If the light does not flash - the unit has expired - and must be replaced.

4.1.15 Post 2016 models. To test the light press the button (Figure 4.1.14). The light must flash, press the light switch again to turn the flashing off (This will not affect the automatic operation of the light). If the light does not flash - the unit has expired - and must be replaced.

5.1 Testing

Immersion Suit Test Procedure with Mk2 face plate for Suit 8800

.
The MSC (Circular 1114. Guidelines for Periodic Testing of Immersion Suit and Anti-Exposure Suit Seams and Closures) recommends an air pressure test be carried out at intervals not exceeding three years. This is aimed at detecting faults that may not be readily apparent at the monthly visual inspections.
The following procedure is an air pressure test using a face plate that provides a good seal. Any leakage can be monitored by the drop in pressure over time without the need for the surfaces of all suits to be covered with soapy water.

5.1.1 **Unpack and Visual inspection.** Remove the immersion suit from its bag and unroll the suit. Carry out the visual inspection (see section 4.1.1 and 4.1.2) to check for any damage (e.g. tears in the neoprene, damaged gloves) as this will avoid fitting the face plate unnecessarily. Also if the gloves are perished they will need to be replaced before the suit is pressure tested (See section 7.1.4) or the wrist clamped to prevent air entering the glove.

5.1.2 **Fitting face plate** Open the immersion suit face aperture and slid the zip down 10cm or so. Place a new foam face seal onto the back plate of the face seal (Figure 5.01), insert into the immersion suit face aperture and zip the suit up. A new foam face seal must be used each time to ensure that a reliable seal is obtained. Thread the whistle and cord through the clearance hole of the front plate of the face seal and place on the chest of the suit. (Figure 5.02).

Figure. 5.01

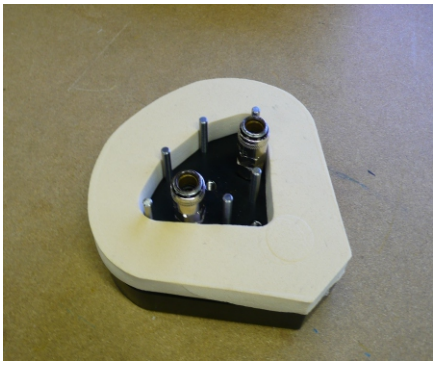


Figure. 5.02

Manipulate the neoprene foam of the face aperture so that it is flat and sitting around the outside of the locating dowels. Lower the front plate onto the dowels keeping the neoprene flat and in place for as long as possible. (Figure 5.03).

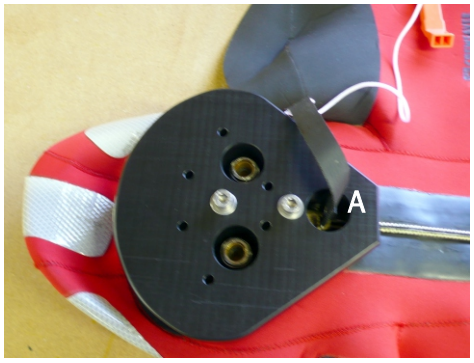
This is can be an awkward process especially if the neoprene has been creased or folded. Assistance from a second person for this stage can be a great help.

Figure. 5.03

5.1 Testing

Pull the whistle and cord fully through and align the zip pull in the clearance hole (A). Firmly tighten down the 2 bolts alternating the tightening so that the pressure is applied equally. Continue tightening until one bolt does not significantly affect the tightness of the second. This equates to 8 to 10Nm if a torque wrench is used. (Figure 5.04)

Figure. 5.04



5.1.3 **Measurement of Pressure**

Always use a calibrated digital gauge whenever possible.
The pressure gauge supplied with the kit is for indication only. Should it have to be used always tap the gauge gently to ensure that the indicating needle is not sticking prior to taking the reading.

5.1.4 **Pressurise the suit**

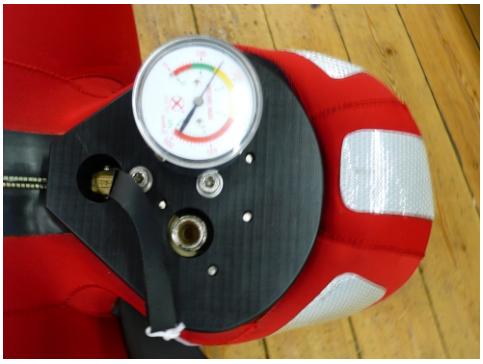
Connect the pressure gauge and air line adaptor to the face plate. Connect the compressed air line to the adaptor hose. Pressurise the suit with air to 2.0Kpa

Figure. 5.05

5.1.5 **Initial measurement of pressure.**

The pressure will fall rapidly at first as the neoprene of the suit stretches under pressure. This is normal. Allow this to continue for 10 minutes and then top the pressure back up to 2.0Kpa. Take the pressure reading after a further 20 minutes (30 minutes after initially pressurising the suit). (Figure 5.06)

Figure. 5.06



5.1 Testing

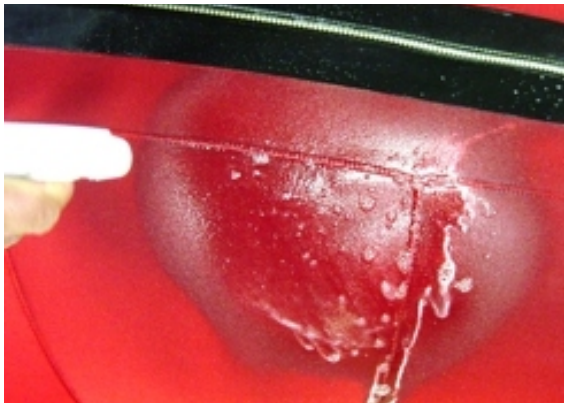
5.1.6 **Checking the Latex gloves.**
The latex gloves need to be separately tested as pin holes in, for example, a finger will not show up in the pressure drop after 2½ hours. Once the suit is inflated the glove should be briefly submerged in water and checked for leaks.

5.1.7 **Final measurement of pressure.**
Leave the inflated suit for a further 2½ hours (a total of 3 hours after initially pressurising the suit) before taking the final pressure reading (again tap the gauge gently to ensure that the indicating needle is not sticking). If a digital gauge is available with an adaptor for a lifejacket oral tube then this should be used as it removes the interpretation needed with a dial gauge. Calculate the pressure drop between the 2 readings. If the drop is 0.20kpa or less then the suit is OK.
Deflate using stay put oral tube caps.

5.1.8 **Leak detection.**
If the drop is greater than 0.20kpa check the face plate first using soapy water as the cause of the leak may have been caused by a fold in the neoprene during the fitting.

5.1.9 **Checking the suit to locate leaks.** If the face plate does not show signs of leakage reinflate the immersion suit to 2.0kpa and Spray the entire Immersion Suit with a water and soap solution (household washing up liquid) (Figure 5.07). Visually inspect the material and seams for signs of leakage or punctures indicated by the formation of bubbles. Mark areas requiring repair with a china marker pen.

Figure. 5.07



5.1.10 Allow 24hr drying time before repairing. See section 7.1 repairs

5.1.11 More frequent readings
If the suit is suspected of having a leak, intermediate readings can be taken between the initial and final pressure readings. If the suit has a drop greater than 0.20kpa the suit should be checked for location of the leak. (See 5.1.8 and 5.1.9) If a digital gauge is used ensure that loss of air is not caused be taking these additional readings.

5.1 Testing

Immersion Suit Test Procedure with Hyayan face plate for models 8800Mk2, 8806, 8807, 8808, 8809 and 8810

5.1.12 **Unpack and Visual inspection.** Remove the immersion suit from its bag and unroll out. Carry out the visual inspection (see section 4.1) to check for any damage (e.g. tears in the neoprene, damaged gloves) as this will avoid fitting the face plate unnecessarily. Also if the suit is fitted with rubber gloves and they are perished they will need to be replaced before the suit is pressure tested (See section 7.1.4) or the wrist clamped to prevent air entering the glove.

5.1.3 **Fitting face plate** Open the immersion suit face aperture and slid the zip down 10cm or so. Place the neoprene face seal onto the back plate of the face seal (Figure 5.08), if not already fitted, insert into the immersion suit face aperture and zip the suit up. Ensure the zip pull is laying flat and down the zip. add the neoprene zip panel over the zip (figure 5.10)

Figure. 5.08

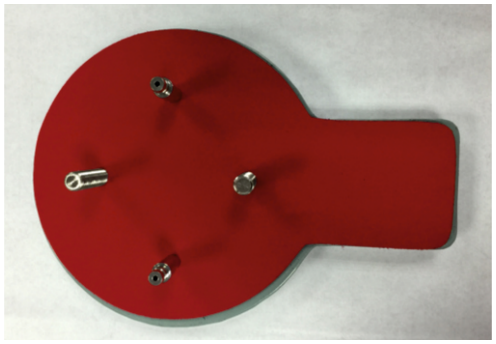
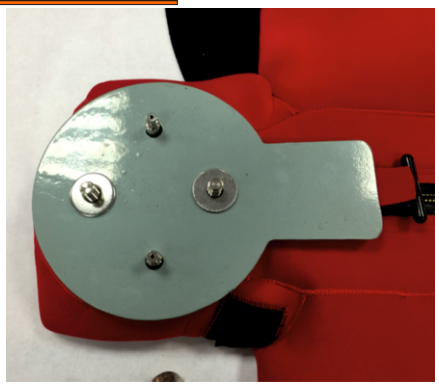


Figure. 5.09

Manipulate the neoprene foam of the face aperture so that it is flat and sitting around the outside of the locating dowels. Lower the front plate onto the dowels keeping the neoprene flat and in place for as long as possible. (Figure 5.11).

Figure. 5.10

Figure. 5.11



This is can be an awkward process especially if the neoprene has been creased or folded. Assistance from a second person for this stage can be a great help.

5.1 Testing

Firmly tighten down the face plate alternating the tightening so that the pressure is applied equally. Continue tightening until there is no significant affect to the tightness of the second bolt.

Figure. 5.12

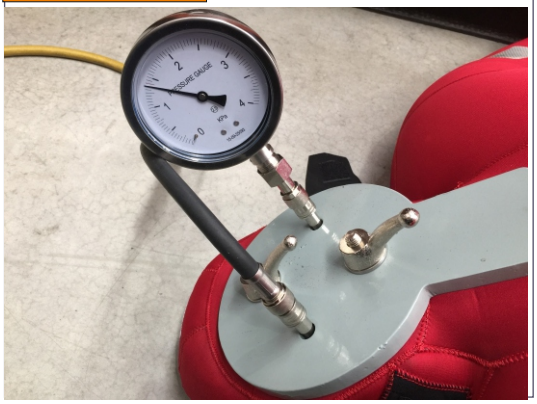
5.1.4 **Measurement of Pressure**

Always use a calibrated digital gauge whenever possible.
The pressure gauge supplied with the kit is for indication only. Should it have to be used always tap the gauge gently to ensure that the indicating needle is not sticking prior to taking the reading.

5.1.5 **Pressurise the suit**

Connect the pressure gauge and air line adaptor to the face plate. Connect the compressed air line to the adaptor hose. Pressurize the suit with air to between 0.7 -1.4Kpa. Keep this pressure range throughout the entire inspection process

Figure. 5.13



5.1.6 **Inspection**

Apply a solution of soapy water to the zip and all seams. Any leaks will show as a continuous stream of bubbles. Mark any leaking areas with a china marker pen. After inspection clean the tested areas and zip with clean water and allow t dry for 24 hours. See section 7.1 repairs

Figure. 5.14

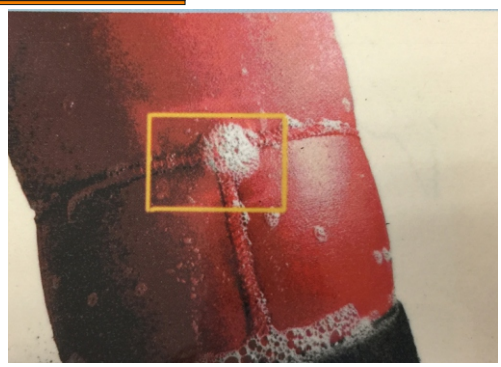


Figure. 5.15

6.1 General maintenance

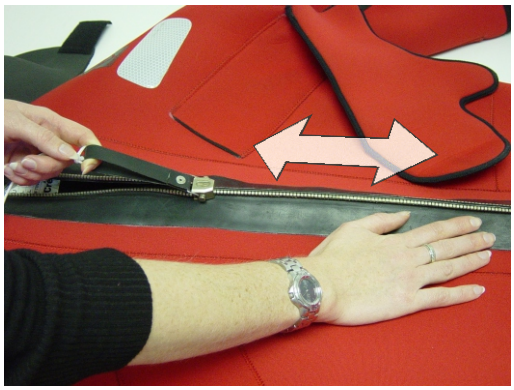
This section describes the method for maintaining the zip to ensure a long trouble free use throughout the life of the suit.

6.1.1 **Cleaning the front entry zip.** Use a soft bristle brush and warm soapy water to clean the teeth of the zip. Gently clean both sides of the zip removing any salt deposits, dirt and grit from between the teeth.

6.1.2 Once all dirt has been removed from the teeth of the zip and dried, rub beeswax or silicon into both sides of the zip (Figure 6.01) to lubricate the zip. Once lubrication has been completed pull the zip up and down several times to ensure that the zip operates smoothly and that any excess wax / silicon has been removed (Figure 6.02).

Figure. 6.01

Figure. 6.02



7.1 Repairs

PERMISSIBLE REPAIRS/REPLACEMENTS
This section described in detail how to repair cuts and tears and the method for removing and replacing the latex gloves.

7.1.1 **Glued repairs/replacements:** Should be carried out using either Alpha S2000 Glue, Zodiac (#:7098 neoprene 2 part adhesive, Viking NR 2 part adhesive or Switlik Bostik 1096M 2 part neoprene adhesive. Use of any other glue should be agreed with Crewsaver first.

7.1.2 **Repair of cuts with straight edges:** Apply three coats of adhesive to each surface allowing the first and second coats of adhesive dry completely. Apply the third coat to each surface and allow to become touch dry. Press the two surfaces together and leave for 24 hours. Cuts over 100mm in length must NOT be repaired.

7.1.3 **Repair of tears and holes:** These should be repaired by means of a neoprene patch. Using the patch as a guide, mark the repair area using china graph pencil. Apply the adhesive as detailed above 7.1.2.

7.1.3.1 Patches must overlap damaged areas by no less than 25mm.
7.1.3.2 Circular patches must not be larger than 150mm diameter.
7.1.3.3 Rectangular patches must not be larger than 150mm x 150mm.
7.1.3.4 The maximum number of patches that can be applied to one panel is three.
(Note: An assessment should be made about the number of repairs made to a suit. Suits that already show a high level of repairs should be deemed BER and replaced.)
7.1.3.5 Patches must not be glued across seams.
7.1.3.6 No repairs allowed to previously repaired areas.

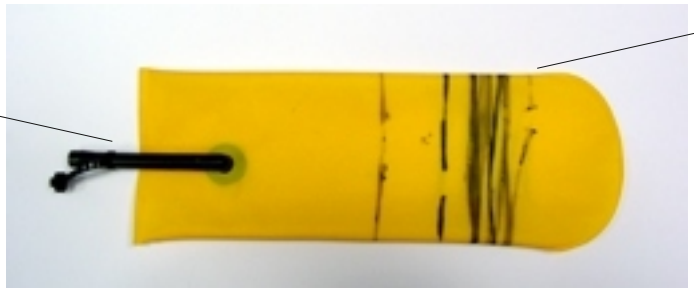
7.1.4 **Replacement of Latex gloves:** To remove the old glove, turn the sleeve inside out and cut the glove off as close to the sleeve as possible. Once the glove has been removed the tape should be removed, this is achieved by applying localised heat to the seal area to soften the glue enabling the tape to be pulled free. As shown below (Figure 7.01 and 7.02).

Figure.7.01

Figure.7.02

7.1.5 The new glove should be fitted using an inflatable arm (available from Crewsaver). (Figure 7.03)

Figure. 7.03



7.1 Repairs (continued)

7.1.6 Fold the inflatable arm in half, lengthwise, then insert into the immersion suit sleeve so that the inflation tube is accessible from inside the arm. At least 140mm of the inflatable arm should be showing . (Figure 7.04).

Figure. 7.04

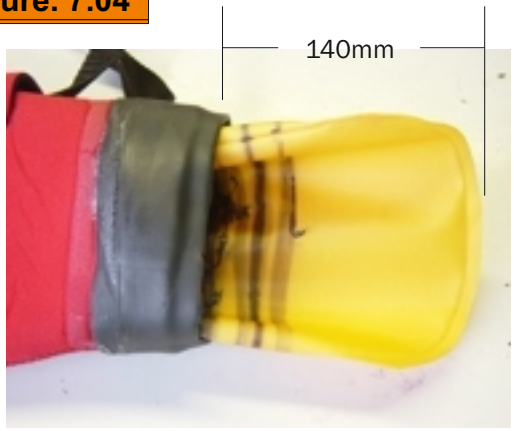


Figure. 7.05

7.17 Make sure that if the left hand glove is removed it is replaced with a new left hand glove and visa versa. Before fitting the glove abrade / Rough up both surfaces of the glove to be glued using a wire brush or sand paper.
(Warning: Care should be taken when abrading the latex glove ensuring the material is not holed or nicked.)

7.1.8 All surfaces must be clean, dry and dust free. Remove all traces of grease, oil and release agents using Dunlop Cleaner T559 or Bostik M501.

7.1.9 Fit the new glove onto the inflatable arm ensuring that it is in the correct position on the arm of the suit and that it covers the remaining 3cm of the old glove left after the old glove is cut away. (Figure 7.05)

Figure. 7.06

Figure. 7.07

Figure. 7.08

7.1.10 Inflate the arm (Figure 7.06). Roll back the wrist of the glove to expose the area to be glued (Figure 7.07). Apply a band of masking tape on to the glove to protect the glove from excess glue (Figure 7.08). Apply two layers of glue to both surfaces and allow to dry, apply a third coat of adhesive to each surface and allow to become touch dry. Press the two surfaces firmly together, bone down all glued areas. (see section 7.1.17 for adhesive type).

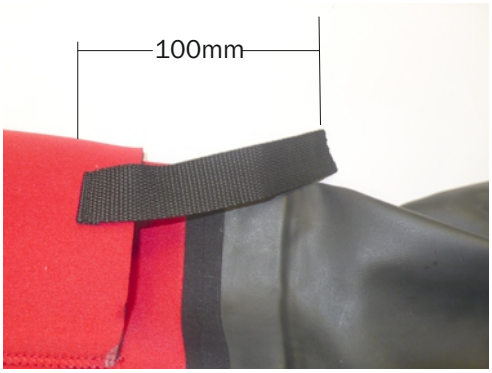
7.1.11 As soon as the glove has been glued to the arm the tape can be added to cover the join. With the inflatable arm still inflated apply a layer of glue to both surfaces sufficient to cover the width of the tape and allow to dry. Apply a second coat of adhesive to each surface and allow to become touch dry. Ease and press the tape over the join and remove any excess glue. Leave for 24 hours with the inflatable arm still inflated.

7.1 Repairs (continued)

7.1.12 **Over Glove replacement**.
If the over glove is damaged or missing remove any excess webbing by cutting and heat sealing the end, (Figure 7.09), leaving approximately 100 mm of webbing attached to the over glove pocket. (Figure 7.10).

Figure. 7.09

Figure. 7.10



If the over glove and webbing has been completely removed the immersion suit should be discarded.

7.1.13 **Fitting the new over glove**
Overlap the webbing of the new glove with the remaining webbing of the removed glove by 30mm. Ensure the glove is the correct way round for the side that it will be attached. Turn the ends of both webbings in so they interlock.(Figure 7.11). Sew two tipple lines of stitching over the folded ends. (Figure 7.12 and 7.13)

Figure. 7.11

Figure. 7.12

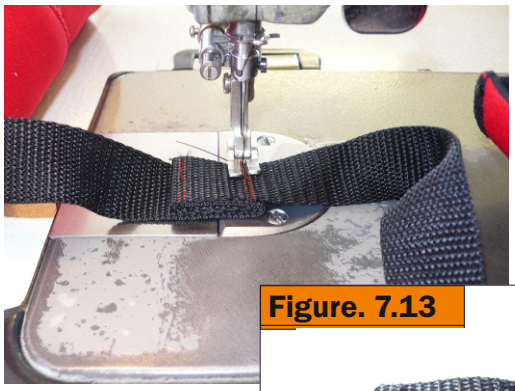


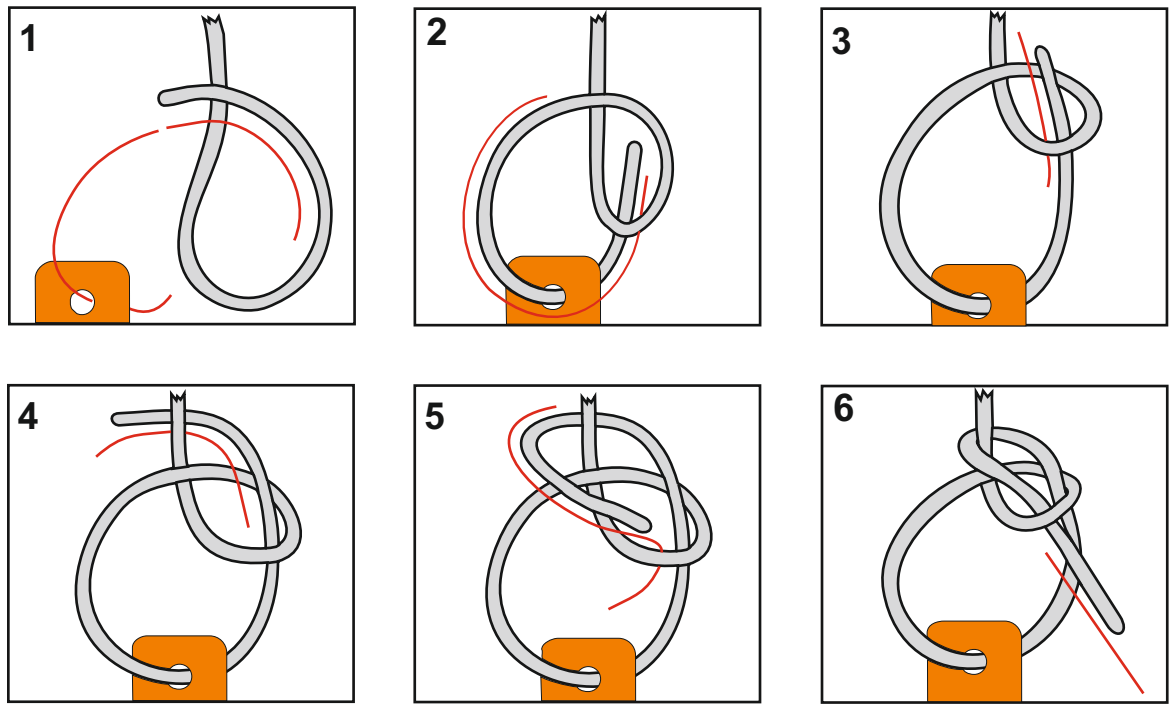
Figure. 7.13

7.1 Repairs (continued)

7.1.14 **Replacement of retro-reflective tape**. Remove any loose or peeling parts from existing tape, the new tape will be placed over this. Cut the replacement tape to length (110mm.) and radius the corners. Using the damaged reflective tape as a guide, apply a coat of 3M Scotch-Grip Rubber and Gasket Adhesive 2141, and allow to dry. Attach the tape to the suit and allow to dry for 24 hours.

7.1.15 **Replacement of whistle.** If the whistle is broken or damaged it must be replaced. Untie the old whistle or cut the lanyard and discard. If the lanyard had to be cut to remove the whistle then the lanyard should be replaced. Use a bowline knot , as illustrated below (Figure 7.14), to tie the whistle to the lanyard and the lanyard to the zip or whistle pocket. Both ends of the lanyard are to be heat sealed.

Figure. 7.14



7.1.16 All parts used in repairs, except adhesive, must be obtained from Crewsaver. Refer to Crewsaver for compatible adhesives list.

7.1.17 Any other repairs that are deemed to be necessary must be referred to Crewsaver.

7.1.18 A leakage test must be carried out after the repair of cuts, punctures or the replacement of gloves.

7.2 Replacing the buddy line

7.2.1 **Replacement of buddy line (8800 models).**

7.2.1.1 Thread the 2 metre length of Crewsaver buddy line through the white toggle and tie a knot to secure the toggle. (Ensure lengths are cut cleanly with the ends sealed with a rope cutting knife)

7.2.1.2 Pass the other end of the rope through the pocket and out through the side hole towards the back of the suit. Then thread the rope through the retainer, under the arm and through the front retainer (with retro-reflective tape). Now pass the rope through the side hole to the front of the pocket. (Figure 7.15).

Figure. 7.15

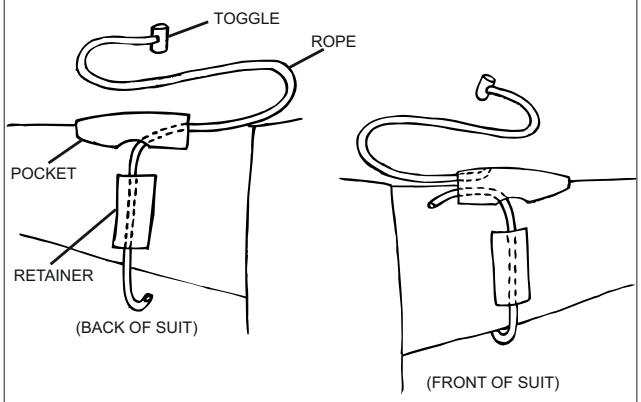
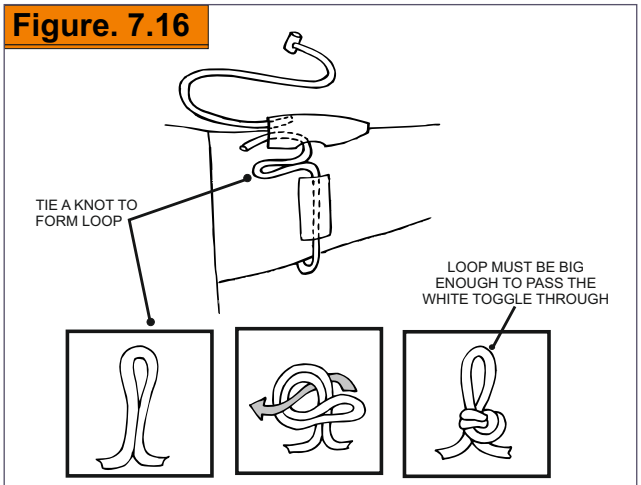


Figure. 7.16



7.2.1.3 Pull some more rope through the front retainer and tie a knot to form a loop in the rope between the front retainer and the pocket. The loop must be just big enough to pass the white toggle through. (See Figure 7.16).

7.2.1.4 Next tie a Bowline knot (as shown in Figure 7.14) with the loose end of the rope to the rope with the white toggle. The knot should be at the top of the pocket leaving a length of no less than 40cm. of rope between the knot and the white toggle. (Figure 7.17a).

Figure. 7.17a

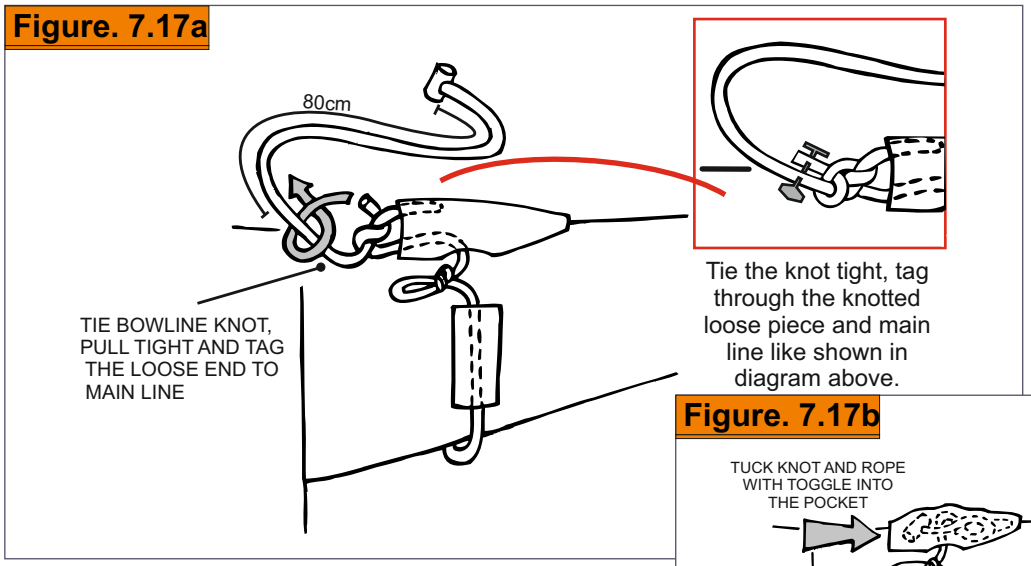
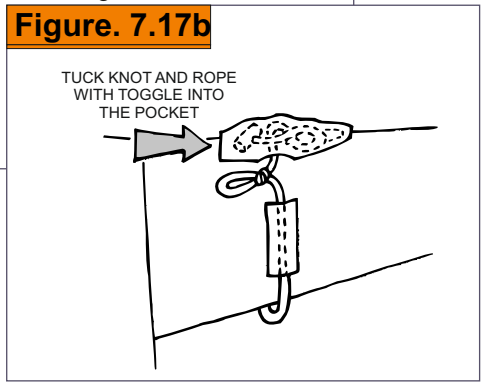


Figure. 7.17b



7.2.1.5 Finally tuck the buddy line into the Pocket. See Figure 7.17b.

7.3 Replacing the lifting strop

7.3.1 Ensure the correct size of lifting strop is fitted to the suit. Thread one end of the buckle through the right front belt loop (Fig 7.18). Feed the webbing through the loop up to the lifting becket (Fig 7.19). Turn the Immersion Suit over and continue to thread the webbing through the back loop - longest loop for Suits with additional loop (Fig 7.20). Turn the Suit over again and continue to thread the webbing through the front left loop (Fig 7.21). Fig 7.22 shows the Immersion Suit with the belt threaded correctly. **The lifting strop should be left unfastened.**

Figure. 7.18

Figure. 7.19

Figure. 7.20

Figure. 7.21

Figure. 7.22

7.4 Replacing the storage bag

7.4.1 Ensure that the correct size is indicated on the new bag and if the suit is fitted with a Harness ensure that this is indicated on the bag also.

7.5 Replacing the lights (L6)

7.5.1 The McMurdo L6 light is attached using a fabric bracket. The fabric bracket is supplied with the L6 light; see section 9

7.5.2 To attach the light thread the fabric bracket trough the neoprene harness loop on the front of the suit. Lay the backing plate behind the fabric bracket lining up the punched holes, locate the backing plate through the holes and push the light housing on to the backing plate, sandwiching the fabric bracket . (Figure 7.23 - 7.27)

Figure. 7.23

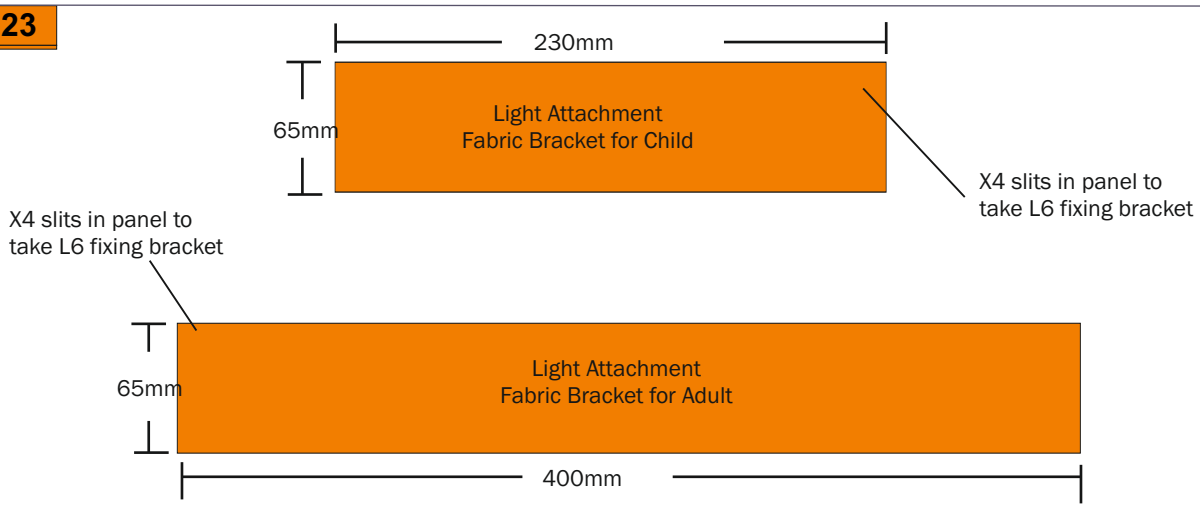
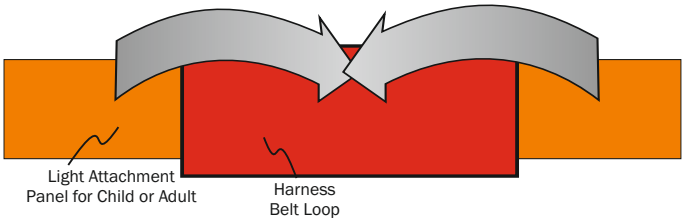


Figure. 7.24



Thread light attachment panel through Immersion suit harness loop. Fold the ends of the exposed light panel over the harness loop and line slits up.

Figure. 7.25

Ensure the slits on each panel line up. Pass the L6 fixing bracket behind the panel and push bracket ends through the slits
Figure 7.18a

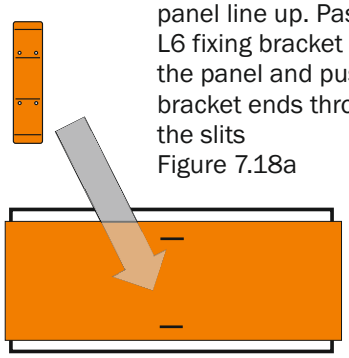
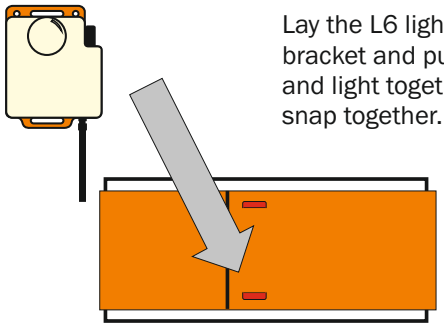
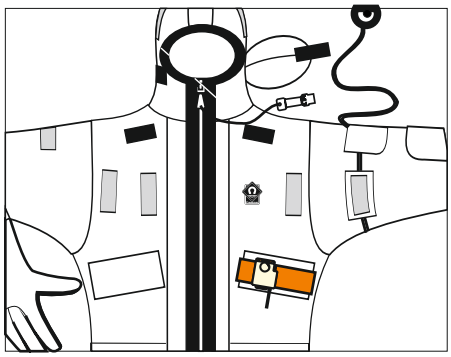


Figure. 7.26



Lay the L6 light over the bracket and push bracket and light together until they snap together.

Figure. 7.27

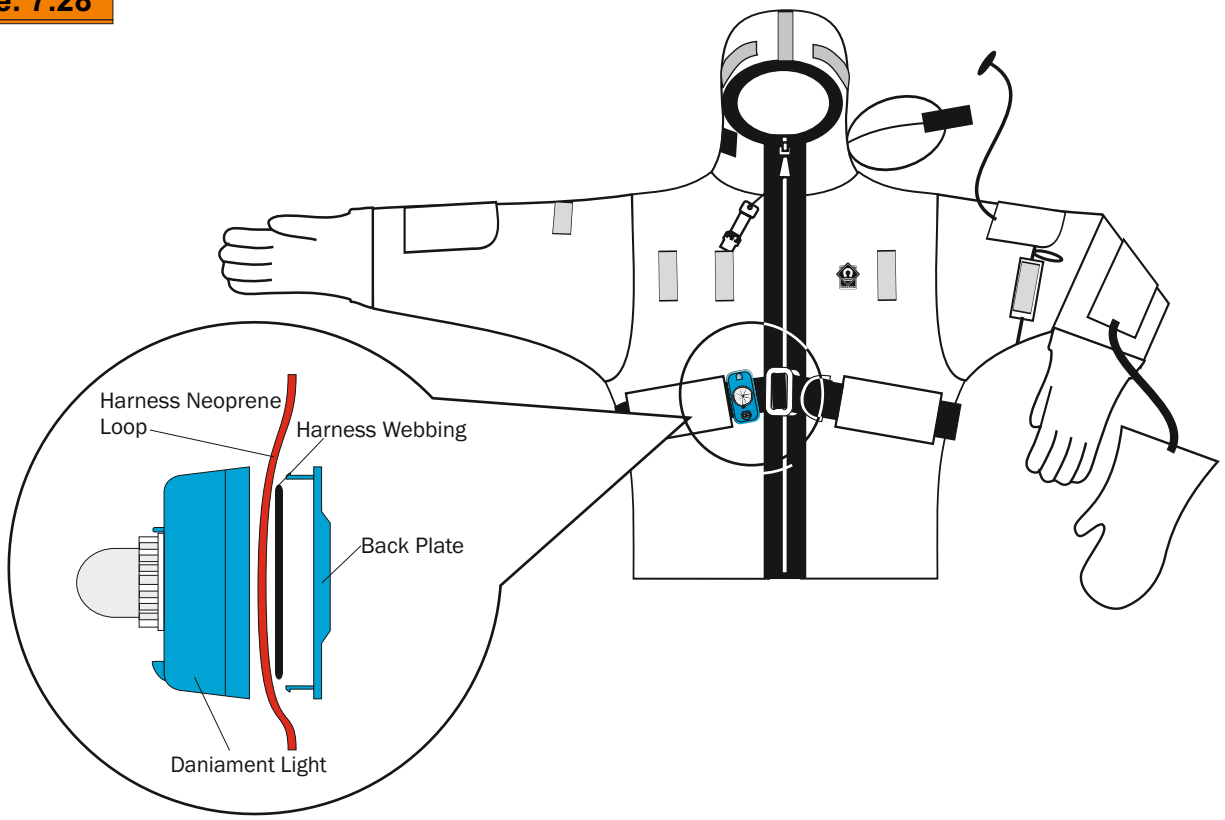


7.5 Replacing the lights (Daniament)

7.5.3 The Daniament light is attached to the harness webbing between the square link and bar buckle and the harness retainer.

7.5.4 To attach the light lay the backing plate behind the harness webbing and push the light housing on to the backing plate, sandwiching the harness. (Figure 7.28)

Figure. 7.28

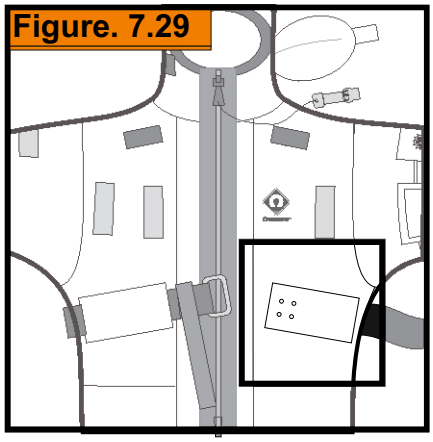


7.5 Replacing the lights (CSL Lights)

8800 model suits

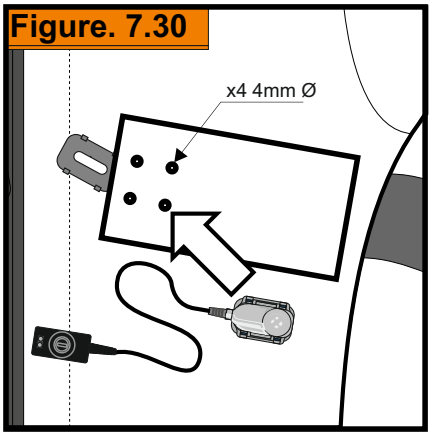
7.5.5 The Crewsaver Surface Light is attached to the harness webbing belt loop on the front of the suit.

Figure. 7.29



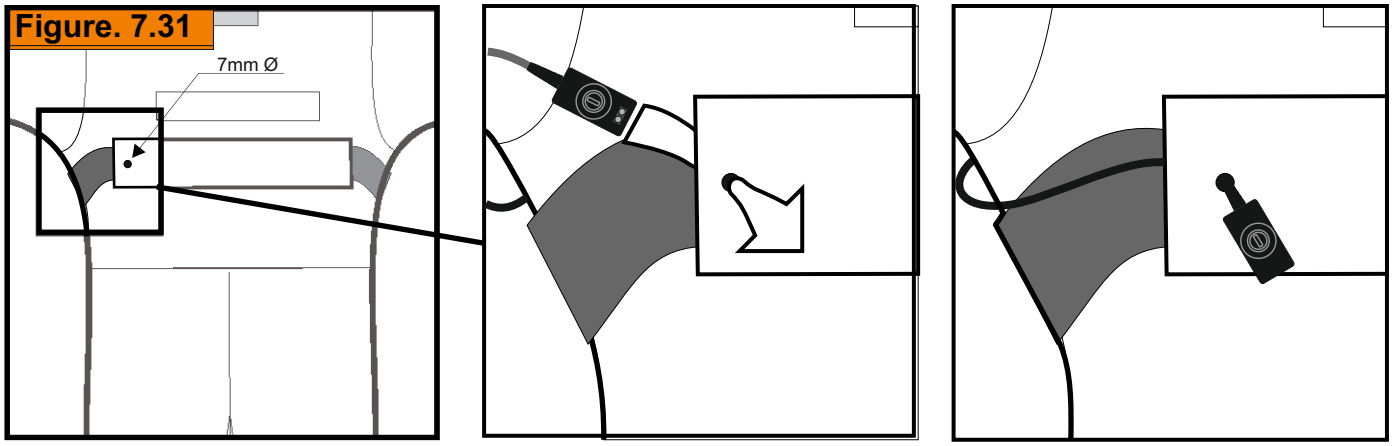
7.5.6 The light back plate is placed behind the belt loop and the four pins are pushed through the holes in the neoprene. If the holes are not present these can be added by punching four 4mm dimeter holes in the belt loop.

Figure. 7.30



7.5.7 With the light positioned with the cable nearest to the belt loop opening push the light onto the bracket. Pass the light cable through the belt loop round to the belt loop on the back of the suit and pass the switch through the 7mm hole. If the hole is not present this can be added by punched a 7mm hole into the belt loop.

Figure. 7.31



7.5 Replacing the lights (CSL Lights)

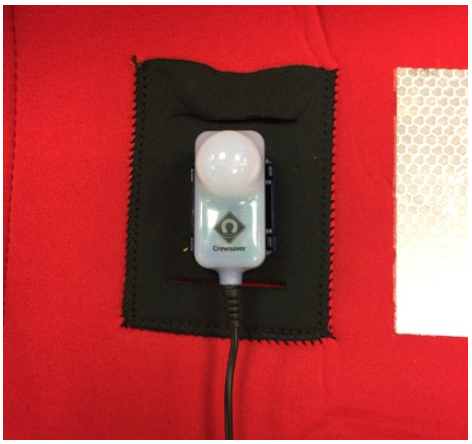
Models 8800Mk2, 8806, 8807, 8808, 8809 and 8810

7.5.8 The Crewsaver Surface Light is attached to the black light panel on the left front chest. The light back plate is passed behind the panel and the four pins pass through the holes in the panel.

Figure. 7.32

7.5.6 The light is pressed on to the back plate with the cable hanging down.

Figure. 7.33



7.5.7 Pass the cable through the belt loop and loop over the belt

Figure. 7.34

7.6 Fitting a replacement Buoyancy Plus pillow

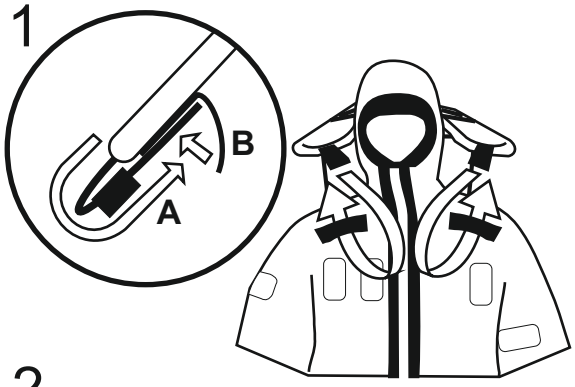
8800 Models only

7.6.1 Ensure the correct size Buoyancy Plus pillow is fitted to the suit. All Child sized suits require a Child buoyancy pillow. All Adult sizes require an adult sized buoyancy pillow..

7.6.2 Remove the old Buoyancy Plus pillow and discard. To fit the new Buoyancy Plus pillow see Figure 7.28 (Note: For immersion suits approved to J.MOT requirements an additional kimble should be used to fasten each of the velcro fastenings.

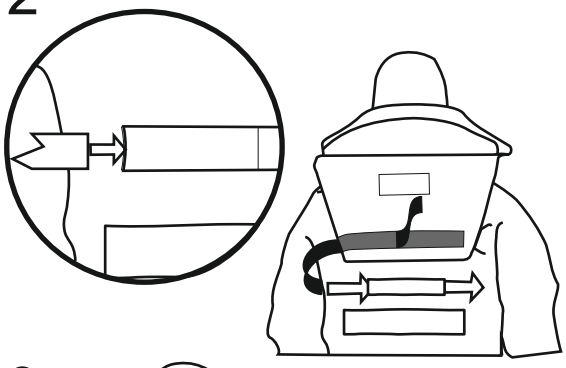
Figure. 7.35

1



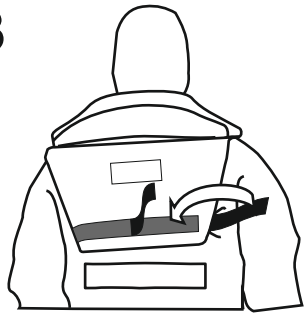
The shoulder webbings pass over the webbing loops on the immersion suit. Pass the shoulder webbing up through the loops and attach to the velcro on the underside of the Buoyancy Plus

2



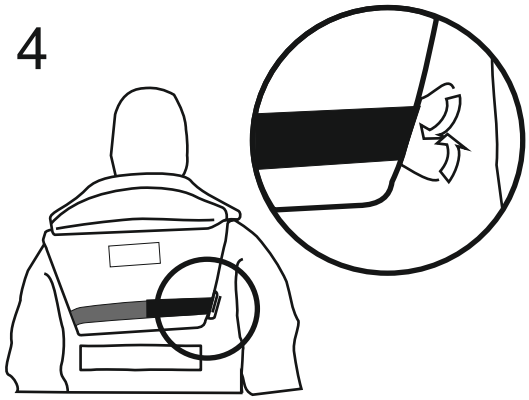
Pass the back foam webbing through the top neoprene loop on the back of the immersion suit

3



Pull the back foam webbing firmly over the back foam and attach to the velcro

4



Ensure the back webbing passes over the open 20mm webbing retainer on the side of the back foam. Fold this webbing over and attach velcro. *(This is important as it prevents the back foam webbing from slipping if the wearer jumps into the water)*

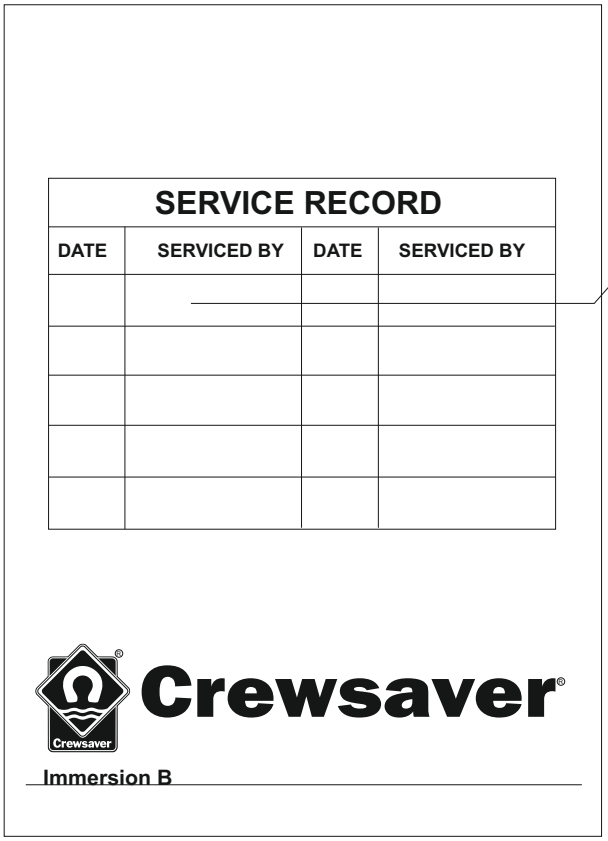
8.1 Service records

8.1.1 **RECORD KEEPING.** In addition to completing the service record sheet, all immersion suits are fitted with a service label sewn inside the suit as a record of date of service and personnel who carried out the service

8.1.2 Immersion suits that have passed inspection and are returned to service should have a label, attached to the inside of the immersion suit, indicating the serviceability status and the date of the next required service inspection.

8.2 Records of periodic inspections and repairs should be kept for each Immersion Suit.

Figure. 8.01



Mark date and name of service station using an indelible pen or laundry marker, on to the service record label attached inside the suit

8.2 Packing instructions (check list)

8.2.1 Ensure the service label on the suit has been signed and dated.

8.2.2 Ensure additional items if fitted have been fitted correctly.

8.2.3 Ensure the rescue strop if fitted has been left open prior to packing the jacket.

8.2.4 The Immersion suit zip should be fully open prior to packing the lifejacket

8.2.5 Check that the size of the suit matches the size indicated on the bag.

8.2.6 Ensure donning cards are inserted into the bag either in with the suit or in the pockets provided.

See section 8.3 for packing of the Immersion Suit.

8.3 Packing instructions (packing)

Figure. 8.02

Ensure the immersion suit is fully unzipped.

Figure. 8.03

Fold the arms across the immersion suit

Figure. 8.04

Roll the immersion suit from the feet up

Figure. 8.05

Continue to roll the immersion suit up, folding the hood over with the remainder of the jacket

Figure. 8.06

This shows the immersion suit fully folded.

Figure. 8.07

Open out the immersion suit bag

Figure. 8.08

Slide the folded suit together with the donning instruction leaflet Into the bag. Turn the bag lip in and fasten the Velcro closure or pull the draw string to close the bag (Do not tie the loose ends)

8.4 Storage conditions

8.4.1 The temperature at which the suit must be stored must be within the range -30C to +65C.

8.4.2 The suit should be dry and free from contaminants likely to cause deterioration of the materials used.

8.4.3 The suit should be packed into its bag prior to storage.

8.4.4 The storage container should be water and vermin proof and not subject to extremes of temperature likely to exceed those specified in 8.4.1.

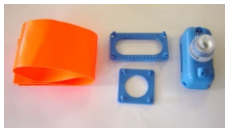
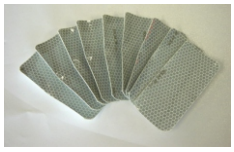
8.4.5 The packed suit should be stored out of the direct effect of sunlight.

8.4.6 The suits must be readily accessible when required.

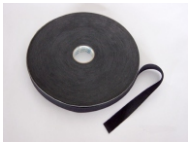
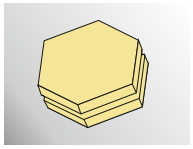
9.1 Replacement parts

Min Req.	Description	Product Code	
3 of each	Immersion suit bag Adult Child	98830 98831	
20	A5 Donning instruction cards English Chinese / Japanese	98832 98833	
5	Buddy Line cord 2 metre lengths	98836	
5	Buddy Line Toggle	98837	
10 pairs	Latex Gloves (Pair)	98844	
5 pairs	Neoprene over glove Complete with webbing	98838	
3 of each	Lifting Strop Extra Large Large Universal Child	98826 98827 98828 98829	
2 of each	Buoyancy Plus Adult Child	8800 SCOT 8800 SCOTCHILD	

9.2 Replacement parts

Min Req.	Description	Product Code	
Order when required	Dan W1 Light and fixing Kit	98846	
Order when required	L6 Light Include fixing Kit Manual Automatic	98841 98842	
20 of each	MW2 Whistle	98839	
20 pieces	Retro reflective tape	98840	
1	MK1 Immersion suit Inflation Test Kit. For on Board servicing	10245	
4	Immersion suit Inflatable arm	98847	
1	Kimble Gun	98848	
1 kit	Neoprene patch Kit comprising of: X10 60-mm Patches X10 120mm patches	98849	

9.2 Replacement parts

Min Req.	Description	Product Code	
1 roll	Seam tape roll 3 metres	98850	
4 blocks	Beeswax for lubricating dry zip	98852	
I	MK2 Test Kit	10249	
20	Replaceable face seal	10251	
5	Replaceable face seal for face plate 900201	900200	
1	Face Plate for immersion suit models 8800Mk2, 8808 and 8810	900201	
1	Air supply hose for face plate 900201	900202	
1	pressure Guage for faceplate 900201	900203