



# Open Water Diver

Part 1  
Basic equipment

## 1 Light diving equipment

Diving is practiced in a water environment that is not natural to us, which is why it is called a hostile environment, since we are not designed to survive in it. Hence, we need to draw on techniques and technology in order to evolve in that environment. We move poorly in it so we need fins to improve this aspect. Anyone who has opened their eyes underwater will have been able to notice that their vision is very blurred, so we need a mask that will keep our eyes in a gaseous environment. We all know that we cannot breathe water, as fishes do, so if we want to dive for longer than we can hold our breath, we need a device that provides us with air. And we could go on and on with these comments, but let's go on to describe all the diving equipment, indicating the purpose of each element that constitutes it.

Diving equipment is usually separated in two large families, basic equipment (also known as light or snorkelling equipment) and scuba equipment (sometimes called heavy equipment). It is often called basic equipment to the different components necessary to practice diving in apnoea, that is, holding your breath underwater. On the other hand, it is often called scuba equipment to the part of the equipment necessary to be able to dive while breathing under the water.

If we decide to buy our own diving equipment, we will find that the offer in the market is very wide, so much that it can puzzle the novice diver. Until we can form our own criteria and see which equipment may be more suitable for us, it is advisable to follow the advice of our instructor or, else, an expert in the specialized dive shop that we choose.

The maintenance operations are explained for each part of the equipment and all have in common the rinsing in fresh water after each dive and avoiding heat sources. In this regard we want to make a call of **attention** as the inside of a car or its trunk, parked under the sunlight, can reach very high temperatures, enough to deteriorate or destroy many of the items, so we should **never** leave the diving equipment inside the car, much less if it will be parked under the sun.

So, let's start with the basic equipment, consisting of mask, snorkel, booties, fins, diving suit, gloves and weight belt.

### 1.1 The mask

If you have ever opened your eyes underwater, you surely have noticed that your vision is blurred. That is because in our aerial vision, a refraction happens when light passes from an aerial to the aqueous environment that is part of our eye, such refraction is necessary for the image to be formed with clarity in our retina. If our eyes are in contact with water, such refraction does not occur, which causes a marked farsightedness, that is, we see very blurred. This problem is solved with a mask that keeps our eyes in an aerial environment, which allows us to see with clarity.



To achieve this, we need the mask to fit perfectly to the contour of our face and also that it can remain fixed, without moving or loosening up and **covering both the eyes and nose**. In the chapter about pressure changes and their consequences we will explain this need. To meet these requirements the market offers a wide variety of masks, what we have to do to check if the mask chosen fits us well, is to place it on our face and, inhaling lightly through the nose, check that it is tightened without the need to put on the back strap. If it holds in place it is because we have caused a vacuum, this way we know that if the air cannot go in, neither will the water.

It is recommended that the mask be designed to have as minimum internal volume as possible. Currently most of the masks are like this and the sealing is achieved thanks to the double skirt in its outline.

The lens must be tempered to reduce the risk of breakage. We can check that easily because it is marked right on the glass, or with a T surrounded by a circle. Glass fogs easily with the vapour produced by our skin, but this annoyance is avoided with anti-fog liquids that we find in the shops, there are other homemade solutions too that we will learn or our instructor will indicate to us. The lens or lenses are mounted on a rigid structure, generally made of polycarbonate.

The back strap must be wide and adjustable in length. We must adjust its length so that the mask remains in place, but without tightening. When we place the mask on the face to check its fit, as we indicated before, we should ensure that it leans only on the perimeter which provides the watertightness. If it leans on other parts of the face, such as the nose or the frown, after a time of use this can cause headaches.

The material is silicone, as this provides a better fit and it is smoother to the contour of the face. Everything is mounted on a rigid polycarbonate structure, so the lenses are kept in the axis of our vision. In the market we will see that there are white silicone and black silicone. Choosing one or the other is a personal aesthetic option. Photographers usually prefer to use as model divers, with a white or translucent silicone mask, since by letting the light pass through the silicone, they allow to see very well the image of the face, without shadows or dark background.

The mask can be made with two lenses or a single one. The masks with two lenses allow for correction lenses, in case we need graduated glasses. It is recommended a small internal volume, in this sense, masks with two lenses usually have a smaller internal volume. The mask of the image is specially prepared by the manufacturer to easily fit correction lenses.



As a general rule you should not dive with contact lenses, unless our doctor or specialist tells us that we can dive with a specific type of lens. We will see masks with lateral glasses that, although valid to dive if we like them, are less recommended because they have a higher internal volume.

The masks are easily fogged due to evaporation and temperature difference. In addition to the "homemade" solutions that we will learn with our instructor, we can find in the dive shop anti-fog liquids to apply before use and thus avoid the annoying fogging. A solution that we should never use is to heat the lenses with a flame. Someone may tell us that it works as an antifog, but we alter the safety features of the glass and run the risk of destroying the mask.

The mask and snorkel kits that we can find in toyshops or beach shops do not usually meet the minimum safety requirements so, it is advisable to listen to the advice from our instructor and, in any case, when we decide to buy the equipment, we should do it in a specialized diving shop.

After each dive, it should be rinsed with plenty of fresh water and never dried under the sun or in a heat source.

You can download the file mask in which you will see an image with interesting details of the masks.

## 1.2 The snorkel

Underwater it has no role, but on the surface, it allows us to be with our faces in the water and breathing, which makes it more comfortable to swim to the dive area or back to the boat or coastline when we finish the dive.

This exclusive use for the surface, makes it not advisable to attach the snorkel to the strap of the mask, as while diving it can annoy us or cause flooding of the mask, so it is advisable to keep it in some fixation provided in our equipment.

The inside of the snorkel must be smooth to allow the ejection of water with ease when blowing, because the snorkel bends to go from our mouth to the surface, the bending should be smooth and without sharp angles. Snorkels may have the lower part flexible in order to access the mouth more easily and many types they have a drain valve that facilitates the expelling of the water, either when we reach the surface or if while we are swimming some water enters by the top.

It is preferable for the mouthpiece to be made of silicone because its touch is softer in our mouth. Snorkel with valve is more comfortable to purge but we must keep the valve clean and be careful not to get any garbage, sand or algae while being used as it can cause flooding and an unpleasant gulp of water when trying to breathe.



After each dive, it should be rinsed with plenty of fresh water and never let it dry under the sun.

You can download the file snorkel in which you will see an image with some details.

### 1.3 The neoprene socks or booties

They are our diving shoes, they are made of neoprene, just like the diving suits, as they really are their complement. Its function is to protect our feet from cold and friction with the fins, so they have to be tight but not squeezing.

There are basically two types: the socks (without sole) and the booties (with sole). As we need to walk frequently with the equipment, booties with sole are very common as they protect our feet from the irregularities of the ground, the socks hardly protect us and they deteriorate fast, reason why are used mostly by people who only dive by boat. If we use booties with sole, we have to use adjustable fins.



There are also different thicknesses, according to the thermal protection we need, the most frequent being those between 3 and 5 mm thick. Booties usually have a zipper that makes it much easier to put them on and to remove them. Nowadays the whole length of the opening of the zipper is on a neoprene fold, to maintain its thermal properties in spite of the zipper.

After each dive, they should be rinsed with plenty of fresh water and never dried under the sun or in a heat source.

You can download the file boots.jpg in which you will see an image with different types of boots and their details.

### 1.4 The fins

They facilitate our movement in water. They have a housing for the foot and a large blade. When finning, we move a large volume of water backwards, which propels us forward, because of the principle of action-reaction. It is the same behaviour as with the fins of the fish. At the same time, thanks to the large surface of the blade, it helps us to maintain stability.

There are 2 main types: full foot fins and open heel fins. The full foot fins have a closed foot housing, so that we also insert the heel in. They have the advantage of keeping the foot centred on the fin but the disadvantage that they are not suitable for thick or soled booties, as the excessive looseness facilitates their loss.

The open heel fins have ample space to insert the foot, without covering the heel, so they have a flexible and adjustable strap to embrace the heel and thus create the support of the foot inside the housing of the fin. This system allows the use of neoprene socks of any thickness and even soled booties. That is why they are the most used in diving.



The blade should be wide, with certain rigidity on the sides, but more flexible at the end. This shape gives us power, necessary to move around carrying diving equipment. In order to decide its purchase, it is best to listen to the advice of our instructor, as the rigidity as well as the blade surface must be according to our legs muscular strength and our experience. The market offer is so wide that this specialized assistance is necessary at the beginning, a recommendation that can be extended to all diving equipment.

The best efficiency is achieved by moving the greatest amount of water with the smallest effort. Some are built with different materials to find the best ratio of rigidity and flexibility where necessary, since the end of the blade is convenient to be more flexible, as well as the accommodation of the foot, for greater comfort.

After each dive, they should be rinsed with plenty of fresh water and never dried under the sun or in any heat source.

You can download the file fins.jpg in which you see an image with different fins and their details.

## 1.5 The diving suit

Also called wetsuit It serves to protect us from cold and friction with abrasive surfaces or stinging animals, but its main function is thermal protection.

The water is 24 times more heat conductive than the air, which causes that we lose temperature at much faster speed when we are in that environment. That is something we all know, even if it is intuitive, as when we get wet, we cool off. The problem of cold while diving is serious, so we need adequate protection.

Mostly, diving suits are made of a synthetic material called neoprene, which is an insulating and impermeable material, made up of many microcells that hold gas inside, usually air, hence their insulating power. It is manufactured with neoprene of different thicknesses, being the most common those of 3, 5 or 7 mm. Of course, the thicker the neoprene, the greater the insulation power it will offer, but the neoprene has to have a certain elasticity to conform to the perimeter of our body, so neoprene thicker than 7 mm (also known as  $\frac{1}{4}$  in), although theoretically it would provide more thermal insulation, in reality if they are wetsuits it is not so, as its greater rigidity facilitates the circulation of water inside the suit. Nowadays they are manufactured with neoprene of different thicknesses according to the part of the body to cover.

The suit is waterproof but that does not mean that we will not get wet, in fact it is called wetsuit. As soon as we get into the water, the suit is flooded, because although it is waterproof, water enters by the joints of the neck, wrists and ankles in addition to that which enters by the zippers. Nevertheless, as it is well adjusted to

our body, the film of water that enters is very thin and we warm it immediately with the heat of our body. Because of the suit's adjustment, that water does not come easily out, so that its renewal is very slow and thus we may stay long under water without feeling cold. Obviously, the suit must have a hood to cover and also protect our neck and head.

They can be one piece or two pieces (pants and jacket), with or without zippers to facilitate putting it on and off, although the one piece suits necessarily need to have a zipper to allow dressing and undressing. There are so called semi-dry and dry suits, in which no water enters, but their use is more suitable for very cold waters or long underwater stays. There are also other suits such as lycra suits, mainly used in warm waters, for their very little thermal protection, being their main function to protect our skin from possible friction with the equipment, from the bottom substrates and from rubbing against stinging animals. Nowadays lycra is in disuse as very thin neoprene suits are used instead.

The semi-dry and dry suits are equipped with watertight zippers. Its thickness can be somewhat higher than 7 mm, since their stiffness is less important as they are waterproof. They are equipped with a thin smooth neoprene collar to prevent water from entering by the neck as well as wrists and ankles, also in smooth neoprene, to fit hermetically to the skin. The dry suits usually have the booties incorporated and allow the injection of air inside, as well as its purge to control the ascent.

In professional diving dry suits made of plastic materials (not neoprene), known as trilaminates are used, which are also resistant to chemical products, although the thermal protection in this case is limited to the clothes that we wear under the suit. The special characteristics of the dry suits make it necessary to learn to dive with them, due to their great differences with respect to wet suits.

The suit contains air or other gases according to its construction, this is compressed with the depth losing thickness, hence the need to use greater thickness if we dive in cold or deep water. The trilaminated dry suits that we have mentioned, can even cause wrinkles that cause us painful pinching, but that we learn how to avoid it when we receive training on the use of those types of suits.

ACUC offers a specialty course in which you learn the use and maintenance of dry suits, as well as the precautions and techniques needed during their use.

After each dive, it should be rinsed with plenty of fresh water and never dried under the sun or in any heat source and neither bent. Preferably, must be dried on a hanger in a shaded and well ventilated place.

You can download the file [wetsuit.jpg](#) in which you see different suits and details.

## 1.6 Gloves

It complements our thermal protection as the suit covers us only up to the wrists. They also protect our hands from possible friction, because when staying in the water for a long time, our skin loses resistance which facilitates abrasion or injury due to friction. We all know the typical effect of wrinkled skin. We should choose neoprene gloves for colder waters and leather or fabric for warmer waters.



There are gloves available from very thin to thick neoprene. The thicker the glove, the more it protects from the cold but in return we lose dexterity. We must choose the appropriate gloves depending on the temperature of the water.

We should never touch anything, both to avoid damages to the environment and to prevent injury in case of touching some abrasive or stinging animal, but the protection is necessary for accidental friction.

After each dive, they should be rinsed with plenty of fresh water and never dried under the sun or in any heat source.



## 1.7 Weight belt

Getting in the water with the diving suit on is like getting in with a float. The suit has a positive buoyancy so strong that it prevents us from going underwater, so we have to compensate for that buoyancy with ballast, for which we use a weight belt.

In the image we can see that it is indeed a belt. It is a ribbon, usually made of nylon or polypropylene, with a quick-release buckle. The weights are arranged in tablets of 1 kg or 2 kg (2 to 6 pounds), which are the most common; they have two slots to pass through the ribbon and thus be part of the belt. There are other belts that have pockets, where we put the lead pellets to distribute the weight or we can introduce closed bags with lead pellets (named shot), which make it more comfortable and less painful if it falls on our foot.



The buckle is called a quick release, because it has to be such that the diver, with one hand and a single movement can open the buckle so that the belt, by its own weight, falls off from the waist of the person. It is an essential safety condition. Definitely the belt is the last thing we must put on, so that there is no component of the equipment that prevents its release.

The system allows you to vary the ballast by adding or removing lead packs, as people need different weight according to their constitution and the same person will also need different weight depending on the suit or equipment used, or if diving in fresh water or salt water.

After each dive, it must be rinsed in fresh water and never dried under the sun or in any heat source.

You can download the file ballast in which you will see an image with details.

## 1.8 Summary

Diving equipment consists of two families: basic equipment and scuba equipment. We call basic to the equipment used to dive without breathing apparatus and scuba equipment to the materials necessary to dive with breathing equipment.

**Mask:** of silicone, one or two tempered lenses, with wide and adjustable strap for fastening, **covering both the eyes and the nose**, that fits well to the contour of our face. If we need graduated lenses the mask must have two lenses.

**Neoprene socks:** which fit tight but not squeezing, can be socks without sole or booties with sole, the booties are more suitable for walking. They protect our feet from cold and from rubbing with the fins.

**Fins:** can be full foot or open heel. The full foot ones are not suitable for boots and the open heel ones are. They have to adjust well to our foot without squeezing, so that they do not fall off while diving.

They are an essential aid for underwater and surface navigation. The blade surface should be appropriate to our body size. They should be stiffer at the sides than at the centre of the blade and have guides or channels to limit turbulences.

**Snorkel:** to breathe on the surface with the face in the water. Inside it must be smooth to facilitate evacuation by blowing if water enters. It can have a drain valve or not. The mouthpiece, preferably silicone.

**Wetsuit:** It protects us from cold and friction. Variable thickness according to the temperature of the waters, most common of 3, 5 or 7 mm. It can be one piece (overall) or two pieces (pants and jacket). It should fit our body tight but not squeezing. There are also semi-dry and dry suits for cooler waters and, on the contrary, very thin neoprene suits for warmer waters.

**Gloves:** they protect our hands from cold and friction. The neoprene ones are warmer more but we lose dexterity.

**Weight belt:** must allow the quantity of weights packs to vary and have a quick-release buckle: a single hand, a single movement, so that the belt detaches from our body. We must not have any component of the equipment preventing its quick release.

**Maintenance:** All the equipment must be rinsed in fresh water after each dive and must not be dried under the sun or in any heat source.