

## The US Divers 1010 Aqua-Master

### "The 'Best' Regulator in the World"

When Jacques Cousteau and Emile Gagnan collaborated in the development of the original Aqua Lung in 1942-43, Gagnan was never satisfied with the performance of the invention. With the success of the CG45, Gagnan continued to innovate, devising a way to combine a sufficient volume of air at any depth of the two stage unit with the low breathing resistance of the venturi-assisted single stage.

Unfortunately, the single stage units with a smaller orifice, i.e., Over-Pressure, Stream Air, Mistral, Jet Airs, didn't provide enough air in deep water. The CG45 and later followed by the Broxton styles and finally ending with the DA Navy-Approved unit required relatively high breathing effort. In mid-1957, Gagnan produced a prototype and a short run of a new regulator that was to be called the 'Aqua-Master.' This regulator added a venturi-assist to the second, 'demand' stage.

In April of 1958, U.S. Divers issued a press release that said: *"This superb new two-stage regulator has the same ruggedness and dependability of the DA (Navy-Approved). A venturi action keeps the breathing resistance at an extremely low level regardless of the air the diver requires. Specially made for divers having to work very hard underwater. With Kleer-EZ mouth piece."*

Two months later, U.S. Divers made this announcement: *"The Aqua-Master is so good that we are discontinuing the manufacture of the former 'DA Navy-Approved' unit, which is the best selling regulator in the world." And a month later, U.S. Divers issued another bulletin: "High sales of the 1958 model 1010 DA Aqua-Master and the increased demand for hookah units have compelled our immediate release of the 1959 model Aqua-Master which features a hookah attachment."*

From its introduction until its conclusion, production of the Aqua-Master regulator was well over a million units before it was superseded by single hose regulators, ironically these were also based on Emile Gagnan's original designs. (Nuytten, 2005)

Prior to the introduction of the Aqua-Master, the U.S. Navy was using the DA Navy Approved. The Navy's test in mid-October 1958 of a 'preproduction' sample of the Aqua-Master made the following conclusions:

- a) Exhalation resistance needed to be reduced (possibly due to duckbill configuration),
- b) To identify the regulator with distinctive nomenclature other than DA and carry a serial number, and
- c) That a circular ring is used instead of box clips and that a slotted screw is used to secure the ring (US Navy, 1958)

Other than replacing the duckbill method of exhalation, US Divers did comply with the Navy recommendations on the Aqua-Master, but those changes took many years to occur.

It should be noted here that all references to serial numbers in the following discussion are those that are documented and currently owned by collectors including some of which are still in use by their owners today.

### 1958 DA Aqua-Master

When the Aqua-Master was introduced to the public in 1958 it had numerous characteristics not found on later models. The blue tab name label had no serial number. Also there was no hookah port.



The regulator body was like the DA Navy Approved model with the raised area oriented toward the intake hose horn. In contrast the DA Navy pointed toward the exhaust horn.



The 1958 DA Aqua-Master was fitted with black hoses and a straight black mouthpiece attached with Tinnerman hose clamps.



In the summer to fall of 1958, the Aqua-Master now had a hookah port, but still no serial number.

### **1959 DA Aqua-Master**

Sometime during 1959 the serial number began to be stamped on the label starting with the serial number 200000. Most likely the older non-serial numbered labels were used up before the newer one with the number was introduced. This blue-tabbed label remained the same on the DA models until 1970.



A hookah port was added to the model with US Divers using this upgrade in their marketing throughout the Aqua-Master's run. The hookah port had a male thread, with a large hex-headed sealing cap. Recent developments have replaced the original cap with one that can be used with modern low pressure hoses.



Yellow hoses and mouthpiece assemblies were used on the 1959 Aqua-Master for 'safety' and held together with yellow Tinnerman clamps. At this time, the highest serial number that has been found with yellow mouthpiece is 202532. Later style black nylon hose clamps have been found with serial numbers 201040, 202516, 202532 and 203841. Were these added later by their owners?



### **1960 Aqua-Master**

There were no significant changes to the Aqua-Master in 1960. Physically and mechanically the DA Aqua-Master did not change much from 1960 through the end of 1972. In 1960, the hoses were yellow with a contrasting black straight mouthpiece. The earliest known black mouthpiece unit contains serial number 203274. It has also been documented that regulator number 203972 was produced in the factory on 8/28/1959. So the black mouthpieces were introduced as early as August 1959. The serial numbers of the yellow/black combo units go as high as 218533. Number 217063, for example, was produced on 4/5/1960.

Another change that US Divers also introduced was a new nylon hose clamp which replaced the Tinnerman. The hose clamp had an integrated female part in which a slotted screw was fit. With little modification, this change would be the method of hose fastening throughout the double hose era.



### **1961 Aqua-Master**

From the 1961 US Divers Catalog: *"There is one basic change for 1961 on the already superb Aqua-Master Regulator...a re-designed hose and mouthpiece assembly. The black neoprene hose, in its relaxed state, is shorter than the former yellow hose but there are many more convolutions per inch, which provides much greater stretch ability than former hoses. This feature enables the diver to turn his head from side to side with complete freedom and with no pull on the mouthpiece. The new streamlined mouthpiece is contoured to the natural curve of the face and of the hoses and fits snugly to the mouth. The mouthpiece is smaller and more comfortable, yet the opening of the hose and through the mouthpiece remains the same and provides the normal flow of air to the diver without additional resistance."*

The use of these super-stretch hoses was to last for only a year. They have been found on regulators with serial numbers in the upper 218XXX series. This series being close to the documented 217063 produced in April 1960 indicates that the new hose assembly could have been available in the Spring/Summer of 1960. A suggestion has been made that the new convoluted hoses were used by Spirotechnique after which US Divers 'borrowed' the idea for use in theirs. The curved mouthpiece however became the standard for all US Divers double hose regulators to follow. The hoses used the same early style of nylon hose clamps like the 1960 Aqua-Master. As will be seen later, the French influence becomes more apparent in the 'Made in France' models.





### **1962-63 DA Aqua-Master**

The Aqua-Master went through a confusing series of cosmetic changes between 1962 and 1963. The West Pico Blvd models used a new black neoprene hose with less convolutions and the curved black mouthpiece. About this time, US Divers moved to their W. Delhi Avenue Plant. We find a series of Aqua-Masters with the W Delhi address that had other features, the majority of which were polished chrome with a 'Made in France' sticker. The serial number range for these models is 900244-913461. Today some polished models have been found without the sticker. These stickers may have been lost, removed or possibly never had them. Recently a few satin chrome W. Delhi models have been seen without stickers but two have been found with 'Made in France' stamped on the inlet horn underneath the hose. Today, no one is aware if the Delhi regulators had the highly convoluted hoses. A few theories have been suggested for the 'Made in France' regulators. One theory involves a worker's strike at the plant, another speculates that the physical move of the manufacturing machinery caused down time and a third questions the manufacturing relationship of Spirotechnique to US Divers.



Photo courtesy of [www.vintagedoublehose.com](http://www.vintagedoublehose.com)

Another change in the model years 1962 and 1963 consisted of a redesigned nylon hose clamp. The earlier clamp, which replaced the Tinnerman, consisted of a plain nylon strap with a connecting screw threading into a female section of the clamp.

The new style clamp had a raised bead on both sides running lengthwise and was fastened with a screw and separate hexagonal nut. Both ends of the clamp had a reinforced area specifically for the screw head and nut. The nut-side nylon section was molded to fit the nut exactly. This feature negated the use of a wrench to hold the nut while tightening. A small thin tab of nylon on one end of the clamp would slide under the opposite end to provide a continuous 360° holding surface. This clamp was used on all subsequently manufactured US Divers regulators and is still used on many BC inflator hoses today.



### **1964-1965 DA Aqua-Master**

In 1964 US Divers produced a new double hose regulator. This was the Royal Master, a balanced first stage, 2 stage regulator. With this new model in the product line, the 1964 and 1965 Aqua-Master underwent more cosmetic changes. The most obvious modification was the external case. Up until 1964 all West Warner labeled DA Aqua-Masters had a brass case with a satin chrome finish. This included regulators with serial numbers 230017 to 231398. In 1964, the brass case had a highly-

polished, shiny chrome surface. It has been documented that a shiny chrome model, number 231632 was purchased in 1964 (Ovanessian, M., 2010).



Satin Chrome Brass Body



Shiny Chrome Brass Body (Photo courtesy of Karl Gehring)

Commencing in 1964, the yoke screw was changed from an unmarked style to one with the US Divers and Aqua-Lung logos in raised letters. The polished chrome units with the US Divers stamped yoke screws were used on models with serial numbers that went up to 240XXX. From 240XXX and higher they came with the rubber tire style yoke screw. This transition occurred in the 1964-65 model years. Both the aqua lung and tire yokes and screws were of polished chrome plated brass.



Early style satin chrome yoke and screw



Later polished chrome yoke and raised letter screw



First model of the tire yoke screw

### 1966-69 DA Aqua-Master

During the late 1950s, US Divers as well as other dive equipment manufacturers began marketing the single hose regulator in addition to the double hose. Once these new regulators were produced, the double hose models started to lost favor.

During the final years of the 1960s like all other diving equipment companies, US Divers was recognizing the popularity of the single hose regulators which were taking over the market and would



continue to do so through the present day. One of the advantages of the single hose was the ability for the first stage to address the issue of monitoring air supply.

US Divers and others saw the need to resolve this problem with double hose regulators and devised a way to solve it by marketing a part known as a 'banjo.' Listed as item #7018-25 Sea-Dive Gauge Adapter, this device was placed between the tank valve and the regulator inlet and the SPG was attached to it.



However the banjos caused a need for a longer yoke to accommodate its thickness. Beginning in 1966-1967 including serial number 251658 through 1972 this long yoke model was the standard. In 1972, however, the long yoke changed to the 3000 psi yoke which became the standard for the DA Aqua-Master.



A couple of other changes also occurred during this period. In 1968-69 (Serial numbers 265126-287034) the tire yoke screw changed sticker to express US Divers changing logo.



Also around serial number 266000 the logo on the curved mouthpiece changed to coincide with US Divers marketing.



Early Mouthpiece logo 1961-68



Late Mouthpiece logo 1968-1972

### 1970-1972 DA Aqua-Master

US Divers began to fully realize the end of the double hose system and tried to update their double hose regulators. In 1970, a new look to the double hose regulators occurred. The DA Aqua-Master now sported a round sticker label consistent with the current logo of US Divers. We have found an interesting serial number range for this model to include numbers from 109321-155491, 392890-402641 and also 646623 and 646630. These serial numbers were no longer on the label but stamped on the yoke side can. Why these large gaps between serial numbers? One speculation is that missing units were Navy issued. The early 1970-1971 units used the established black hose/curved mouthpiece, late style nylon hose clamps, long 2250 PSI yokes with later style logos on both yoke screws and mouthpieces. Finally after twenty-plus years, the Aqua-Master utilized a circular ring with a slotted screw instead of the seven box clips as suggested by the 1958 US Navy test recommendations.



Photo from Howell, M., 2003

The last change to the DA Aqua-Master occurred in 1972 during its last year of manufacture, with the use of a heavy 3000 PSI yoke with large plastic knob. This was an early view of the future of regulator yokes.



3000 PSI Yoke

(Photo courtesy of [www.thescubamuseum.com](http://www.thescubamuseum.com))

### **Military Use of the DA Aqua-Master**

The US Navy had been involved with US Divers for a long time. From the initial tests by the Navy, as noted in the introduction, the demand for a regulator that was of military value was important. US Divers produced the DA Navy Approved model in the 1950s which apparently had undergone testing. This model and the following DA Aqua-Master were made of non-magnetic materials. Test reports from NEDU's library have been found, Bernie Campoli (2010) provided that:

- #7-56: US Divers non-magnetic open circuit demand scuba; Project NS185-005, Subtask 4, Test 32, P.L. Willoughby, 1955 and
- #1-65: Test of US Divers Non-Magnetic Open-Circuit Demand Regulator and Cylinders to determine adherence to specification requirements, Project F011-06-03, Task 3380, Test 15, J.V. Harter, S.D. Zuber, R. Garrahan, 1965.

Available information about the US Divers non-magnetic DA Aqua-Master, or NONMAG is very sketchy. Dates of manufacture and production numbers are unknown at this time. The few samples that are known today have the W. Pico and the West Warner address labels. In the 1968 through at least the 1970 US Divers Catalogs, a non-magnetic military version of the DA Aqua-Master regulator was noted as item number 1062-00. It was said to comply with military specs Mil R-19595 and 19558. So the current assumption is that the NONMAG was available throughout the entire DA Aqua-Master time frame.



Photo Courtesy of Karl Gehring

The NONMAG DA Aqua-Master regulator would be purposely built to facilitate the needs of the military diver. It would have a virtually non-existent magnetic signature, the fewest possible number of failure points, the lowest amount of visual reflectivity, and the lowest possible unit cost. It would be deployed with double aluminum SCUBA cylinders (unheard of at the time) and a matching non-magnetic J valve style manifold as a set, enabling the diver to have a single source for missions requiring anti-magnetic equipment. Inside, the regulator is unlike any other before it. The high pressure seat, second stage poppet, and second stage retainer are all gold plated, as is the nozzle. These parts can be easily identified, as they are marked with an etched line around their circumference. All of the main regulator parts, including the body and yoke are stamped with a special character resembling a lowercase *mu* from the Greek alphabet. Outside, the entire regulator is finished in low visibility matte black paint.





Photo Courtesy of [www.thescubamuseum.com](http://www.thescubamuseum.com)

Under the paint is a layer of zinc plating, which covers a layer of copper. The substrate, or base material, of the regulator is brass. This regulator features a "stubbed" or non-functional hookah port. There are two primary theories on why the Navy had regulators produced in this fashion. First, the snubbed hookah port eliminates another possible failure point as there is one less spot to leak air, which would jeopardize the mission or increase the risk of discovery. Second, it was cheaper to make and manufacture a regulator without a hookah port, and if the bodies were going to have to undergo the unique plating process to reduce their magnetic signature, then they would have to be custom made anyway as no off the shelf parts would work.



Photo Courtesy of Karl Gehring

The NONMAG is just as easy breathing as its civilian counterpart, though it is a bit harder to maintain in a salt water environment due to its painted finish. Every model that has been identified as being a stock NONMAG has been observed identically configured, as is the requirement for the military. Hoses were always black but both straight and curved mouthpieces have been found, most likely corresponding with the year of production. Later models had standard nylon clamps for the post-1961 time period. All of the hose clamping hardware are bare brass, to eliminate any potential magnetic signature and to reduce glare. The yoke is the shorter, non-banjo friendly style and features the older U.S. Divers logo thumb screw. All NONMAGS featured C clip fasteners as the primary method of

securing the top can to the bottom can. Most of the models that have been observed appear to have been painted after their final assembly, which means that original models usually do not have paint inside the inhalation can and will exhibit paint overspray on the inside of the exhaust can. (Sivonda, R., 2010)

### **Biosystems DA Aqua-Master**

John Cronin, who was President of US Divers in the 1980s, decided that making the non-magnetic DA Aqua-Master was too much of a hassle because a completed unit might not be acceptable if they failed to pass the magnetometer test. Thus US Divers provided prints to the Navy so that other sources could make the parts. Biosystems of Middletown, CT got the bid and provided a total of 72 units, with a cost of \$3000.00 per regulator. A set of tanks, harness and regulator was \$5000.00. Each unit was made by hand.

After the regulators were made, they were sent to the Navy's EOD headquarters in Indian Head, MD for testing. After they passed the magnetometer test, they were sent into the field for use by the US Navy's Explosive Ordinance Disposal (EOD) teams. The regulator and non-magnetic twin Aluminum cylinders also had non-magnetic valve and reserve assemblies.

The regulators are identical in form, fit and function with the 1970 model DA Aqua-Master.



Photo courtesy of Ron Miller

The hookah port was not on this model as can be seen by the rectangular snubbed area.



Photo courtesy of Ron Miller

Biosystems also ran into the same problems with the government on rejects, which drove the cost of manufacture up for them as well, even though parts were interchangeable with the US Divers units. Biosystems discontinued producing non-magnetic scuba regulators in the late 1980s.

Due to the small number made and unknown number that were discarded today, the Biosystems non-magnetic DA Aqua-Master is probably one of the rarest of two hose regulators. (Miller, Ron, 2010)

### **Kawasaki DA Aqua-Master**

In the late 1960s and 1970s US Divers gave permission for the Kawasaki Aircraft Company to produce a series of Aqua-Masters. Using the Nihon Aqua-Lung K.K. Aqua-Master name, the series was different from US Divers Aqua-Master in one major aspect. All of the internal parts were metric. Therefore the parts were not interchangeable with the US produced models. The Kawasaki came with seamless hoses and different clamps. Apparently the Kawasaki models came in three variations. One had a satin finish while the more common DA and DA II were made in shiny chrome.

The DA has been seen in the 1971 and 1977 Kawasaki catalogs. It appears to be very similar to the US produced Aqua-Master and the yoke used was the early style.





DA II is found in the 1978 Kawasaki catalog appears to have a heavy yoke update with no other major changes.







(Kawasaki photos and information provided by Karl Gehring, 2010)

Most interesting is that on some Kawasaki regulators a lead seal is found on some of the can halves. This seal has not, however, been found on all regulators still in existence. It has been suggested that after a tech would do a rebuild on this regulator he was required to wire in a new seal showing the regulator was rebuilt and untampered with ([www.thescubamuseum.com](http://www.thescubamuseum.com), 2010).



(Photo courtesy [www.thescubamuseum.com](http://www.thescubamuseum.com))

The American Company US Divers had an almost 25 year double hose success. Based upon a design that originated in 1943, these regulators were and forever will be the brand that most divers recognize as the high water mark of double hose diving. They dominated the diving world throughout the 1950s and most of the 1960s. They are also still alive today with a growing community of divers wishing to experience the fun of vintage regulators. Of all of the double hose models made, the 1010 DA Aqua-Master had the longest life. Manufacture began in 1958 and continued until 1972, the longest run of all of the US Divers double hose regulators. It was advertised as one of “*the most efficient and rugged regulators that was ever built.*” This was a bold statement that can be still be verified today. Countless

numbers of DA Aqua-Masters are still being used by sport and commercial divers and photographers all over the world. The DA Aqua-Master remains as one of the true icons of scuba diving.

**U.S. Divers Double Hose Regulator Time-Line**

	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Aqua Lung, Spaco Inc. (metric)	X																										
Aqua Lung U.S. Divers Co (metric)		X	X	X																							
Aqua Lung (blue label)					X	X																					
Aqua Lung (green label)					X	X																					
Navy type DA							X	X																			
Over-pressure DX							X	X	X																		
Stream Air DW								X	X																		
Jet Air DY (brown phenolic)								X	X																		
Navy Approved DA									X																		
1000 Two Stage DA (no hooka)										X																	
1008 Mistral DW									X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1010 DA Aqua-Master									X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1020 Jet Air (black cycolac)											X	X	X														
1046 Royal Master															X	X											
1054 Royal Mistral																X	X	X									
1046 Royal Aqua-Master																	X	X	X	X	X	X	X	X	X	X	X

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