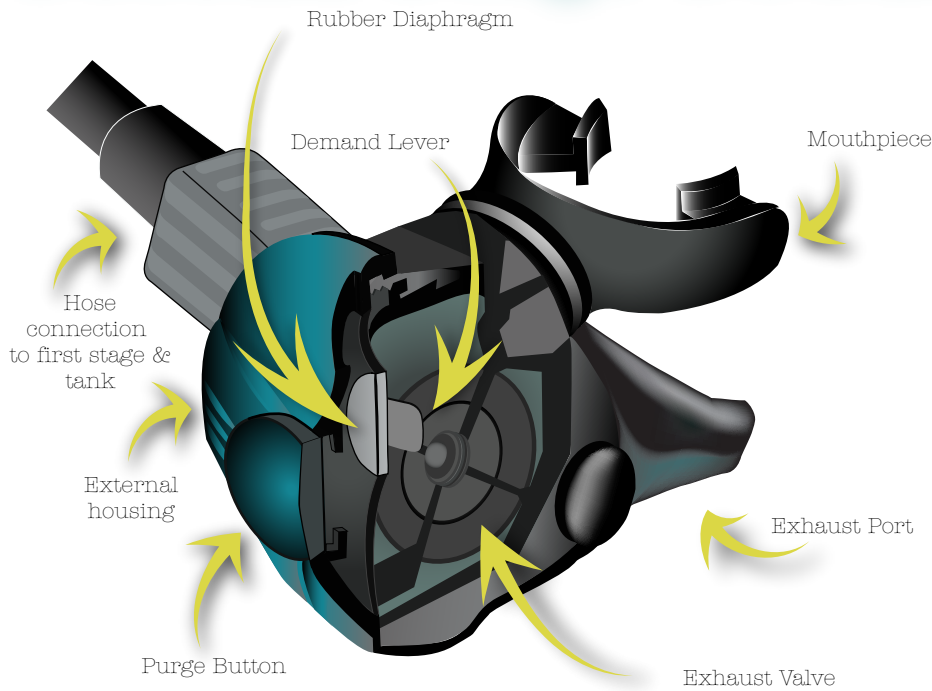


Second Stage SCUBA Regulator



The ability for humans to explore our planet's underwater environment can only be achieved through mechanical means, one of which is SCUBA (Self-Contained Underwater Breathing Apparatus). The second-stage regulator, as shown, is the last phase in the complex and vital air delivery system utilized by scuba divers.

For a diver, a tank of compressed air is of little use without having a means of reducing that air to a breathable pressure. The human respiratory system is only capable of tolerating a pressure differential of 2psi between the air being breathed and the fluid medium surrounding the lungs. In order for a diver to breathe, the compressed air supply in a SCUBA tank must be decreased to ambient pressure - this is accomplished by using a regulator.

A regulator is actually comprised of two stages: the first-stage takes the air in the SCUBA cylinder, which is compressed to approximately 3000psi, and reduces it to the external ambient pressure. From there, the air can then flow through the hose connecting to the second stage which regulates the breathable air to the diver as needed. For this reason, these second-stage regulators are also known as demand regulators. This means that they are activated automatically by the user's inhaling and exhaling.

The diagrams below show the internal workings of a second-stage regulator in both the closed (exhaling) and open (inhaling) positions. When the diver is not inhaling, the bias-spring pressure is equal to the intermediate pressure which will hold the valve seat tight against the opening to the hose. Upon inhaling, the diaphragm, a rubber ring with a metal plate in the centre, is pulled inward, pushing on the demand lever. The demand lever, pivoting counter-clockwise, contracts the bias-spring which, in turn, releases the valve seat from the opening to the hose. The suction of the flowing air then creates a venturi effect which will keep the diaphragm pushed against the demand lever for as long as the diver inhales. During exhalation, the diaphragm is then pushed away from the lever, closing the valve seat and the expelled air is consequently forced through the exhaust valve on the base of the regulator. In the event that excess water becomes trapped inside the regulator, causing a 'gurgling' sound during breathing, there is a purge button located on the front housing. Depressing this button activates the demand lever the same way inhaling does. This allows a free-flow of air, for as long as the button is depressed, which then expels the residual water out through the exhaust valve.

