Operation of Gas Ballast Valve

IT IS VITALLY IMPORTANT THAT THE PUMP HAS REACHED ITS NORMAL OPERATIONAL TEMPERATURE (50-70°C) BEFORE ANY CONDENSABLE VAPOURS ARE PUMPED. FAILURE TO DO THIS MAY CONTAMINATE THE OIL AND DAMAGE THE PUMP. SUCH DAMAGE WILL VOID THE WARRANTY.

Normal operating condition is about two turns, at which a slight "popping" noise occurs. Open valve several turns before closing down to required control position. If valve is removed ensure spring and ball are replaced in the correct order – spring first.

Allowing the pump to run for a few hours with the ballast valve open and the inlet port closed off will purge oil slightly contaminated condensed vapours i.e. water. The gas ballast, if used during start up of the pump will aid in bringing the pump up to its operational temperature sooner.

Care must be taken when operating the ballast valve that the body of the pump is not touched, as the normal heat generated by the pump in normal operation is in the order of 50-70°C.

What is the purpose of the Air Ballast (Gas Ballast)?

The air ballast valve is situated at the top of the vacuum pump next to the suction fitting. It is opened by turning anticlockwise. The valve must only be shut down finger tight otherwise the precision valve seat may get damaged.

The function of the gas ballast valve is to enable condensable vapours to be discharged through the pump with minimum oil contamination, depending on the nature and quantity of the vapour(s) involved. As vapour will condense back into its liquid form upon compression at (or greater than) its Saturation Vapour Pressure (SVP) this can present a problem with high vacuum pumps which have a suction and a compression cycle. It is necessary during the compression cycle of the pump to compress the system gas from the suction port at or greater than atmospheric pressure in order to lift the exhaust valve allowing them to be discharged. In a vacuum system containing a quantity of water for example, the air is quickly removed by the vacuum pump and the partial pressure of the water in the system will increase. When the partial pressure of the water vapour of the system gas reaches it SVP during the compression cycle of the pump, it will condense back into a liquid and mix with the oil.

At this stage the vacuum pump CANNOT achieve a vacuum better than the SVP of the water. This is because the water evaporates from the oil on the suction cycle and then re-condenses back into the oil during the compression cycle. The water in the oil therefore becomes a source of vapour that the pump must contend with! If however we reduce the partial pressure of the water vapour during the pump's compression cycle with a measured and controlled amount of non-condensable gas the water vapour WILL NOT reach its SVP during compression and will therefore be discharged from the pump. The gas ballast valve in Javac pumps 'meter in' a controlled amount of atmospheric gas into the compression cycle of the pump, thus 'diluting' the amount of vapour that is being compressed. All high vacuum pumps have a maximum amount of water vapour tolerance i.e. the quantity of water that the pump can successfully pump without contamination. (Please contact Javac if you are unsure with the amount of water or any other vapor that your pump will handle.)

Note: the above is in accordance with the normal operation of a JAVAC vacuum pump. Operational differences are minimal in comparison to other manufacturers pumps.