

DIFFERENT SECURITY SYSTEMS TO AVOID EXPLOSION IN HYDRAULIC ACCUMULATORS & PULSATION DAMPENERS

There are basically two systems to evacuate the internal compressed gas to the atmosphere and consequently avoid the vessel explosion in case if the internal gas pressure rose above the vessel pressure design:

1.- TEMPERATURE FUSE ADAPTOR

The temperature fuse adaptor is a device installed on the gas side of the vessel. If the external temperature increased excessively because an external fire or the flame of a torch, etc..., then the fuse would melt and the gas inside would be exhausted to the atmosphere. This happens when the ambient temperature reaches 160 °C.

If we admit that for every 10 °C of temperature the gas pressure increases about 3% and, if the vessel is being used close to its design pressure at the standard temperature (20 °C) then, when the external temperature rises to 160 °C, the pressure will be increased:

$$P_{max} (160 \text{ }^{\circ}\text{C}) = D.P. (20 \text{ }^{\circ}\text{C}) \times (1 + 0.03)^{14} = D.P. (20 \text{ }^{\circ}\text{C}) \times 1.03^{14} = \mathbf{D.P. (20 \text{ }^{\circ}\text{C}) \times 1.5}$$

(D.P. = Design Pressure)

This means that, at the fuse melting temperature, the pressure will be that of the pressure test **HIDRACAR** subjects every accumulator or pulsation dampener prior to its delivery.

Therefore, the gas will be evacuated to the atmosphere without exceeding the yield point of the vessel body material.

All said till now is valid for carbon steel vessels. In the case of stainless steel dampeners or accumulators, at 160 °C the yielding point of AISI-316 stainless steel will be reduced about a 24%, for what the escape pressure will be higher than the yielding point of the material. However, the accumulator will never explode because the austenitic steels (like AISI-316) tensile strength is more than twice its yield point.

If the increase of temperature up to 160 °C happens when the accumulator is working at a 25% below its design pressure (at 20 °C), the escape of the gas will take place below the yielding point of the material.

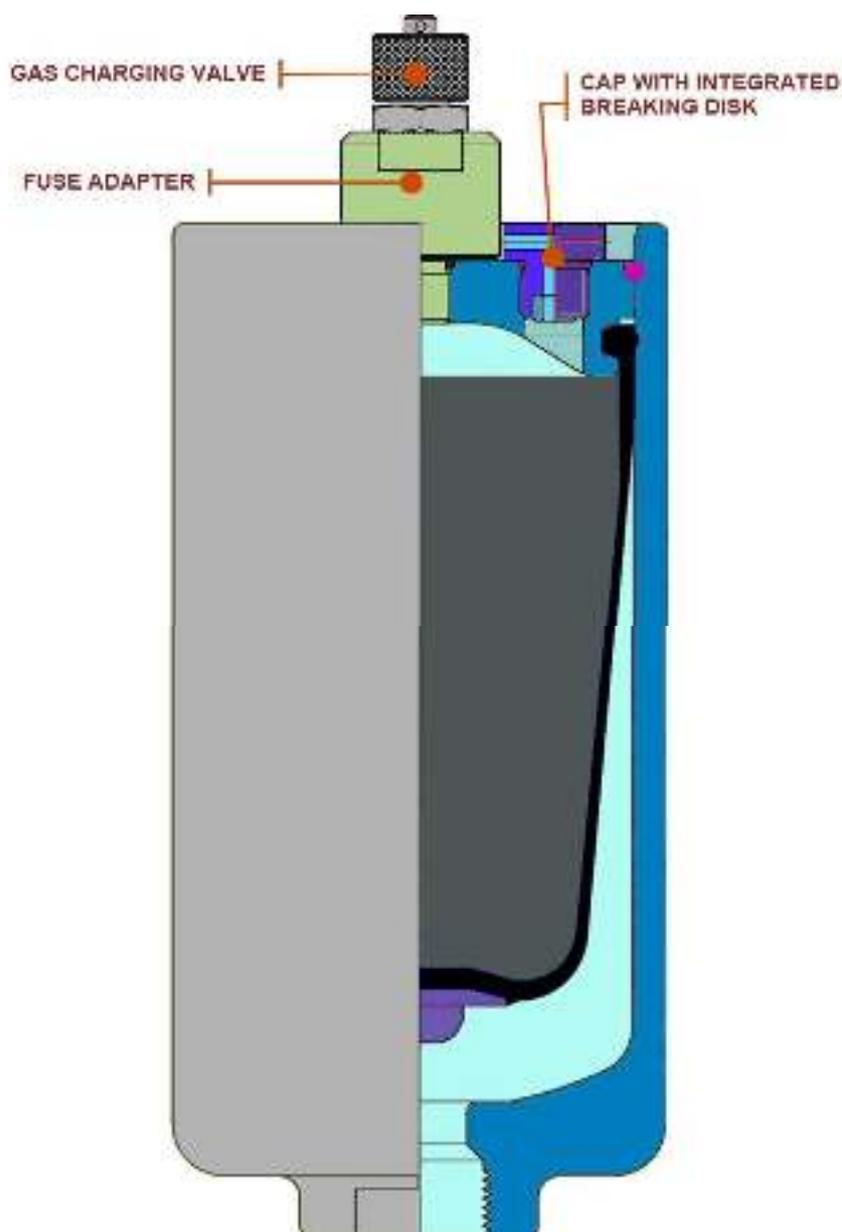
2.- BREAKING DISC PLUG

The breaking disc plug is a device that prevents the accumulator or pulsation dampener from exploding in case of excess pressure in the hydraulic circuit to which the pressure vessel is connected.

The rupture disc must be calculated at a value of, at least, 25% above the maximum circuit pressure in order to avoid the rupture by fatigue.

This solution is recommended in circuits where exists the possibility of relief valve failure or closed circuits where the pressure can increase by the effect of uncontrolled forces on hydraulic rams where the accumulator is installed.

Note: *In case of fire the breaking disc does not guarantee that the internal gas will be evacuated to the atmosphere before the vessel bursts.*



**SCHEMATIC DRAWING OF AN
HYDRO-PNEUMATIC ACCUMULATOR
SHOWING BOTH SOLUTIONS**