The most widely used experimental method to determine and to compare energetic and ballistic properties of different propellants is burning a specific amount of propellant in closed chamber. Up to now adequate formal standards and regulations (for example STANAG 4115, MIL STD 286) recommend - according to main assumption of internal ballistic analysis that all propellant grains are ignited uniformly with all exposed surface areas of the grains - similar conditions of closed vessel investigations like:

a) limited range of loading density

b) determined mass of black powder as igniter material for determined loading density

Ensuring similarity of combustion conditions of different propellants is considerable problem during relative measurements in particularly.

In the case of standard conditions of propellant ignition, the assumption that each particle is ignited instantaneously over the entire surface and the burning rate \( r(p) \) is immediately established is wrong. Ignition is a process with a characteristic time depending not only on loading density (at the same mass of ignition material) but also on the method of ignition for the same value of loading density. In this time the burning rate is affected by the unsteady process of temperature redistribution in the heated propellant layer and variation in the layer thickness. Analyzing the unsteady effects on propellant combustion one should take into account the heat exchange of combustion products with the wall of the vessel as well as conditions of heat transfer of ignition gases with surface of propellant grains.

On the basis of standard equation for heat conduction in a solid it is possible to analyse conditions of ignition process as a function of incident heat flux which is defined as the energy per unit time per unit surface area transferred to the propellant.

In the present paper we discuss the influence of ignition and combustion conditions during closed vessel tests on possible deviations in determination of burning rate.

Performed analysis and tests give some hints for creation of relative measurements conditions of different propellants (with different shapes of particles) as a function of heat flux.