The present paper deals with the modelling of ductile fracture which is the result of severe plastic deformation [1]. It can be result of a crash or accident [2] or introduced intentionally [3]. There is a need of increasing the safety in many fields of industrial sector or transportation. One option of studying the limit states is the computational modelling [4], besides experimenting [5]. The aluminium alloy 2024-T351 is widely used for studies of ductile fracture [6]. The material was supplied as a cold-rolled plate for this study and examined within a broad range of stress states. First of all, the flow curve was determined using the standard tensile test of smooth cylindrical bar [7]. Then, the tensile tests of variously notched cylindrical bars were conducted to show the pressure dependence. The tensile and torsion tests of notched tube were added in order to document the dependency on the deviatoric stress state. Finally, the compression test of smooth cylinder was executed. Then, deviatoric stress state dependent plasticity and the original ductile fracture hyperbolic criterion were calibrated. The damage accumulation nonlinearity was examined through loading–unloading experiments. The double damage curve approach from fatigue was revisited and calibrated using the semi-cyclic testing [8]. Finally, the softening effect was studied aiming to couple the damage with plasticity [9]. The performance and prediction ability was verified after the model was completely calibrated and implemented into the Abaqus finite element software. Three different cases of tension were chosen for this comparative purpose. The tension of notched cylindrical and tubular specimens and flat specimen. The ductile fracture criterion coupled with plasticity should provide the slant fracture in the conditions of plane strain due to localization [10]. Nevertheless, it is shown that the proposed approach has still some drawbacks in prediction of the crack propagation.

REFERENCES