All fluids can exist as two phase mix of gas and liquid. For example water reaches this state when it starts boiling at 100 °C in atmospheric pressure. After surpassing certain temperature and pressure, fluids do not boil or condensate, but they smoothly change their physical state into supercritical one, which has intermediate properties between gas and liquid. These pressure and temperature are called critical point. Amongst thermal-hydraulic issues in flow condensation, the thermodynamics near-critical range of conditions is the least recognized for a majority of synthetic and organic fluids, which may find application in refrigeration and air-conditioning technology. For that range of thermodynamic parameters, the majority of contributions is found for two fluids, namely CO_2 and water. Additionally, only a few papers deal with the flow and heat transfer for different fluids at near critical parameters, particularly in microscale. The reasons why there is a necessity of focusing on this topic are changing parameters of two phase fluid at near critical conditions. With the increase of temperature to critical value, reduced pressure increases, the density and viscosity of the vapor phase rises, while the opposite trend is noticed for the liquid phase. These influences directly contribute to velocity increase of the liquid phase and reduction of velocity of the vapor phase, which results in similar values of the phase velocities. The increase in the reduced temperature also leads to reduction in surface tension, which renders gravitational forces the dominant forces. Not typical character accompanied by a large dynamics of phenomena occurring in the near critical region causes that the parameters of installation operation should be selected very carefully. On the other hand, there is a lack of dedicated theoretical models of flow condensation in that region, which would enable for sufficiently accurate determination of thermal-hydraulic properties in that range of parameters. Models existing in literature describe the heat transfer and flow resistance but do not feature theoretical foundations. In literature, there is a lack of contributions (apart from a few regarding CO_2 and water) treating the near-critical range of parameters, and therefore there is a lack of experimental data enabling verification of the applicability of existing correlations for that region. From that the objectives of proposed experimental activities stem: **a)** recognition of the phenomena related to heat transfer and pressure drop during flow condensation in near critical conditions for new and perspective low-boiling point fluids in single minichannel **b)** verification whether existing correlations describing flow condensation in minichannels find application in near-critical conditions, **c)** testing of the influence of near-critical conditions on the permanent change of thermodynamic properties of selected fluids, **d)** development of a model of flow condensation based on the hypothesis of summation of dissipation energy in the flow as well as attempt to extend and verify the applicability of semi-empirical in-house flow boiling and condensation model for prediction of conditions near the thermodynamic critical point. Due to the above, the present project application is one of a few, in the world, attempts of experimental investigation into heat transfer and pressure drop in minichannels in the range of near-critical conditions during condensation. A condensation section will consist of one copper tube with small internal diameter (<3 mm), where refrigerant will flow. Measurements in the condensation section will be performed by temperature sensors (thermocouples), pressure sensors and flowmeters. The condensation section will be cooled by two cooling loops filled with water. Fast water flow in the first loop will enable stable condensation conditions and low heat transfer resistance to ensure valid measurements. The second loop will be cooling the first loop. Flow in the second loop will be slow to achieve high temperature difference on the inlet and the outlet and ensure precise measurement of test section heat duty. Fast camera will be used for determination of void fraction. In the frame of activities related to the development of the theoretical model of heat transfer in flow boiling and condensation effect of reduced pressure on tension at phase interface will be investigated. As the heat transfer and flow resistance in the conditions near thermodynamic critical point are not fully recognized, we can expect in that region the new research challenges, which were not present in cases where the variation of physical properties of fluids did not strongly influence the course of thermal-hydraulic phenomena. Results to be obtained in the project will serve for extension of database for selected fluids for their behavior in the conditions of near critical point, especially from the point of view of properties of new fluids, which may find applications in high-temperature heat pumps and refrigeration technology. New correlation would allow engineers to design better heat exchangers and avoid unnecessary oversizing of them. That is an urgent need as the mentioned data for many fluids are incomplete.