Attachment A Brief desciption of the training project

- **Training Project Title:**

Innovative methods for design, optimization, prototype construction and validation test of a foam-based extinguishing mixing system based on volumetric pumps couplings

- **Scientific and Educational Objectives Description**

In the fire-fighting sector, in recent years greater attention to environmental issues as well as to the impact of fire prevention systems on the territory and on the aquifers. Due to the main industries in the sector attention, as well as the national and international regulations, the increased attention on environment has led to the development of new environment harmful substances free extinguishing agents which, at the same time, have the same extinguishing capabilities of the products that they replace.

Among the new extinguishing agents, the are taking on particular importance are having new foaming liquids *fluorine-fre*e, PFOS and PFAS free. Their particular chemical composition requires the development of new fire-fighting equipment that allow their correct use and guarantee the same effectiveness against fires. SA Fire Protection intends to develop a foam mixing system that guarantees the same reliability and precision both with the new *fluorine-free* foaming agents, and with traditional foaming agents (AFFF, synthetic, proteinaceous). Furthermore, the mixing system have to include a recirculation circuit for sucking up the foam and then sending it back to the tank without mixing it with the water. Such a system of "blank check" will allow a periodical check of the mixing system correct functioning without wasting and spilling the foaming liquid with a significant reduction of the testing impact on the environment, consequently.

The mixing system will be based on the coupling of two volumetric pumps: the first pump, installed on the main water line, will be activate by the flow of water when the fire-fighting system is activated and will transmit the power to a second pump that sucks the foaming liquid from the tank and inject it into the water line with a regulable mixing ratio in the range 1% to 3%.

The main steps of the research and training project of the Industrial PhD will be the following:

- Definition of the technical system specifications;
- Analysis of the state of the art and definition of the optimal solution, comparing the strengths and weaknesses of the various types of volumetric pumps;
- Development of the optimal solution and design of the mixing system;
- Prototyping and validation tests.

- **Company supervisor:** MEng. Bronco Alessando

- **Training and Research Activities Methods**

The Company, in addition to the academic PhD three years course path, will train the PhD student with specific courses focused on fire-fighting sector regulations and company products:

- Introduction to SA Fire Protection product catalog;
- Regulatory module: fire-fighting sector regulatory analysis, with particular attention to regulations relating to the sizing of fire extinguishing systems with foaming liquid and to construction and testing of correlated equipment.

The forms will be held by the Company's technical staff.

❖ **Effects and expected results with particular emphasis on promoting development economic and productive system**

The company purpose is to develop a products family compatible with the new low environmental impact extinguishers. Among these, mixing systems compatible with the new *fluorine-free* foams are the most interesting. In particular, the system based on hydraulically operated coupled volumetric pumps are the most interesting.

In addition, the Company has chosen to invest in a professional figure who, thanks to the academic and business common studying path and applicative experience, may receive a high-level training. This figure could be very important for the Company in the optimization of existing products and in the development of new future products.

SA Fire Protection srl will host the PhD student beneficiary of the scholarship financed on resources of the Ministerial Decree 352/2022 for **18** months (min 6 max 18) during the PhD course.

Period abroad for no. **6** months (min 6 max 18) at the following institution:
Åbo Akademi University (Turku, Finland)