



EXPERIMENTAL SET-UP FOR THE DETERMINATION OF THE EXPLOSION LIMITS OF FLAMMABLE LIQUIDS VAPOURS

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Summary of the invention

The invention refers to a stand for determining the explosion limits for the vapors of flammable liquids, respectively the lower explosion limit (LEL) and the upper explosion limit (LSE), a stand that allows the recording of the explosion pressure and where the processes of creating vapors from the liquid, of the homogeneous air-vapor mixture and that of rapid combustion, all take place in an thermostated explosion vessel at the boiling temperature of the liquid, the initial pressure and temperature conditions can be set to values between 0.4 bar and 2 bar, respectively between 20 degree C and 400 degree C, the ignition source being either electric sparks (inductive or capacitive) or incandescent wire. The stand, according to the invention, consists of an assembly consisting of a thermostated explosion vessel, equipped with temperature and pressure transducers, an optical sight, metal electrodes for the electric ignition spark (alternatively, an incandescent wire can be mounted), external device for making of the balance of the explosion vessel to achieve internal homogenization of the air-vapor mixture, digital manometer, taps for flammable liquid sample intake, to achieve the initial pressure conditions, to evacuate reaction products, to purge the explosion vessel, as well as related devices: source for supplying electricity to the thermal envelope of the explosion vessel, source for spark generation, video camera for recording explosion phenomena, digital oscilloscope amplifier connected to PC for recording explosion pressure, vacuum/compressed air pump, determined explosion limits providing the technical-scientific basis for the development of technical-organizational explosion protection measures for industrial activities that process, store or use flammable liquids, substances that can create potentially explosive atmospheres.

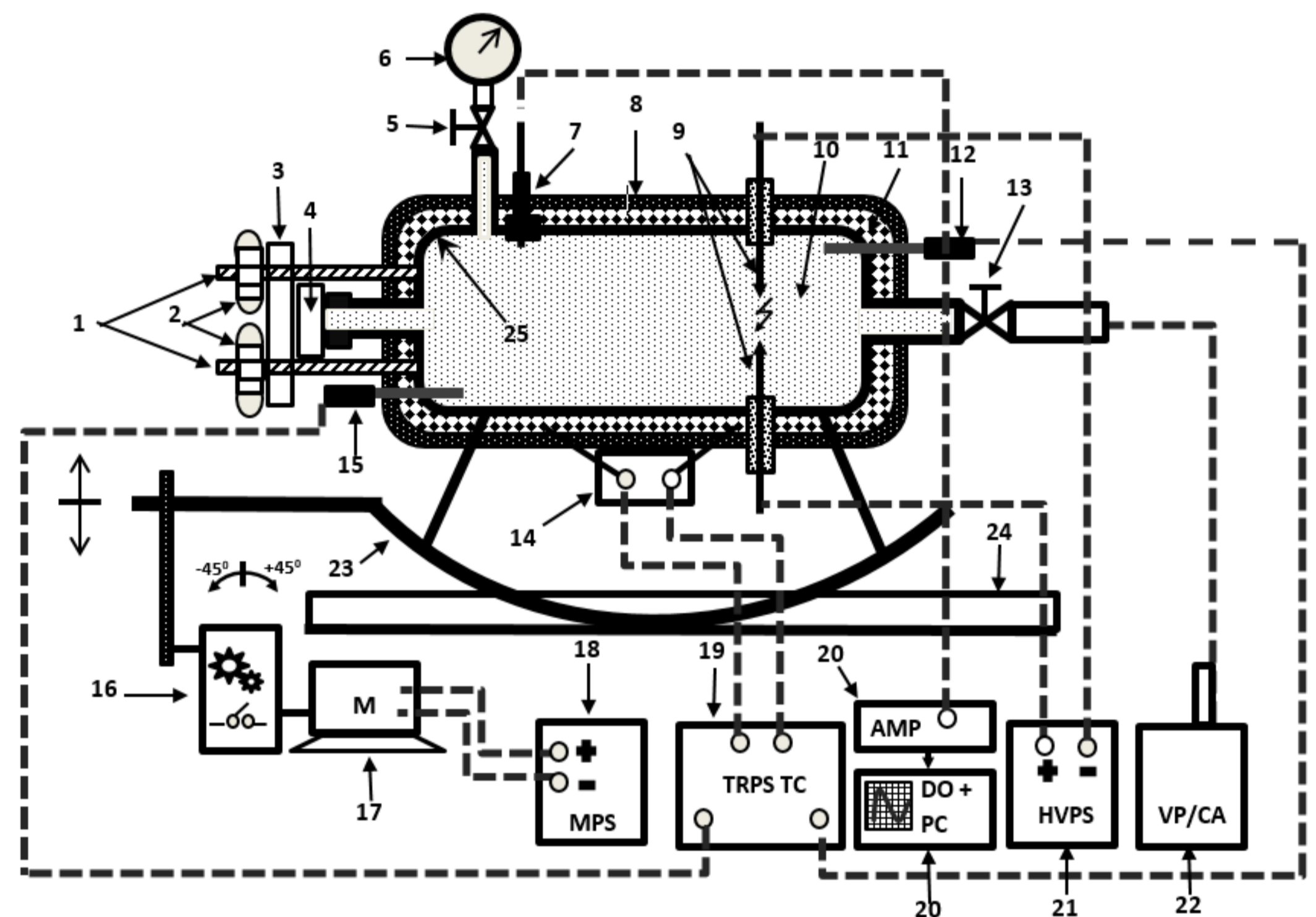


Fig. no. 2. Experimental set-up for the determination of the explosion limits of flammable liquids vapours

-1 Tie rods, for fixing and sealing the visor, supports for the tightening element; -2 Butterfly nut for fixing the clamping element; -3 Visor tightening element; -4 Visor for viewing the spark and the explosion propagation phenomenon, as well as for video recording (by detaching the visor, it is possible to achieve: a second way to purge the combustion gases - in tandem with valve 13, the introduction of the flammable liquid sample) ; -5 Valve for isolating the control manometer during the production of the controlled explosion; -6 Manometer for measuring the initial pressure (0.4 bar -2 bar); -7 Pressure transducer for dynamic measurement of explosion overpressure; -8 Insulating cover to maintain the temperature set at the beginning of the test (between 200C and 400C) -9 Metal electrodes with pass-through insulators with the possibility of adjusting the electric arc (spark) penetration distance or, alternatively, allows the installation of an incandescent wire; -10 Flammable liquid air-vapor mixture (made and homogenized inside the explosion vessel 25) -11 Thermal cover made of electrical resistance to be heated - nickeline in insulating ceramic (the supply of the thermal resistance is made from the dedicated source 19 with temperature control on the transducers 12,15-type K probes);-12 Temperature transducer - type K probe;-13 Multifunctional valve: vacuum creation, initial overpressure exhaust, explosion pressure exhaust, compressed air inlet for purging, liquid sample inlet, air inlet for mixing;-14 Connector for the thermal element;-15 Temperature transducer - type K probe for controlling the thermal element;-16 Worm reducer-worm wheel with arched base actuating arm for making the rocking movement of the explosion vessel to achieve a complete vaporization and homogenization of flammable liquid vapors in the air inside the vessel 25);-17 Electric motor 12 Vdc for driving the reducer with operating arm; -18 Motor power supply (12 Vdc, 3 A);-19 Electric heating resistance power supply with temperature control between 20 C and 400 C;-20 Signal amplifier for the pressure transducer; -21 High voltage source for creating the electric spark between the electrodes with an output voltage higher than 6 kV (alternatively, a source with the appropriate voltage can be used to feed the incandescent wire mounted between the electrodes in the explosion vessel);-22 Air pumping/vacuum unit required to achieve the initial depression or overpressure in the range of 0.4 bar and 2 bar, pressures in absolute value;-23 Arched sole for balancing the explosion vessel 25, movement necessary for total vaporization and complete homogenization of the air-vapor mixture of flammable liquid; -24 Guide rail (U profile) for the arched base of the blasting vessel support;-25 Explosion vessel;-26 Video camera for recording the phenomena of the appearance of the spark and the propagation of the explosion.

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