



## INTEGRATED SYSTEM FOR SIMULTANEOUS MEASUREMENT OF PROPAGATION OF THE FLAME FRONT AND THE PRESSURE WAVE, IN THE CASE OF EXPLOSIONS

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### Summary of the invention

The invention relates to an integrated system for simultaneous measurement of flame front propagation and pressure wave velocities in case of air-flammable gas explosions triggered in the cylindrical shock tube, equipped with optical and pressure transducers, to study their behavior depending on the concentration, on the ignition sources and the propagation distance, respectively for establishing the deflagration or detonation characteristics.

The system consists of an assembly of optical transducers (L1, L2, L3, L4), which can also include the infrared spectrum - NIR, and pressure transducers (P1, P2, P3, P4). These sensors are placed on a cylindrical shock tube (TSC) made of steel of at least 10 m length, at certain distances ( $d_1, d_2, d_3, d_4$ ) from the ignition source (SA), fed from a source (SSA), which initiates the flammable air-gas explosion. The sensors are powered by dedicated sources (SP1-4, SL1-4,) and provide signals that are useful for simultaneous recording of both phenomena (pressure wave and flame front). The recordings are made using a multichannel digital oscilloscope with memory, with at least four channels for optical sensors (CL1, CL2, CL3, CL4) and four channels for pressure sensors (CP1, CP2, CP3, CP4), of which triggering (T) is commanded by the initiation of the explosion from the ignition source.

By knowing these propagation velocities of the flame front and pressure wave, it is possible to accurately characterize the behavior of explosions as a function of the concentration value, the type of initiating source, and the propagation distance, i.e. to determine the character of the explosion: deflagration (subsonic propagation velocities and the pressure wave is ahead of the flame front) or detonation (supersonic propagation velocities and the flame front is in phase with the pressure wave).



Fig. no. 1. Integrated system for simultaneous measurement of flame front and pressure wave propagation velocities of air-gas explosions in the shock tube

