MEASUREMENT OF DIRECTIONAL CHARACTERISTICS OF THREE TYPE OF TWO-SENSOR ANEMOMETRY PROBES

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1. Introduction

There is a comparison of the directional characteristics of three types of two-sensor probes given in the paper. All tested probes were developed and manufactured at Fluid dynamics laboratory of the Institute of Thermomechanics.

2. Directional characteristics measurement

The first examined probe (a) has two crossed wires. The probe (b) is composed from two parallel wires. Probe (c) is designed as a classical X-probe with two inclined wires, which are perpendicular to each other.

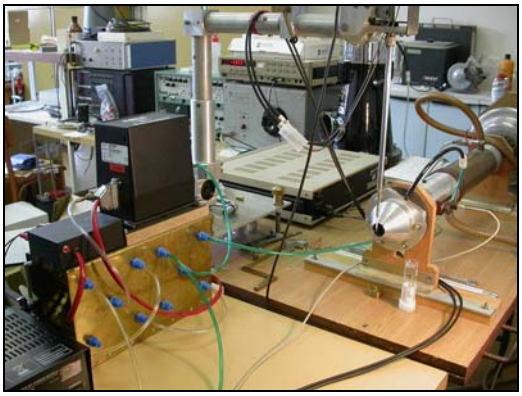


Fig. 1: Directional calibration rig

More detailed description of the probes is given in full text of the paper.

a) Cross-sensor probe R521

Heated elements are placed perpendicular to the probe axis and perpendicular to each other (d_1=5e-6 m; l_1=l_2=1,25e-3 m, d_2=7e-5 m). The scheme is in Fig. 2.

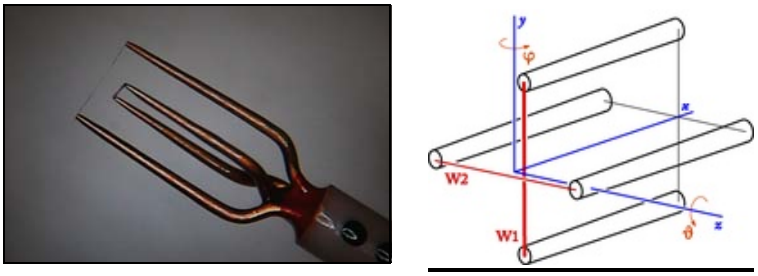
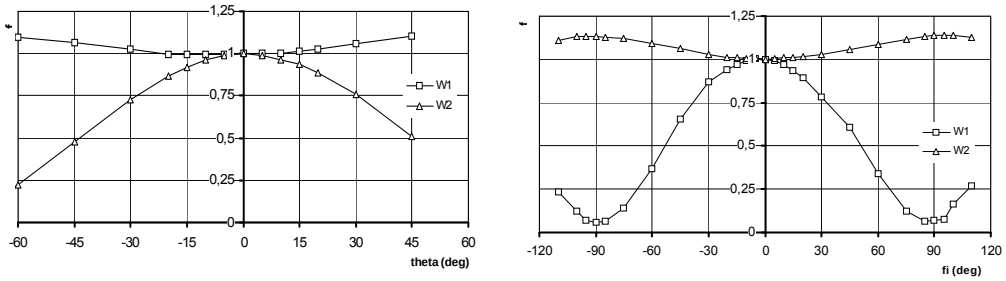
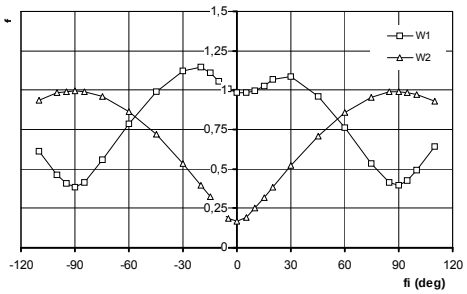


Fig. 2: Cross-sensor probe R521



Graph 1a and 1b: Directional characteristics of probe R521 - *x*-axis is parallel to the flow



Graph 2: Directional characteristics of probe R521 - *x*-axis is perpendicular to the flow

b) Parallel-sensor probe P711

Heated elements are placed perpendicular to the probe axis and parallel to each other (d_1=1e-5 m; l_1=l_2=1,25e-3 m, d_2=5e-6 m).

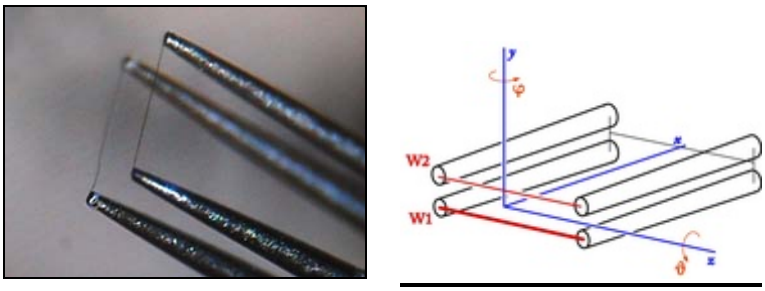
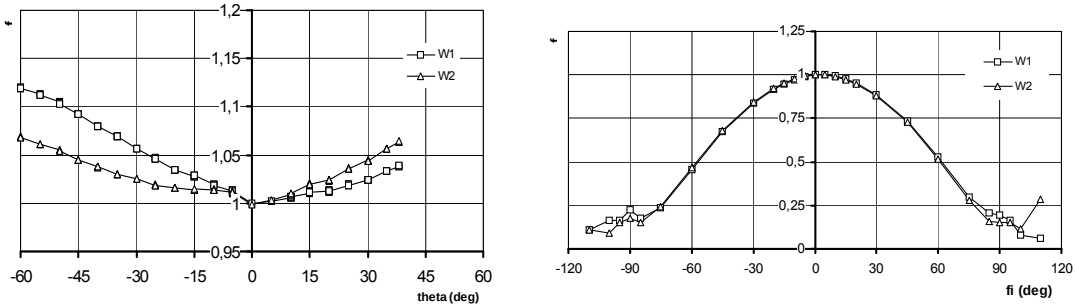


Fig. 3: Parallel-sensor probe P711



Graph 3a and 3b: Directional characteristics of probe P711 - *x*-axis is parallel to the flow

c) X-sensor probe R511

Probe has two inclined wires, which are perpendicular to each other (d_1=5e-6 m; l_1=l_2=1,25e-3 m, d_2=7e-5 m).

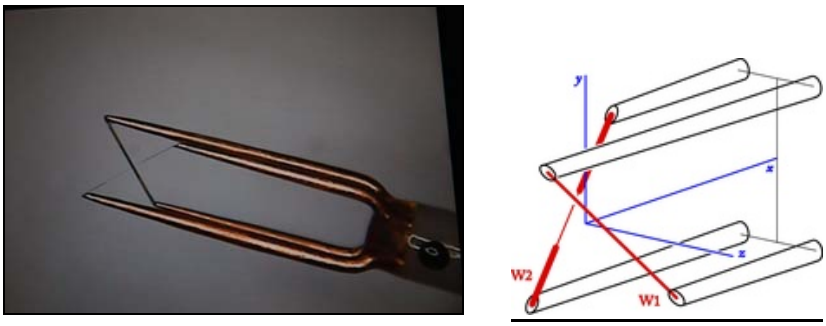
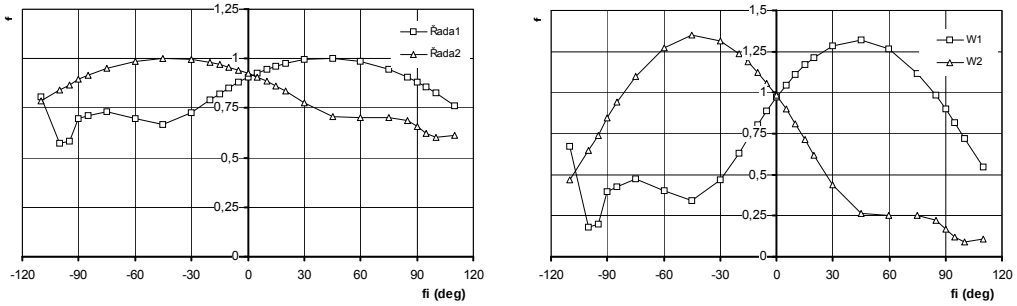


Fig. 4: X-sensor probe R511



Graph 4a and 4b: Functions E^2/E_{max}^2 (left) and directional characteristics (right) of probe R511 - *x*-axis is parallel to the flow

3. Conclusion

The most suitable for simultaneous measurement of velocity and concentration is the X-sensor probe R511. It has been adjusted into position, where effective velocities of both sensors are equal. It can be roughly done from the distribution of output voltages. Then is possible evaluate both, the velocity and the concentration, by iterative procedure.

4. Acknowledgement

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5. References

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