Deutsches Zentrum
DLR für Luft- und Raumfahrt

Handout

Laser-2-Focus Velocimetry (L2F)

Measured values
- Flow Velocity

Principle
The L2F technique is a non-intrusive technique for the measurement of flow velocities in gases and liquids. The velocity of extremely small particles is recorded, which are usually present in all technical flows or may be added if required. The light scattered by the particles when irradiated by a light source is used in this measurement. The required particles are in the size range of the light wavelength (< 1µm) and follow the flow even at high acceleration so that correlation between particles and flow velocity is assured.In the measuring volume of the L2F device, two highly focussed parallel beams are projected which function as a time-of-flight gate. Particles which traverse the beams in this area emit scattering light pulses which are scattered back are detected by two photo detectors each of which is assigned to a beam in the measuring volume. Should a particle traverse both beams, then it transmits two scattering signals, whose time interval provides a value for the velocity component in the plane perpendicular to the beam axis. Two associated double signals are only then obtained when the plane through which the two beams are spread out is nearly parallel to the flow direction. The beam plane is rotatable. In turbulent flow the magnitude and direction of the momentary velocity vector changes constantly. The flow values are therefore usually given as mean values and measures of fluctuation. For this reason the beam plane for a L2F measurement is adjusted in various positions in the range of the mean flow direction and some thousands of time-of-flight measurements are carried out for each position. The measured data may be represented graphically as two-dimensional frequency distribution. Various extensions for 3-component measurements, near wall measurements and for application in rotating machinery are available.

Application
- All sorts of 2- and 3- component flow velocity point measurements
- Especially suited for applications with limited optical access, e.g. turbomachinery
- Measurements within rotating machinery
- Velocity range 1…3000 m/s
- Flow Turbulence up to 30%

Literature / References

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- Förster, W., Karpinsky, G., Krain, H., Röhle, I., Schodl, R. (2000): 3 Component, Doppler Laser-Two-Focus Velocimetry Applied to a Transonic Centrifugal Compressor. In 10th Intl. Symp. on Appl.of Laser Anemometry to Fluid Mechanics (Lisbon)

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This handout, and cross-references to related measurement techiques and facilities are available at: http://messtec.dlr.de/link-42-en.

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