

## Transonic Cascade Wind Tunnel (TGK)

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Oil streak pattern of the corner region between endwall and profile suction side ( $M = 0.7$ )



Schlieren picture of the shock system of a transonic profile ( $M = 1.25$ )



### Measured values

- static pressure on profile and endwalls
- Pitotsonden
- 3-hole and 5-hole wakeprobes
- 2-hole angleprobes
- boundary layer total pressure rake
- temperature probes
- angle and velocity (by means of L2F system)
- angle and velocity distribution in the S1 plane (by means of PIV system)
- flow visualisation by means of oil streak pattern
- shock visualisation by means of Schlieren optics
- visualisation of the boundary layer behaviour by means of Liquide Crystals

### Description of facility

*Experimental investigation of sub- and transonic flow through plane compressor cascade. The main task of the test facility is the exact determination of losses, performance parameters and working range of compressor profiles. Due to the very good optical and measuring accessibility, secondary flow phenomena can be studied in detail. The realistic blade profile can be exactly modeled in this channel by the independent adjustment of the two main aerodynamic parameters Mach number and Reynolds number. With the help of optical methods and flow visualisation, detailed analysis of the flow are performed.*

*Characteristic parameters of the cascade wind tunnel*

- $M = 0.2 - 1.4$
- $Re = 100000 - 3000000$
- $Tu = 0,6 \% - 4 \%$
- Inflow angle:  $80 \text{ deg} - 160 \text{ deg}$

### Application

Aerodynamic investigation of sub and

transonic compressor cascades for

- Experimental validation of 2D and 3D numerical flow simulations with very detailed measurement data
- Development and verification of new profile design concepts
- Fundamental investigations of flow phenomena in turbomachines, e.g. boundary layer development on the profiles (transition and separation), passive and active separation control, shock boundary layer interaction
- Development and control of secondary flow and corner separation. Analysis of the effects of different side wall contouring concepts or profile alignments, as for example sweep or lean.

### Literature / References

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*This handout, and cross-references to related measurement techniques and facilities are available at: <http://messtec.dlr.de/link-251-en>.*