

DATA SHEET

Kiel Temperature Probes

PRODUCT NAME

Kiel Temperature Probes

TYPE

Kiel Probe



Fig. 1 Kiel probe (left side) and rake with several Kiel probe heads installed (right side)

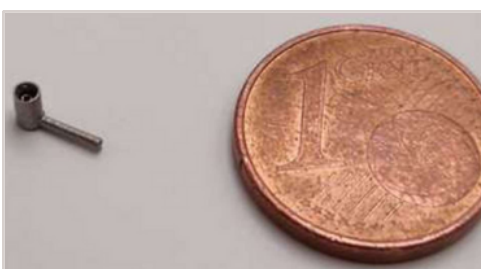


Fig. 2 Micro Kiel probe (Ø 1.65 mm)

DESCRIPTION

Temperature probe for accurate measurement at flow angles up to $\pm 50^\circ$

Vectoflow's *Kiel temperature probes* can capture the total temperature of the flow at an angle of attack of up to 50° . At the same time, it offers all advantages of additive manufacturing, like geometric flexibility and robustness. Vectoflow's *Kiel temperature probes* can be purchased either as a single unit or as part of a probe rake, with a specified number of probe heads.

Kiel temperature probes can be manufactured with a diameter as small as 1.65 mm (see Fig. 2). Necessary calculations to determine the optimal sizes are also available on request.

GENERAL

Geometry	Straight, L-shaped, Cobra, custom
Max length	≤ 100 mm (one-part design) > 100 mm (multi-part designs)
Min. typ. diameter	Ø 1.65 mm (micro Kiel probe) Ø 2 mm standard Kiel
Material	Stainless steel, Titanium, Inconel
Fastening type	None, square, hexagonal, one-sided flattened, cylinder, threaded or custom
Thermometer type	Pt100 or Thermocouple (i.e. Type N or K)

MEASUREMENT RANGE

Temperature range	Up to 800°C, depending on material and thermistor
Angular range	±50° for Kiel probes ±45° for micro-Kiel probes
Velocity range	From 3 m/s to > 343 m/s

TIME CONSTANTS

The settling time of a *Kiel temperature probe* on a flow at a steady temperature depends on the probe's geometry, ranging from 1 second for smaller *Kiel temperature probes* to over 10 seconds for a probe with a diameter of 3.5 mm. The acquisition time to ensure properly converging data is typically no more than 3 seconds for all probes.

RECOVERY RATIO

For correction of the measured temperature with respect to the true total or stagnation temperature a recovery ratio RT is defined as:

$$RT = \frac{T_C}{T_{tot}}$$

Where T_C is the temperature measured by the *Kiel temperature probe*, and T_{tot} is the total temperature measured in the wind tunnel's settling chamber. The average recovery ratio of a *Kiel temperature probe* with a diameter of 3.5 mm as a function of the yaw angle, is shown in Figure 3:

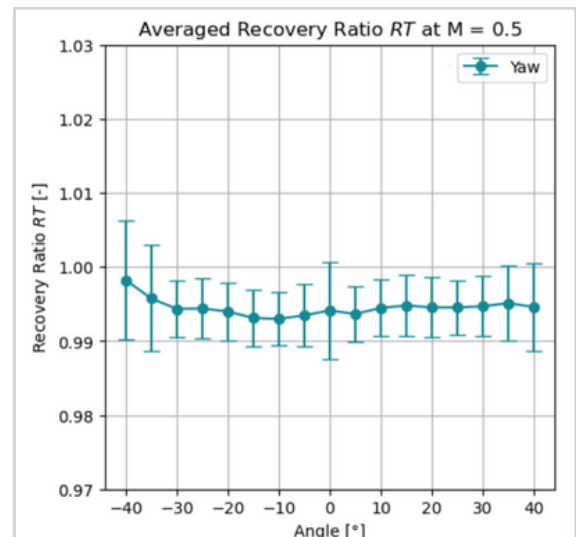


Fig. 3 Recovery ratio as function of yaw angle, with a flow Mach number of $Ma = 0.5$. The values were averaged over thirty-three similar probe heads. Error bars show the standard deviation.