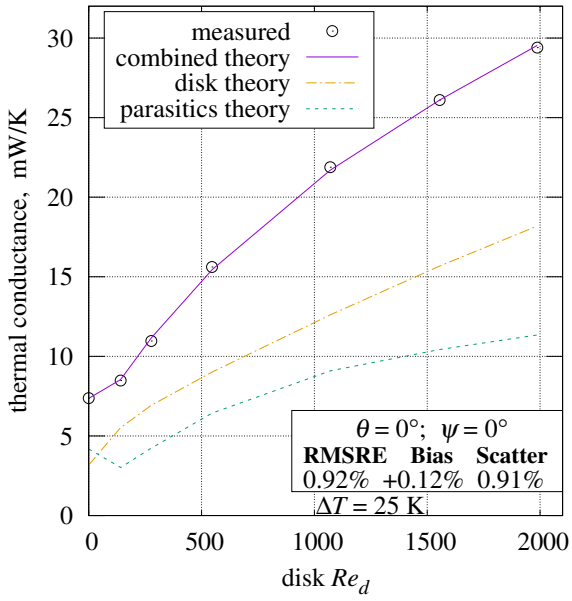
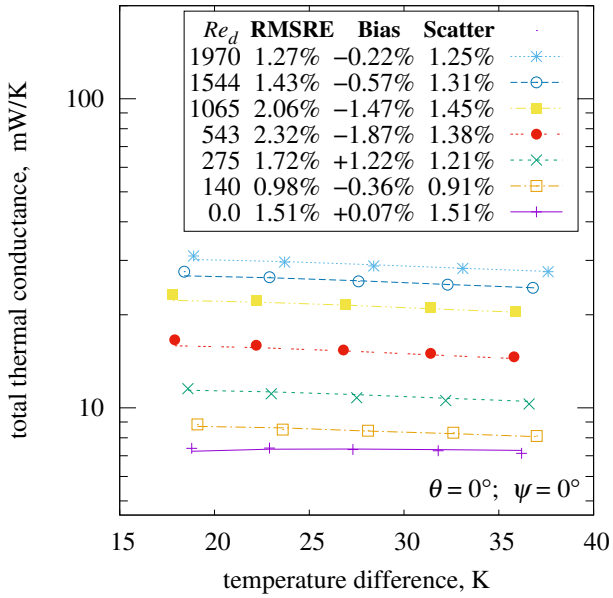
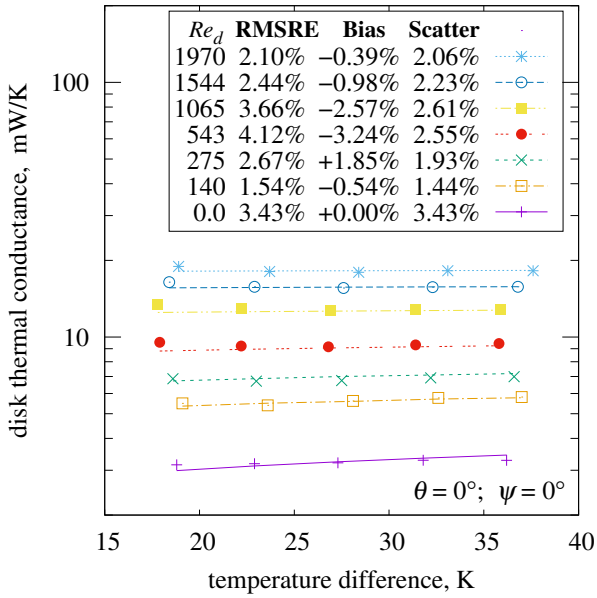
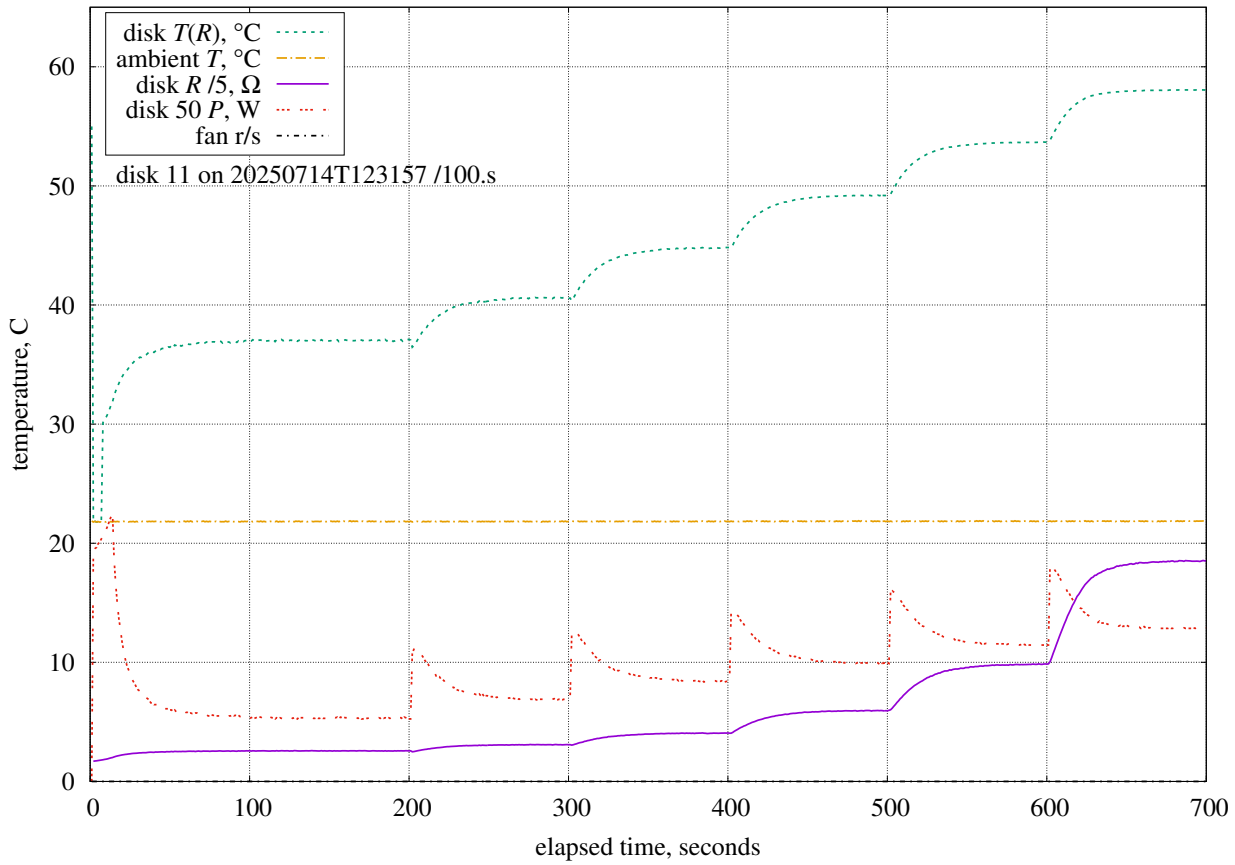

measured
combined theory
disk theory
parasitics theory
thermal conductance, mW/K
disk Re_d
$\theta = 0°;\ \psi = 0°$
RMSRE Bias Scatter
0.92% +0.12% 0.91%
ΔT = 25 K


Re_d RMSRE Bias Scatter
1970 1.27% −0.22% 1.25%
1544 1.43% −0.57% 1.31%
1065 2.06% −1.47% 1.45%
543 2.32% −1.87% 1.38%
275 1.72% +1.22% 1.21%
140 0.98% −0.36% 0.91%
0.0 1.51% +0.07% 1.51%
total thermal conductance, mW/K
temperature difference, K
$\theta = 0°;\ \psi = 0°$

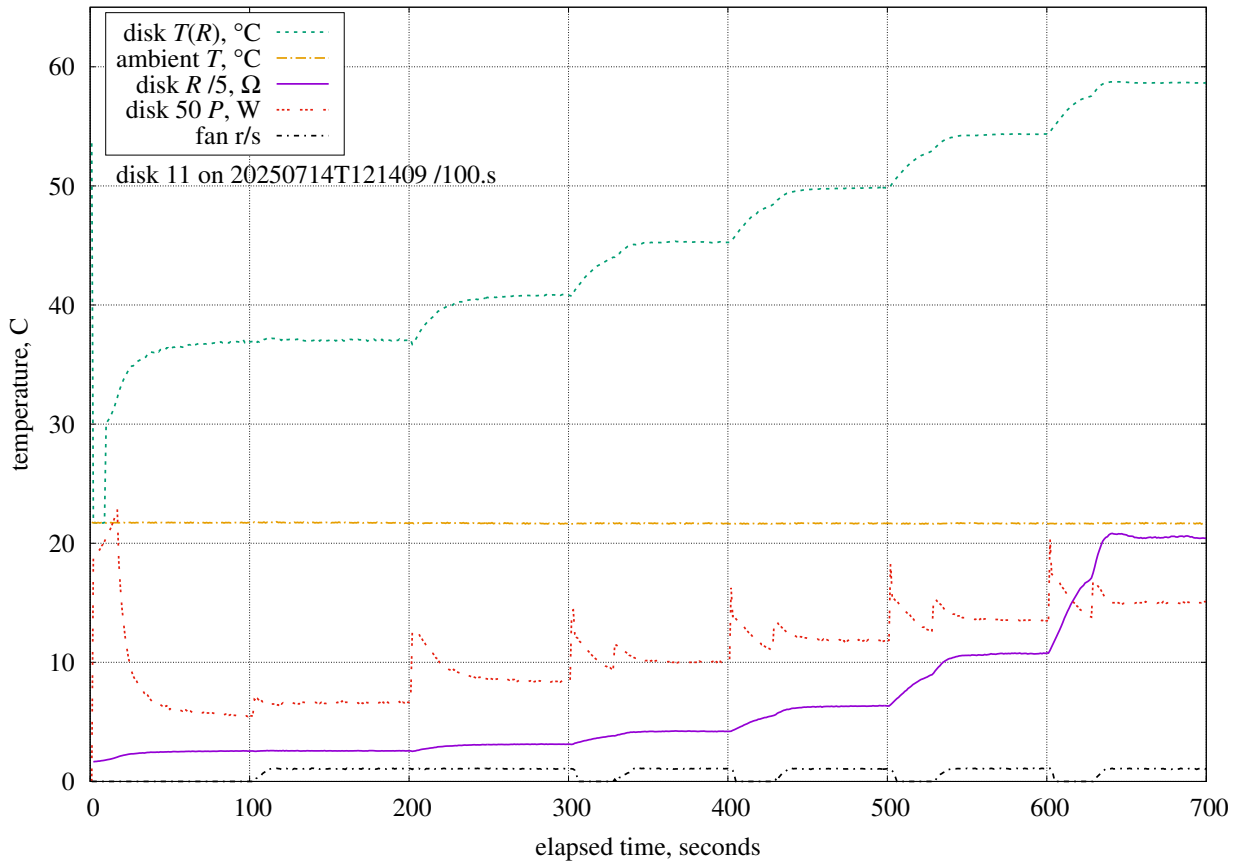

Re_d RMSRE Bias Scatter
1970 2.10% −0.39% 2.06%
1544 2.44% −0.98% 2.23%
1065 3.66% −2.57% 2.61%
543 4.12% −3.24% 2.55%
275 2.67% +1.85% 1.93%
140 1.54% −0.54% 1.44%
0.0 3.43% +0.00% 3.43%
disk thermal conductance, mW/K
temperature difference, K
$\theta = 0°;\ \psi = 0°$



$\theta = 0.0°;\ \psi = 0.0°;\ V = 0.000$ **m/s (0 r/min)**

Estimated measurement uncertainties of natural convection at $\theta = 0.0$.

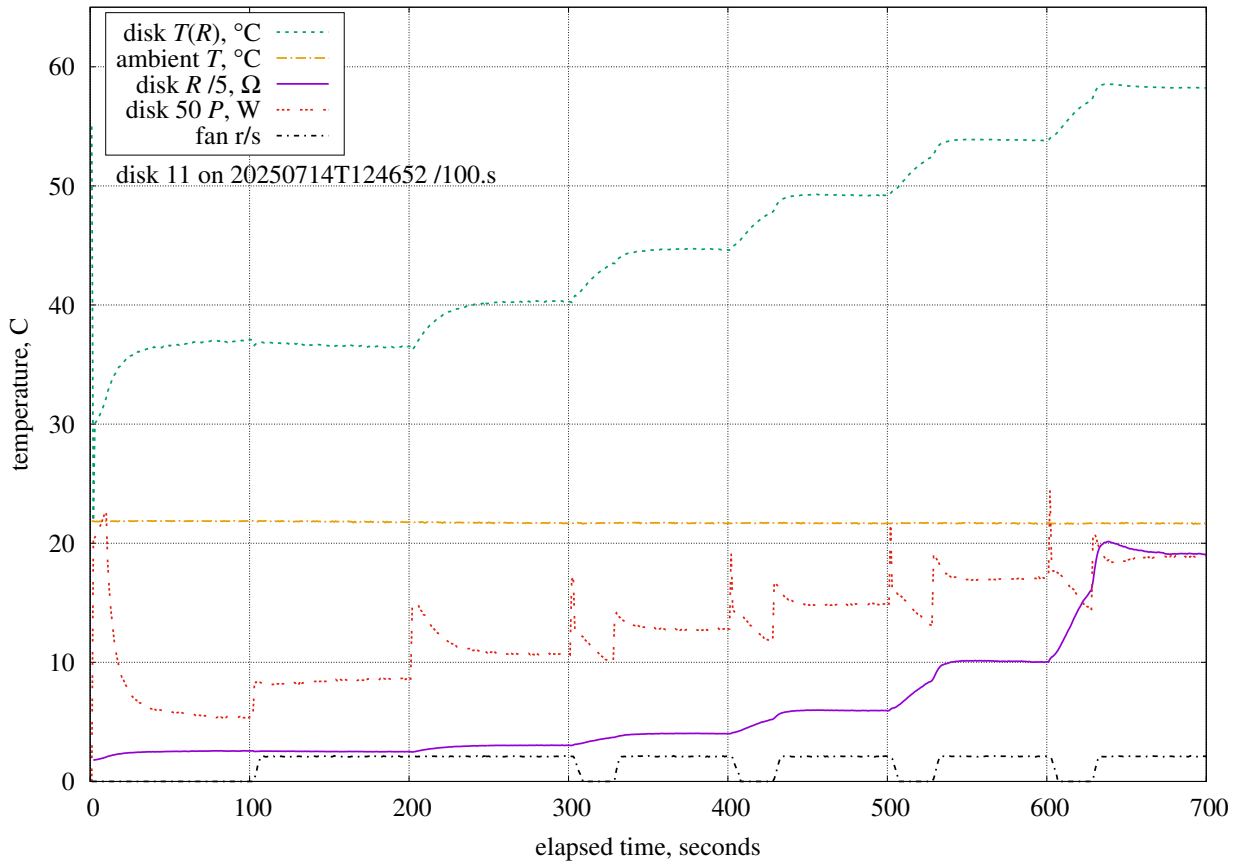
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+4.43%/K	0.10.K	0.44%	LM35C differential
P	101.kPa	+0.0002%/Pa	1.5.kPa	0.29%	MPXH6115A6U air pressure
Re_0	600	+0.0049%	60	0.30%	integration lower-bound
D_o	2.81.mm	+3780%/m	500.um	1.89%	tube outer diameter
D_i	1.11.mm	+3989%/m	200.um	0.80%	tube inner diameter
L_{wire}	38.0.mm	+941%/m	500.um	0.47%	wire length
k_{ABS}	179.$\frac{\text{mW}}{\text{K·m}}$	+0.117%/$\frac{\text{mW}}{\text{K·m}}$	9.0.$\frac{\text{mW}}{\text{K·m}}$	1.05%	ABS thermal conductivity
d	12.0.mm	+5121%/m	100.um	0.51%	disk diameter
θ	50.0.m°	+3.52%/°	0.20.°	0.70%	plate angle
				2.59%	combined bias uncertainty



$\theta = 0.0°;\ \psi = 0.0°;\ V = 0.194$ **m/s (64 r/min)**

Estimated measurement uncertainties at $Re = 141$**.**

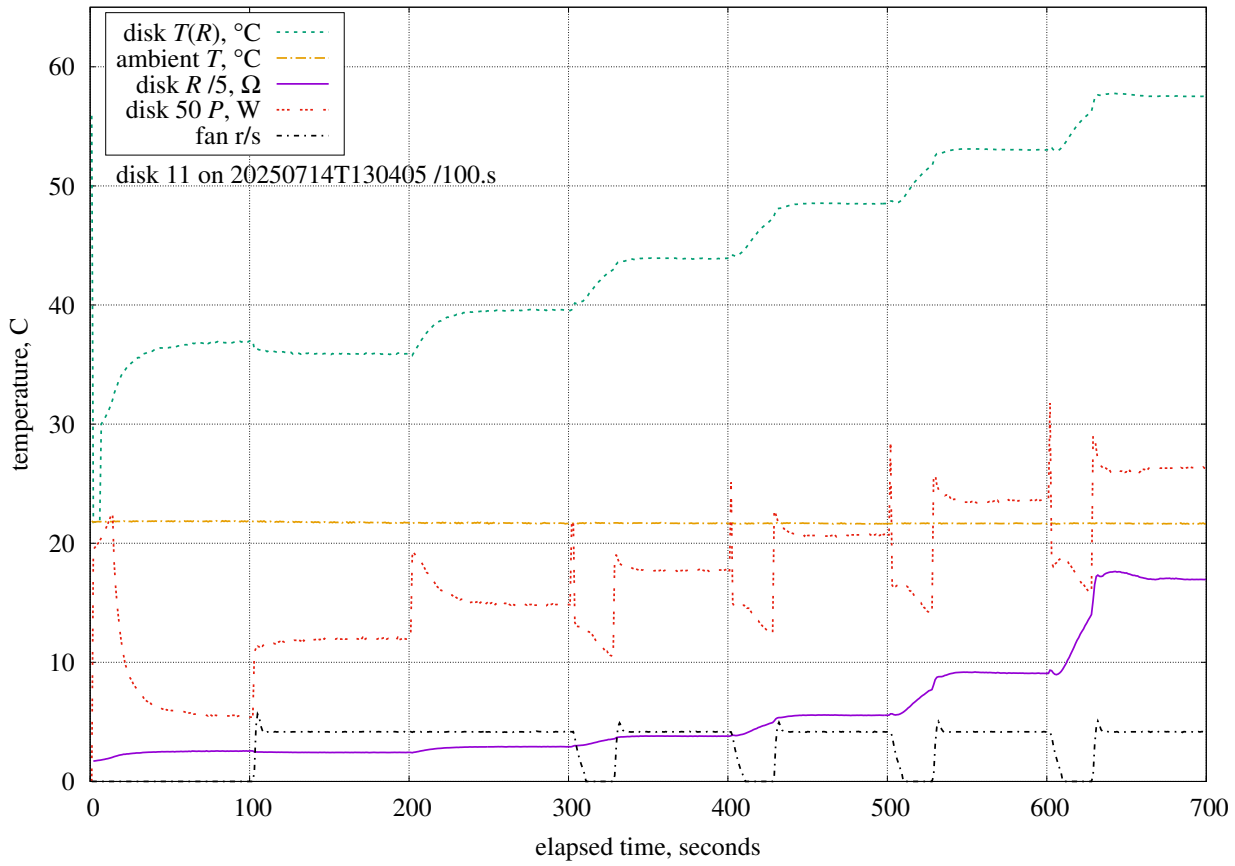
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+4.02%/K	0.10.K	0.40%	LM35C differential
P	101.kPa	+0.0003%/Pa	1.5.kPa	0.50%	MPXH6115A6U air pressure
η	0.340	+99.6%	0.007	0.68%	anemometer calibration
D_i	1.11.mm	+4902%/m	200.um	0.98%	tube inner diameter
D_g	166.um	−276%/m	750.um	0.21%	tube air gap
L_{wire}	38.0.mm	+1150%/m	500.um	0.57%	wire length
k_{ABS}	179.$\frac{\text{mW}}{\text{K·m}}$	+0.138%/$\frac{\text{mW}}{\text{K·m}}$	9.0.$\frac{\text{mW}}{\text{K·m}}$	1.23%	ABS thermal conductivity
d	12.0.mm	+5135%/m	100.um	0.51%	disk diameter
θ	50.0.m°	−1.33%/°	0.20.°	0.27%	plate angle
				2.02%	combined bias uncertainty
Symbol	**Nominal**	**Sensitivity**	**Variability**	**Uncertainty**	**Component**
ω	64.3.r/min	+0.527%/(r/min)	1.1.r/min	0.60%	fan rotation rate
				2.35%	RSS combined uncertainty



$\theta = 0.0°;\ \psi = 0.0°;\ V = 0.380$ **m/s (126 r/min)**

Estimated measurement uncertainties at $Re = 277$**.**

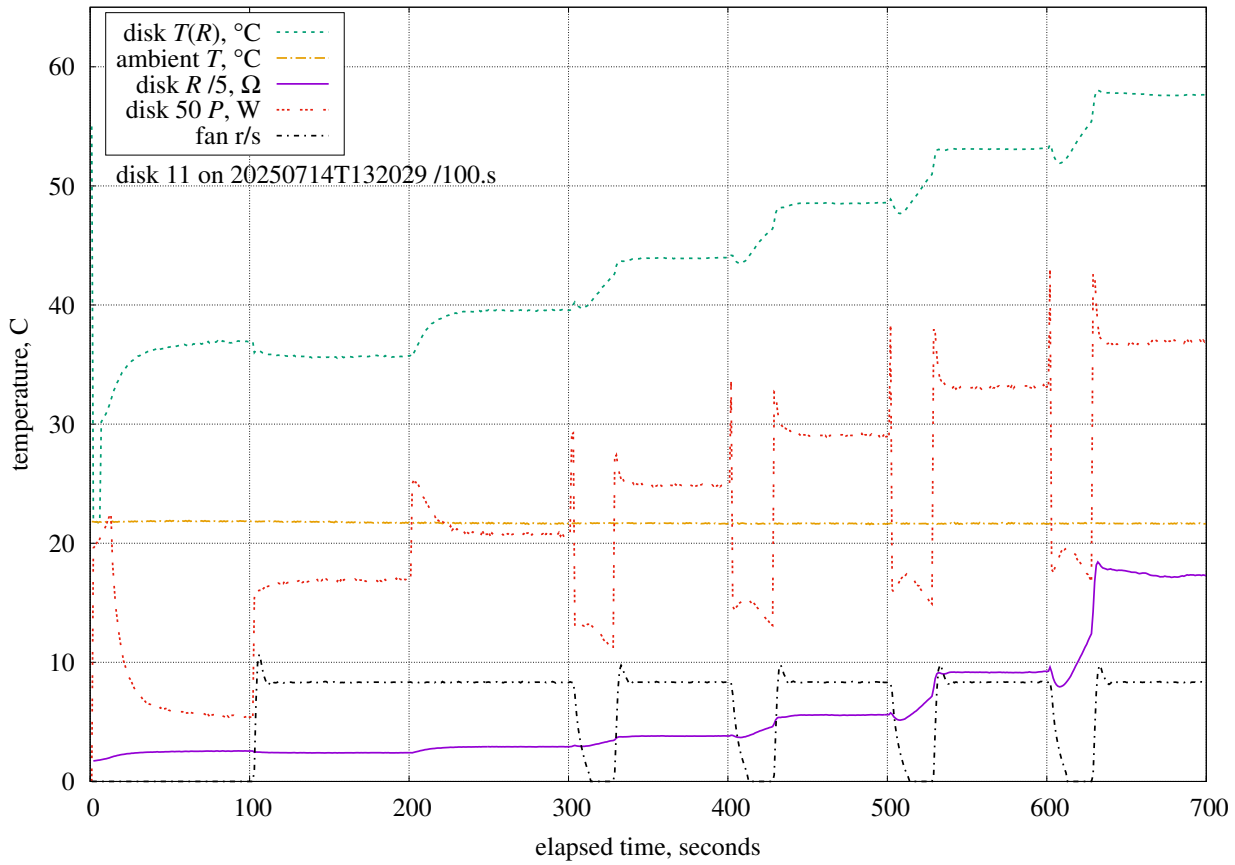
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+3.95%/K	0.10.K	0.39%	LM35C differential
P	101.kPa	+0.0002%/Pa	1.5.kPa	0.32%	MPXH6115A6U air pressure
η	0.340	+74.1%	0.007	0.50%	anemometer calibration
Re_0	600	−0.0037%	60	0.22%	integration lower-bound
C_B	0.541	+2.73%	0.100	0.27%	bypass coefficient
D_o	2.81.mm	−7036%/m	500.um	3.52%	tube outer diameter
D_i	1.11.mm	+6614%/m	200.um	1.32%	tube inner diameter
D_g	166.um	−327%/m	750.um	0.25%	tube air gap
L_{wire}	38.0.mm	+1365%/m	500.um	0.68%	wire length
k_{ABS}	179. $\frac{\text{mW}}{\text{K·m}}$	+0.141%/$\frac{\text{mW}}{\text{K·m}}$	9.0. $\frac{\text{mW}}{\text{K·m}}$	1.26%	ABS thermal conductivity
d	12.0.mm	+5561%/m	100.um	0.56%	disk diameter
				4.15%	combined bias uncertainty
Symbol	**Nominal**	**Sensitivity**	**Variability**	**Uncertainty**	**Component**
ω	126.r/min	+0.199%/(r/min)	1.1.r/min	0.22%	fan rotation rate
				4.17%	RSS combined uncertainty



$\theta = 0.0°;\ \psi = 0.0°;\ V = 0.748$ **m/s (250 r/min)**

Estimated measurement uncertainties at $Re = 546$**.**

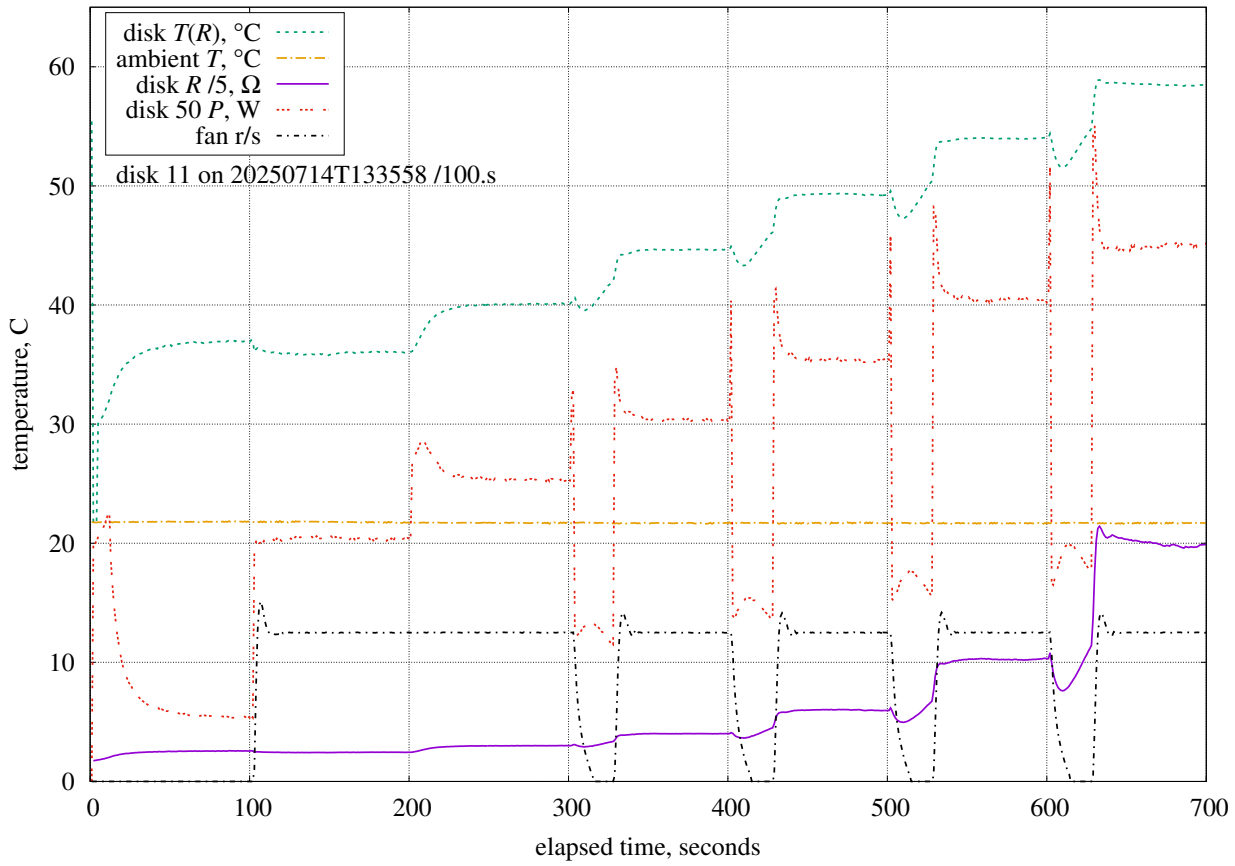
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+3.96%/K	0.10.K	0.40%	LM35C differential
P	101.kPa	+0.0005%/Pa	1.5.kPa	0.74%	MPXH6115A6U air pressure
η	0.340	+154%	0.007	1.05%	anemometer calibration
Re_0	600	−0.0047%	60	0.28%	integration lower-bound
C_B	0.541	+4.70%	0.100	0.47%	bypass coefficient
D_o	2.81.mm	+987%/m	500.um	0.49%	tube outer diameter
D_i	1.11.mm	+9297%/m	200.um	1.86%	tube inner diameter
D_g	166.um	−415%/m	750.um	0.31%	tube air gap
L_{wire}	38.0.mm	+1729%/m	500.um	0.86%	wire length
k_{ABS}	179. $\frac{\text{mW}}{\text{K·m}}$	+0.150%/$\frac{\text{mW}}{\text{K·m}}$	9.0. $\frac{\text{mW}}{\text{K·m}}$	1.34%	ABS thermal conductivity
d	12.0.mm	+5900%/m	100.um	0.59%	disk diameter
				2.97%	combined bias uncertainty
Symbol	**Nominal**	**Sensitivity**	**Variability**	**Uncertainty**	**Component**
ω	250.r/min	+0.210%/(r/min)	1.0.r/min	0.22%	fan rotation rate
				3.00%	RSS combined uncertainty



$\theta = 0.0°;\ \psi = 0.0°;\ V = 1.466$ **m/s (500 r/min)**

Estimated measurement uncertainties at $Re = 1070$**.**

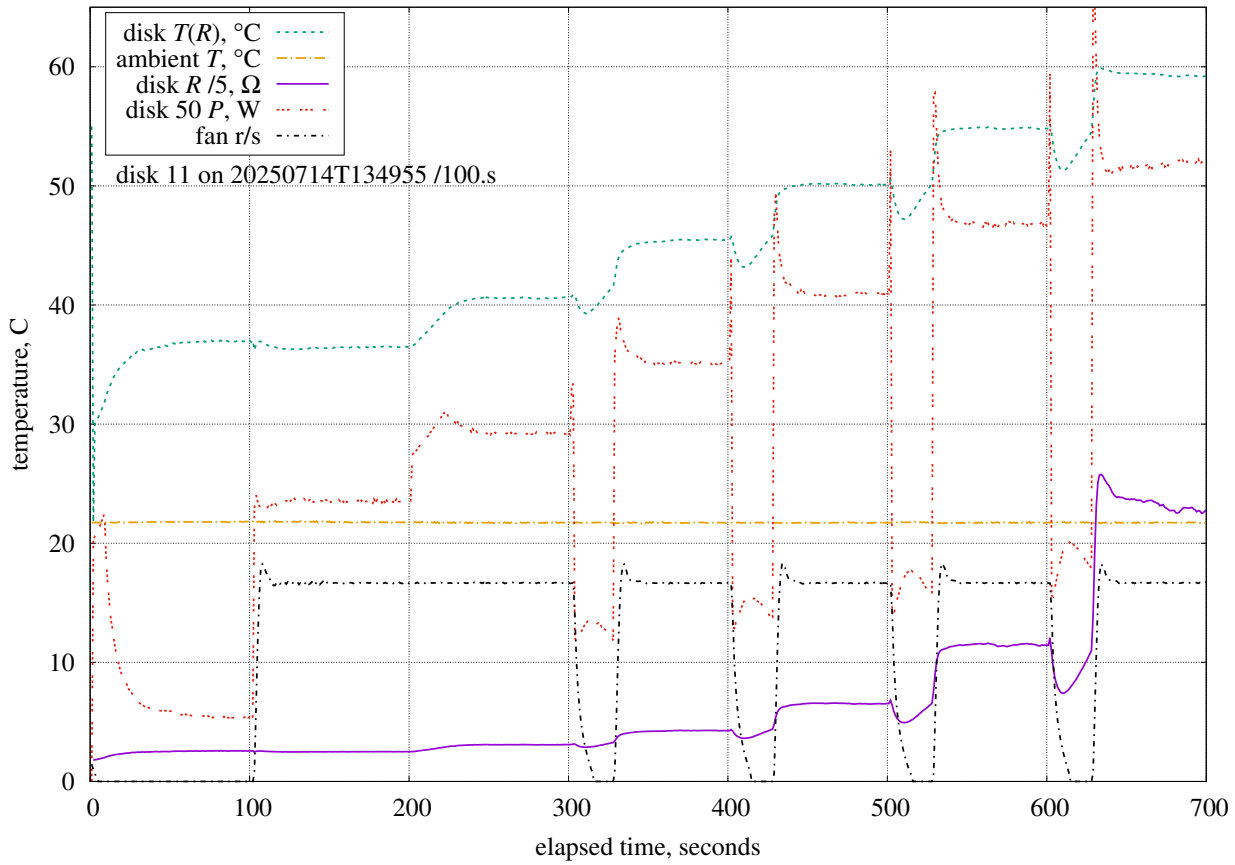
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+3.95%/K	0.10.K	0.39%	LM35C differential
P	101.kPa	+0.0004%/Pa	1.5.kPa	0.61%	MPXH6115A6U air pressure
η	0.340	+126%	0.007	0.86%	anemometer calibration
Re_0	600	−0.0077%	60	0.46%	integration lower-bound
C_B	0.541	+6.76%	0.100	0.68%	bypass coefficient
D_o	2.81.mm	−4711%/m	500.um	2.36%	tube outer diameter
D_i	1.11.mm	+11798%/m	200.um	2.36%	tube inner diameter
D_g	166.um	−495%/m	750.um	0.37%	tube air gap
L_{wire}	38.0.mm	+2063%/m	500.um	1.03%	wire length
k_{ABS}	179.$\frac{\text{mW}}{\text{K·m}}$	+0.154%/$\frac{\text{mW}}{\text{K·m}}$	9.0.$\frac{\text{mW}}{\text{K·m}}$	1.38%	ABS thermal conductivity
d	12.0.mm	+6601%/m	100.um	0.66%	disk diameter
				4.08%	combined bias uncertainty
Symbol	**Nominal**	**Sensitivity**	**Variability**	**Uncertainty**	**Component**
ω	500.r/min	+0.086%/(r/min)	1.4.r/min	0.12%	fan rotation rate
				4.08%	RSS combined uncertainty



$\theta = 0.0°;\ \psi = 0.0°;\ V = 2.131$ **m/s (750 r/min)**

Estimated measurement uncertainties at $Re = 1555$**.**

Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+3.95%/K	0.10.K	0.39%	LM35C differential
P	101.kPa	+0.0004%/Pa	1.5.kPa	0.63%	MPXH6115A6U air pressure
η	0.340	+122%	0.007	0.83%	anemometer calibration
Re_0	600	−0.0084%	60	0.50%	integration lower-bound
C_B	0.541	+7.83%	0.100	0.78%	bypass coefficient
D_o	2.81.mm	−5337%/m	500.um	2.67%	tube outer diameter
D_i	1.11.mm	+12273%/m	200.um	2.45%	tube inner diameter
D_g	166.um	−513%/m	750.um	0.38%	tube air gap
L_{wire}	38.0.mm	+2136%/m	500.um	1.07%	wire length
k_{ABS}	179. $\frac{\text{mW}}{\text{K·m}}$	+0.150%/ $\frac{\text{mW}}{\text{K·m}}$	9.0. $\frac{\text{mW}}{\text{K·m}}$	1.34%	ABS thermal conductivity
d	12.0.mm	+7142%/m	100.um	0.71%	disk diameter
				4.34%	combined bias uncertainty
Symbol	**Nominal**	**Sensitivity**	**Variability**	**Uncertainty**	**Component**
ω	750.r/min	+0.055%/(r/min)	0.82.r/min	0.05%	fan rotation rate
				4.34%	RSS combined uncertainty



$\theta = 0.0°;\ \psi = 0.0°;\ V = 2.724$ **m/s (999 r/min)**

Estimated measurement uncertainties at $Re = 1988$**.**

Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+3.95%/K	0.10.K	0.40%	LM35C differential
P	101.kPa	+0.0004%/Pa	1.5.kPa	0.64%	MPXH6115A6U air pressure
η	0.340	+113%	0.007	0.77%	anemometer calibration
Re_0	600	−0.0084%	60	0.50%	integration lower-bound
C_B	0.541	+8.51%	0.100	0.85%	bypass coefficient
D_o	2.81.mm	−5583%/m	500.um	2.79%	tube outer diameter
D_i	1.11.mm	+12412%/m	200.um	2.48%	tube inner diameter
D_g	166.um	−520%/m	750.um	0.39%	tube air gap
L_{wire}	38.0.mm	+2168%/m	500.um	1.08%	wire length
k_{ABS}	179. $\frac{\text{mW}}{\text{K·m}}$	+0.146%/$\frac{\text{mW}}{\text{K·m}}$	9.0. $\frac{\text{mW}}{\text{K·m}}$	1.31%	ABS thermal conductivity
d	12.0.mm	+7497%/m	100.um	0.75%	disk diameter
				4.44%	combined bias uncertainty
Symbol	**Nominal**	**Sensitivity**	**Variability**	**Uncertainty**	**Component**
ω	999.r/min	+0.039%/(r/min)	1.8.r/min	0.07%	fan rotation rate
				4.44%	RSS combined uncertainty