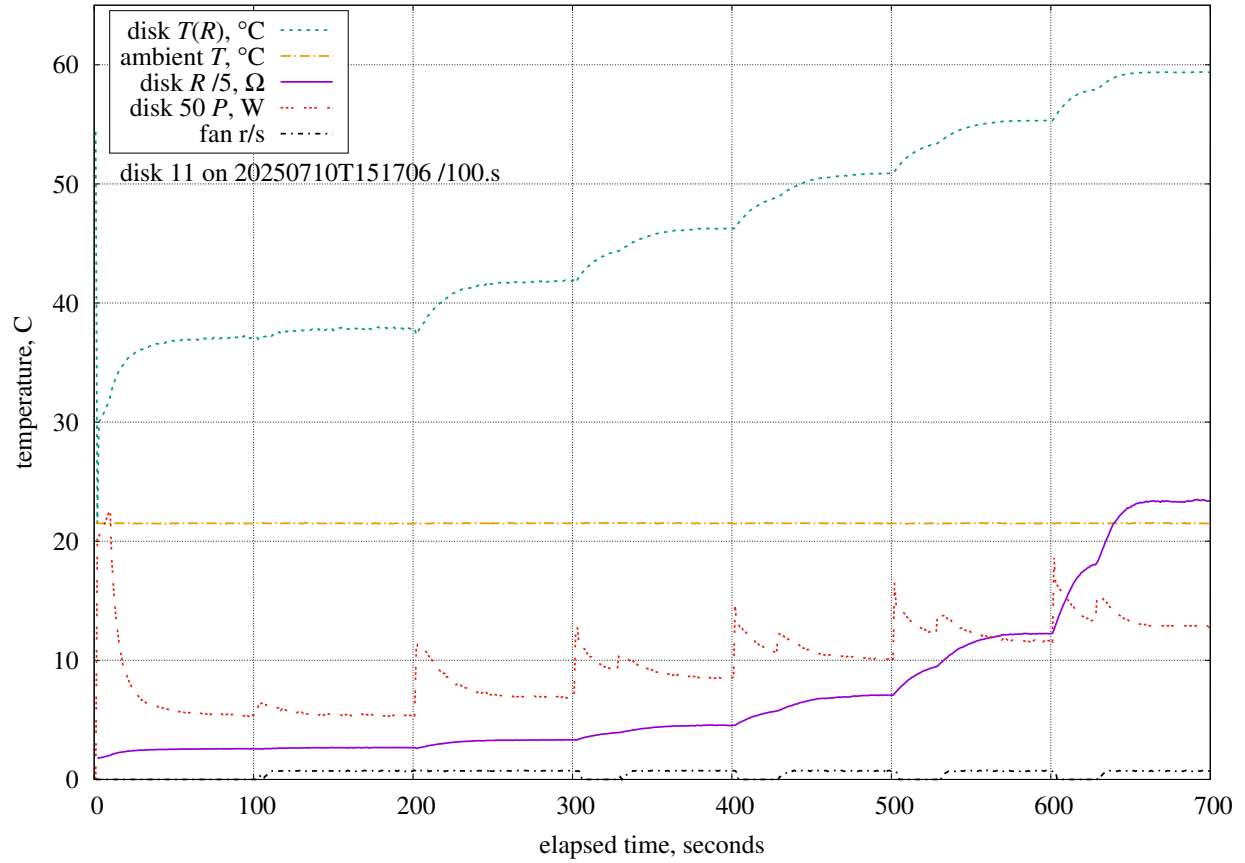


$\theta = 0.0^\circ$; $\psi = 173.3^\circ$; $V = 0.000$ m/s (0 r/min)

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

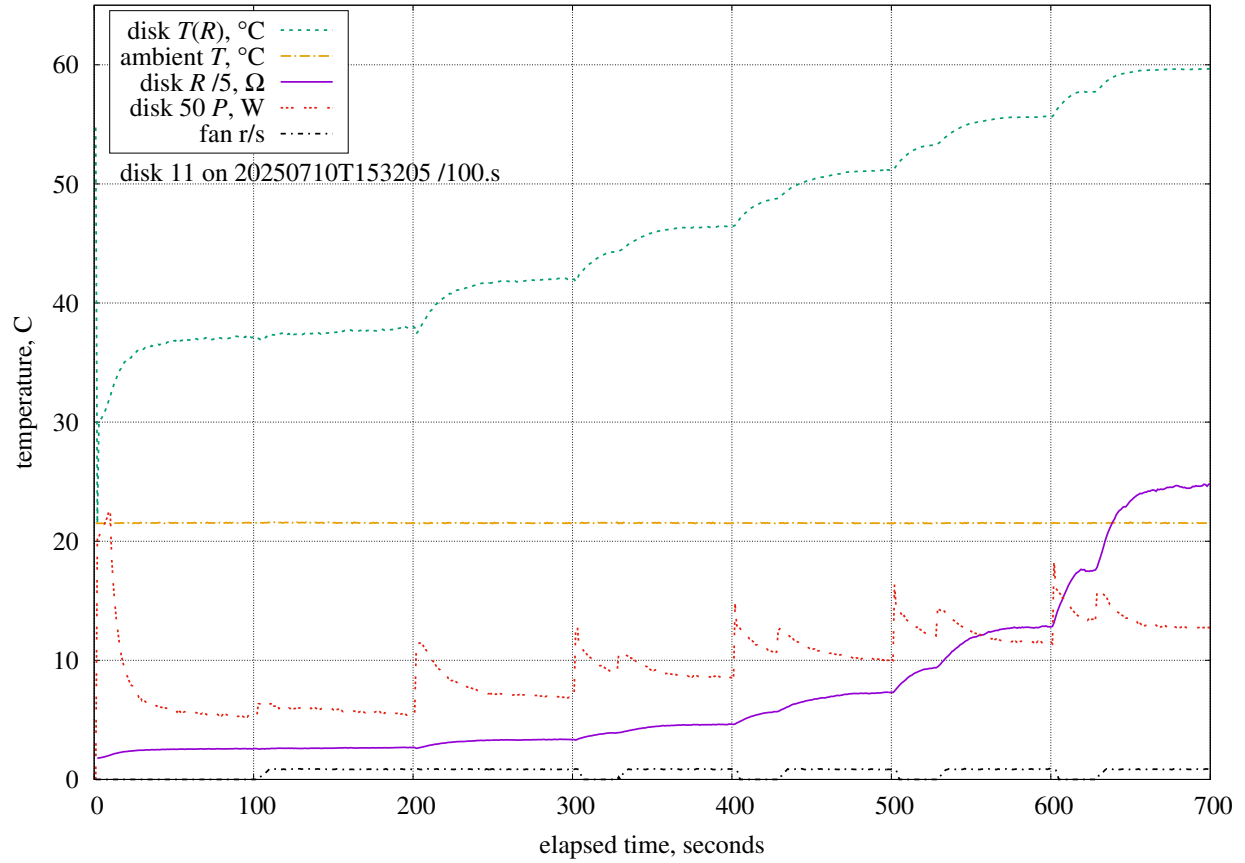
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+4.33%/K	0.10.K	0.43%	LM35C differential
P	101.kPa	+0.0002%/Pa	1.5.kPa	0.27%	MPXH6115A6U air pressure
D_o	2.81.mm	+3255%/m	500.um	1.63%	tube outer diameter
D_i	1.11.mm	+5337%/m	200.um	1.07%	tube inner diameter
L_{wire}	38.0.mm	+1006%/m	500.um	0.50%	wire length
k_{ABS}	179. $\frac{\text{mW}}{\text{K}\cdot\text{m}}$	+0.126%/ $\frac{\text{mW}}{\text{K}\cdot\text{m}}$	9.0. $\frac{\text{mW}}{\text{K}\cdot\text{m}}$	1.13%	ABS thermal conductivity
d	12.0.mm	+4732%/m	100.um	0.47%	disk diameter
θ	50.0.m°	+21.4%/°	0.20.°	4.27%	plate angle
				4.91%	combined bias uncertainty



$\theta = 0.0^\circ$; $\psi = 173.3^\circ$; $V = 0.132$ m/s (44 r/min)

Estimated measurement uncertainties at $Re = 96$.

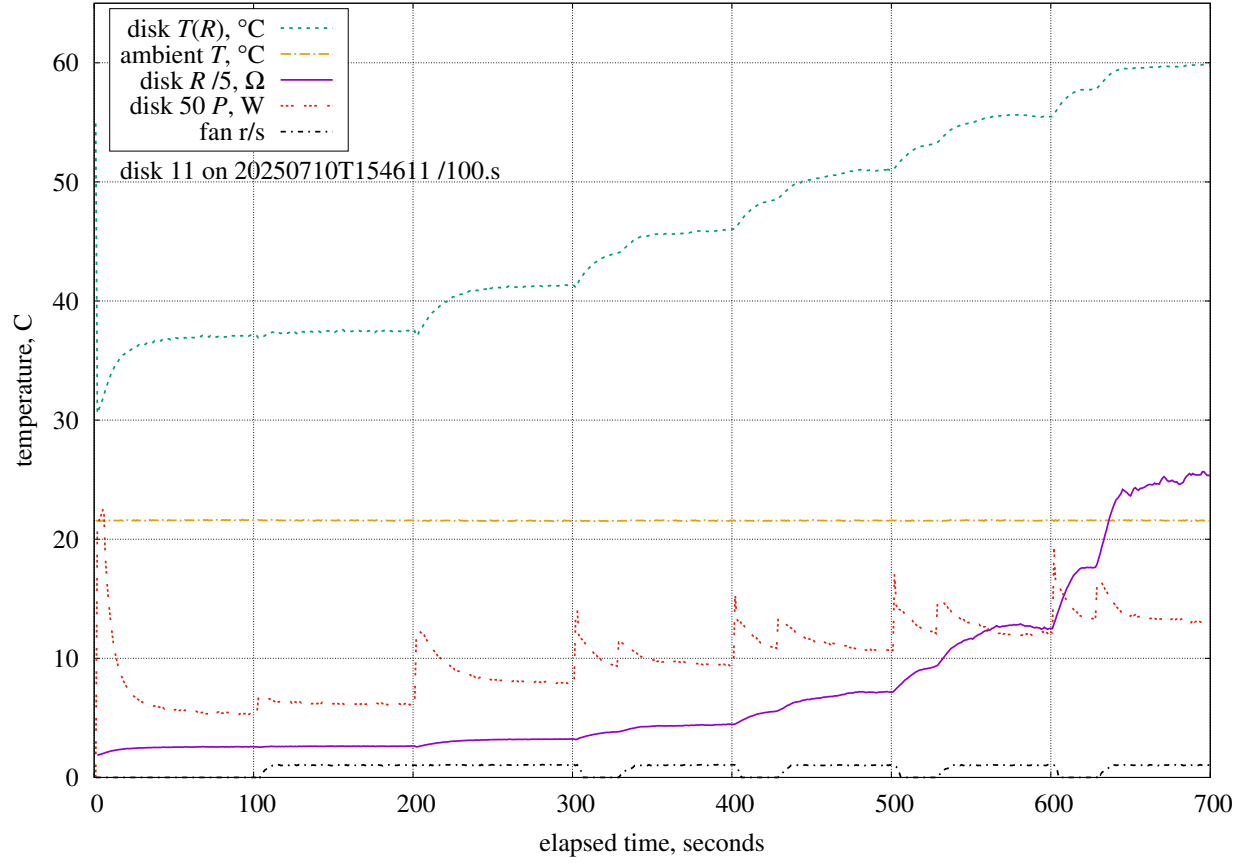
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+4.26%/K	0.10.K	0.43%	LM35C differential
P	101.kPa	+0.0004%/Pa	1.5.kPa	0.55%	MPXH6115A6U air pressure
η	0.340	+61.1%	0.007	0.42%	anemometer calibration
Re_0	600	+0.0087%	60	0.52%	integration lower-bound
D_o	2.81.mm	-5612%/m	500.um	2.81%	tube outer diameter
D_i	1.11.mm	+8505%/m	200.um	1.70%	tube inner diameter
L_{wire}	38.0.mm	+914%/m	500.um	0.46%	wire length
k_{ABS}	179. $\frac{\text{mW}}{\text{K}\cdot\text{m}}$	+0.153%/ $\frac{\text{mW}}{\text{K}\cdot\text{m}}$	9.0. $\frac{\text{mW}}{\text{K}\cdot\text{m}}$	1.37%	ABS thermal conductivity
d	12.0.mm	+4222%/m	100.um	0.42%	disk diameter
ϵ_{ABS}	0.920	-38.9%	0.010	0.39%	ABS emissivity
ϵ_{wt}	0.900	-39.0%	0.025	0.97%	wind-tunnel emissivity
θ	50.0.m°	-8.50%/°	0.20.°	1.70%	plate angle
				4.25%	combined bias uncertainty
Symbol	Nominal	Sensitivity	Variability	Uncertainty	Component
ω	43.8.r/min	+0.475%/(r/min)	1.7.r/min	0.80%	fan rotation rate
				4.54%	RSS combined uncertainty



$\theta = 0.0^\circ$; $\psi = 173.3^\circ$; $V = 0.156$ m/s (52 r/min)

Estimated measurement uncertainties at $Re = 113$.

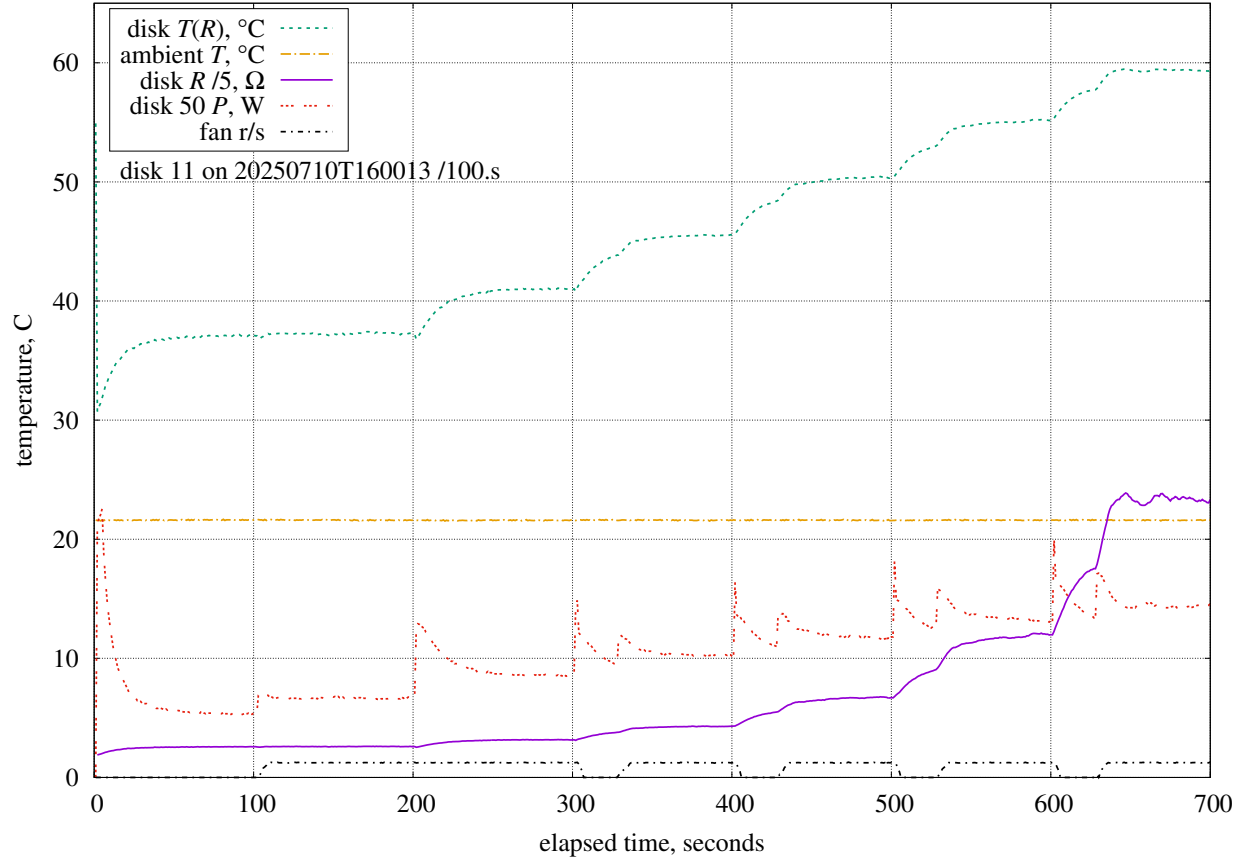
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+4.19%/K	0.10.K	0.42%	LM35C differential
P	101.kPa	+0.0004%/Pa	1.5.kPa	0.60%	MPXH6115A6U air pressure
η	0.340	+80.1%	0.007	0.54%	anemometer calibration
Re_0	600	+0.0056%	60	0.34%	integration lower-bound
D_o	2.81.mm	-6496%/m	500.um	3.25%	tube outer diameter
D_i	1.11.mm	+9663%/m	200.um	1.93%	tube inner diameter
L_{wire}	38.0.mm	+1028%/m	500.um	0.51%	wire length
k_{ABS}	179. $\frac{\text{mW}}{\text{K}\cdot\text{m}}$	+0.164%/ $\frac{\text{mW}}{\text{K}\cdot\text{m}}$	9.0. $\frac{\text{mW}}{\text{K}\cdot\text{m}}$	1.47%	ABS thermal conductivity
d	12.0.mm	+4008%/m	100.um	0.40%	disk diameter
ϵ_{ABS}	0.920	-41.6%	0.010	0.42%	ABS emissivity
ϵ_{wt}	0.900	-41.8%	0.025	1.04%	wind-tunnel emissivity
θ	50.0.m°	-9.05%/°	0.20.°	1.81%	plate angle
				4.74%	combined bias uncertainty
Symbol	Nominal	Sensitivity	Variability	Uncertainty	Component
ω	51.6.r/min	+0.528%/(r/min)	1.0.r/min	0.54%	fan rotation rate
				4.86%	RSS combined uncertainty



$\theta = 0.0^\circ$; $\psi = 173.3^\circ$; $V = 0.187$ m/s (62 r/min)

Estimated measurement uncertainties at $Re = 136$.

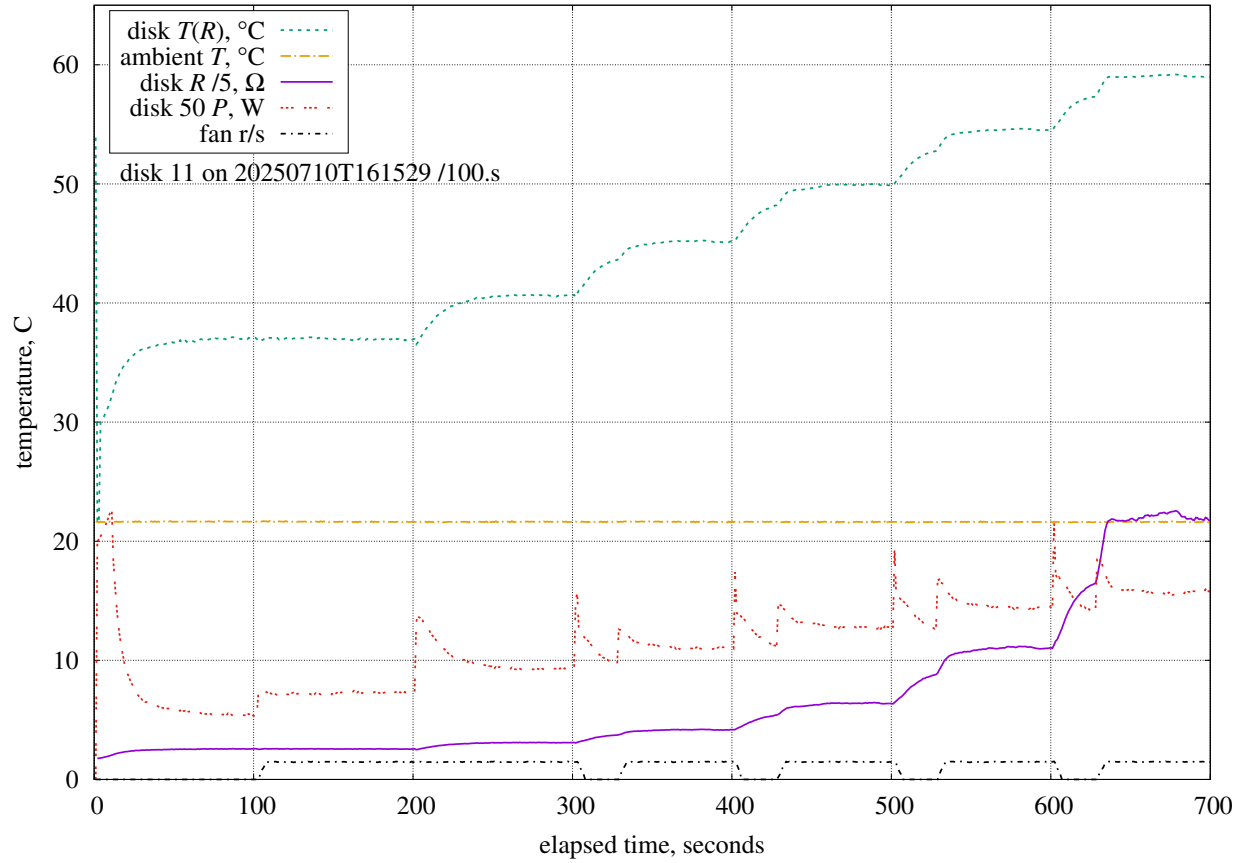
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
T	307.K	$-0.448\%/K$	0.50.K	0.22%	LM35C temperature sensor
ΔT	25.0.K	$+3.98\%/K$	0.10.K	0.40%	LM35C differential
P	101.kPa	$+0.0005\%/Pa$	1.5.kPa	0.77%	MPXH6115A6U air pressure
η	0.340	$+141\%$	0.007	0.96%	anemometer calibration
Re_0	600	-0.0083%	60	0.50%	integration lower-bound
D_o	2.81.mm	$-7380\%/m$	500.um	3.69%	tube outer diameter
D_i	1.11.mm	$+10807\%/m$	200.um	2.16%	tube inner diameter
D_g	166.um	$-274\%/m$	750.um	0.21%	tube air gap
L_{wire}	38.0.mm	$+1143\%/m$	500.um	0.57%	wire length
k_{ABS}	179. $\frac{mW}{K \cdot m}$	$+0.173\%/ \frac{mW}{K \cdot m}$	9.0. $\frac{mW}{K \cdot m}$	1.54%	ABS thermal conductivity
d	12.0.mm	$+4436\%/m$	100.um	0.44%	disk diameter
ϵ_{ABS}	0.920	-43.4%	0.010	0.43%	ABS emissivity
ϵ_{wt}	0.900	-43.6%	0.025	1.09%	wind-tunnel emissivity
θ	50.0.m°	$-9.26\%/^\circ$	0.20.°	1.85%	plate angle
				5.30%	combined bias uncertainty
Symbol	Nominal	Sensitivity	Variability	Uncertainty	Component
ω	62.0.r/min	$+0.776\%/(r/min)$	1.3.r/min	1.00%	fan rotation rate
				5.67%	RSS combined uncertainty



$\theta = 0.0^\circ$; $\psi = 173.3^\circ$; $V = 0.223$ m/s (74 r/min)

Estimated measurement uncertainties at $Re = 163$.

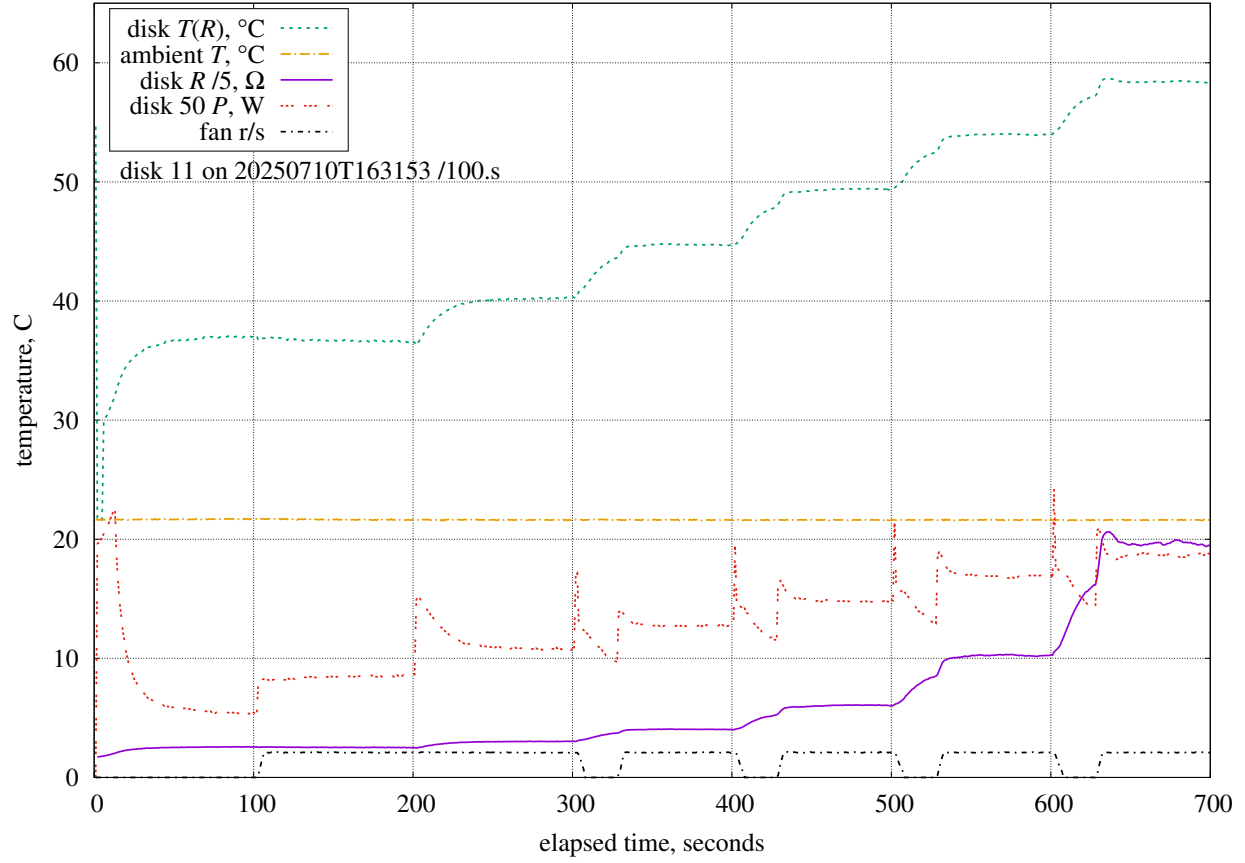
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
T	307.K	$-0.464\%/K$	0.50.K	0.23%	LM35C temperature sensor
ΔT	25.0.K	$+3.93\%/K$	0.10.K	0.39%	LM35C differential
P	101.kPa	$+0.0005\%/Pa$	1.5.kPa	0.80%	MPXH6115A6U air pressure
η	0.340	$+153\%$	0.007	1.04%	anemometer calibration
Re_0	600	-0.011%	60	0.69%	integration lower-bound
D_o	2.81.mm	$-8068\%/m$	500.um	4.03%	tube outer diameter
D_i	1.11.mm	$+11744\%/m$	200.um	2.35%	tube inner diameter
D_g	166.um	$-297\%/m$	750.um	0.22%	tube air gap
L_{wire}	38.0.mm	$+1239\%/m$	500.um	0.62%	wire length
k_{ABS}	179. $\frac{mW}{K \cdot m}$	$+0.177\%/ \frac{mW}{K \cdot m}$	9.0. $\frac{mW}{K \cdot m}$	1.58%	ABS thermal conductivity
d	12.0.mm	$+4615\%/m$	100.um	0.46%	disk diameter
ϵ_{ABS}	0.920	-43.9%	0.010	0.44%	ABS emissivity
ϵ_{wt}	0.900	-44.2%	0.025	1.11%	wind-tunnel emissivity
θ	50.0.m°	$-9.16\%/^\circ$	0.20.°	1.83%	plate angle
				5.67%	combined bias uncertainty
Symbol	Nominal	Sensitivity	Variability	Uncertainty	Component
ω	74.2.r/min	$+0.704\%/(r/min)$	0.98.r/min	0.69%	fan rotation rate
				5.84%	RSS combined uncertainty



$\theta = 0.0^\circ$; $\psi = 173.3^\circ$; $V = 0.267$ m/s (89 r/min)

Estimated measurement uncertainties at $Re = 195$.

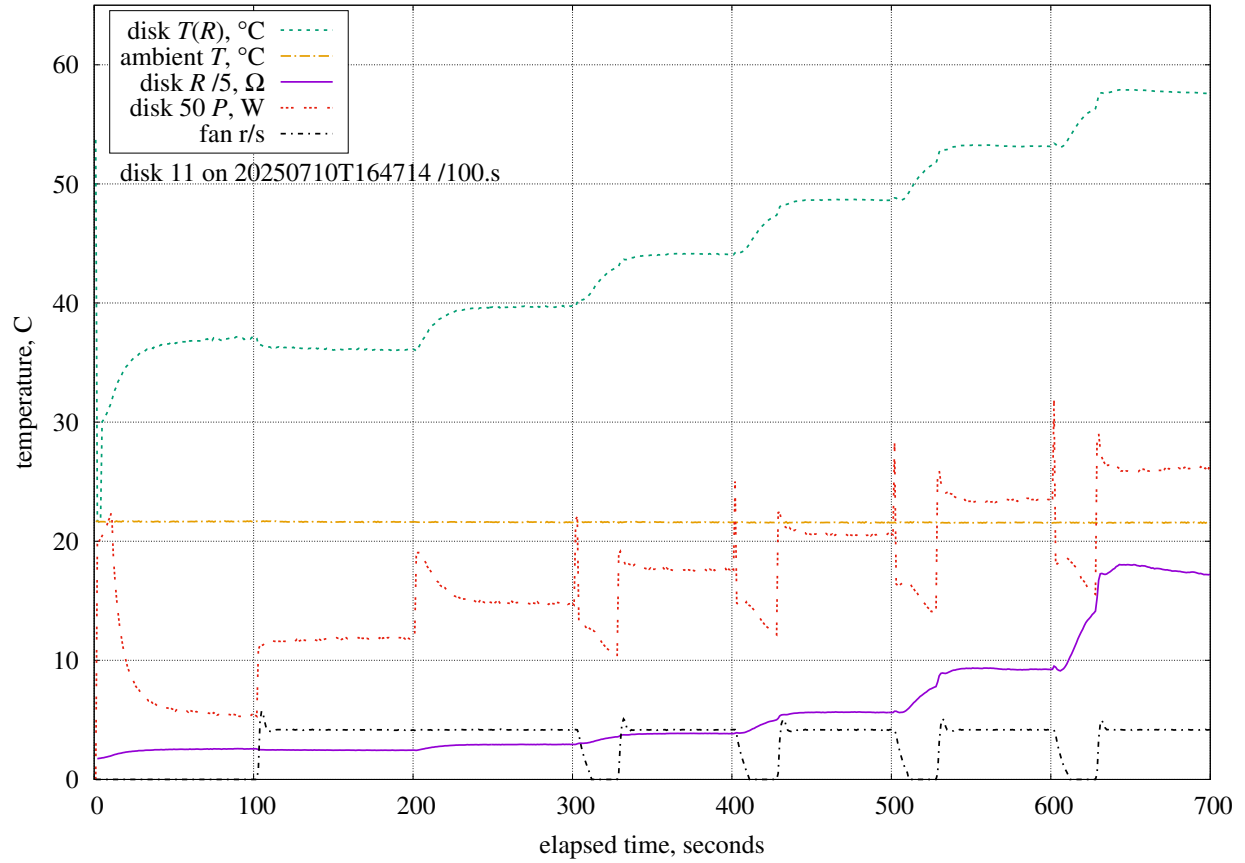
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
T	307.K	$-0.466\%/K$	0.50.K	0.23%	LM35C temperature sensor
ΔT	25.0.K	$+3.93\%/K$	0.10.K	0.39%	LM35C differential
P	101.kPa	$+0.0005\%/Pa$	1.5.kPa	0.80%	MPXH6115A6U air pressure
η	0.340	$+152\%$	0.007	1.03%	anemometer calibration
Re_0	600	-0.011%	60	0.69%	integration lower-bound
D_o	2.81.mm	$-8721\%/m$	500.um	4.36%	tube outer diameter
D_i	1.11.mm	$+12677\%/m$	200.um	2.54%	tube inner diameter
D_g	166.um	$-321\%/m$	750.um	0.24%	tube air gap
L_{wire}	38.0.mm	$+1339\%/m$	500.um	0.67%	wire length
k_{ABS}	179. $\frac{mW}{K \cdot m}$	$+0.181\%/ \frac{mW}{K \cdot m}$	9.0. $\frac{mW}{K \cdot m}$	1.62%	ABS thermal conductivity
d	12.0.mm	$+4681\%/m$	100.um	0.47%	disk diameter
ϵ_{ABS}	0.920	-44.0%	0.010	0.44%	ABS emissivity
ϵ_{wt}	0.900	-44.5%	0.025	1.11%	wind-tunnel emissivity
θ	50.0.m°	$-8.95\%/^\circ$	0.20.°	1.79%	plate angle
				5.99%	combined bias uncertainty
Symbol	Nominal	Sensitivity	Variability	Uncertainty	Component
ω	88.6.r/min	$+0.583\%/(r/min)$	1.1.r/min	0.65%	fan rotation rate
				6.13%	RSS combined uncertainty



$\theta = 0.0^\circ$; $\psi = 173.3^\circ$; $V = 0.379$ m/s (126 r/min)

Estimated measurement uncertainties at $Re = 276$.

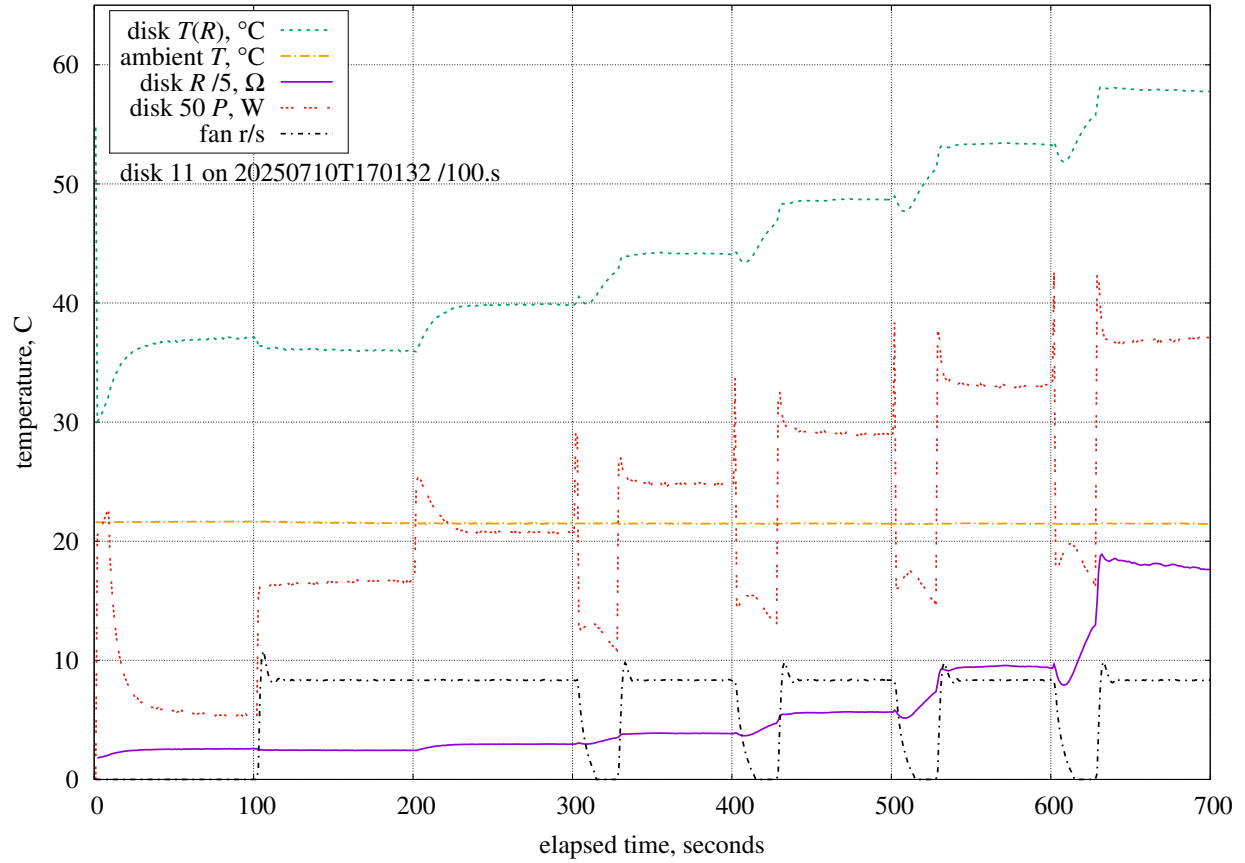
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
T	307.K	$-0.464\%/K$	0.50.K	0.23%	LM35C temperature sensor
ΔT	25.0.K	$+3.92\%/K$	0.10.K	0.39%	LM35C differential
P	101.kPa	$+0.0005\%/Pa$	1.5.kPa	0.77%	MPXH6115A6U air pressure
η	0.340	$+145\%$	0.007	0.99%	anemometer calibration
Re_0	600	-0.011%	60	0.64%	integration lower-bound
D_o	2.81.mm	$-10007\%/m$	500.um	5.00%	tube outer diameter
D_i	1.11.mm	$+14613\%/m$	200.um	2.92%	tube inner diameter
D_g	166.um	$-374\%/m$	750.um	0.28%	tube air gap
L_{wire}	38.0.mm	$+1558\%/m$	500.um	0.78%	wire length
k_{ABS}	179. $\frac{mW}{K \cdot m}$	$+0.190\%/ \frac{mW}{K \cdot m}$	9.0. $\frac{mW}{K \cdot m}$	1.70%	ABS thermal conductivity
d	12.0.mm	$+4755\%/m$	100.um	0.48%	disk diameter
ϵ_{ABS}	0.920	-44.1%	0.010	0.44%	ABS emissivity
ϵ_{wt}	0.900	-44.6%	0.025	1.11%	wind-tunnel emissivity
θ	50.0.m°	$-8.38\%/^\circ$	0.20.°	1.68%	plate angle
				6.62%	combined bias uncertainty
Symbol	Nominal	Sensitivity	Variability	Uncertainty	Component
ω	126.r/min	$+0.391\%/(r/min)$	0.90.r/min	0.35%	fan rotation rate
				6.66%	RSS combined uncertainty



$\theta = 0.0^\circ$; $\psi = 173.3^\circ$; $V = 0.748 \text{ m/s}$ (250 r/min)

Estimated measurement uncertainties at $Re = 546$.

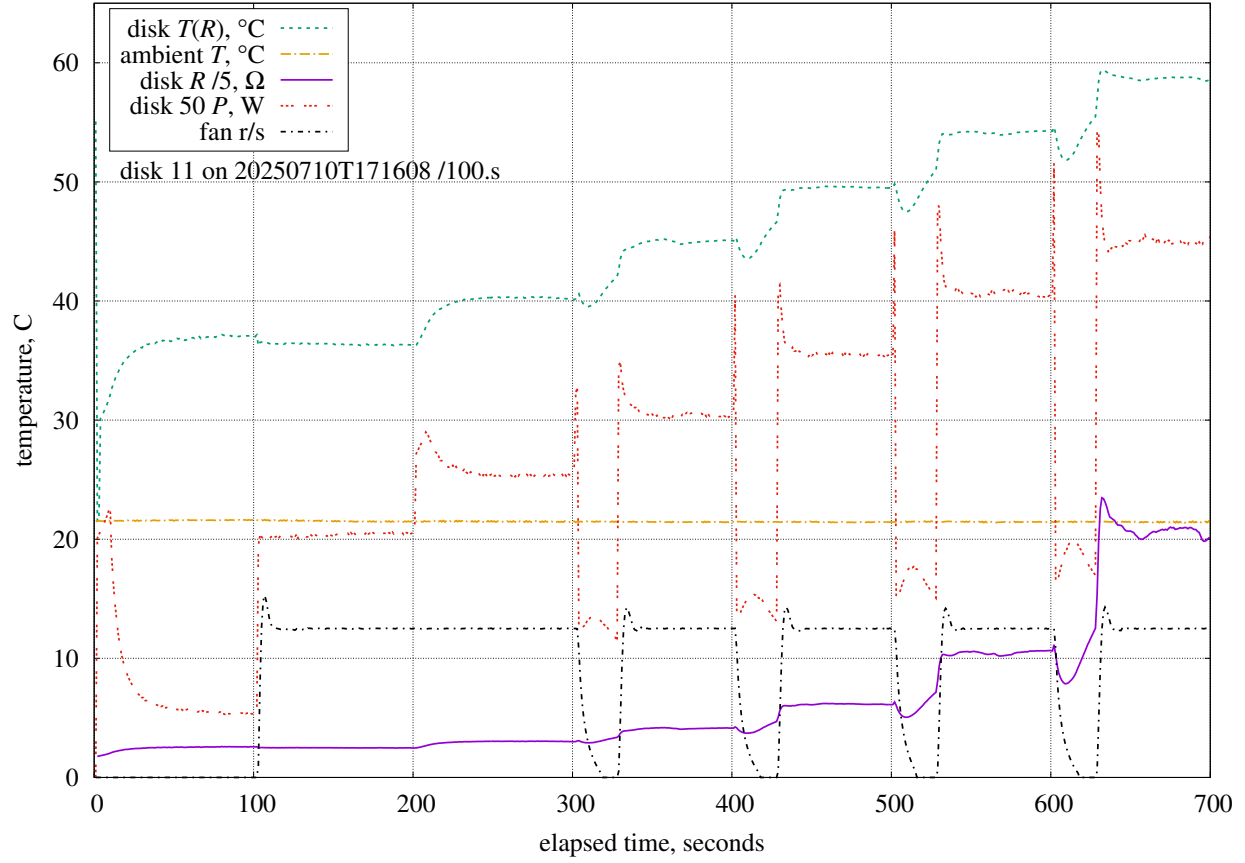
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
T	307.K	$-0.402\%/K$	0.50.K	0.20%	LM35C temperature sensor
ΔT	25.0.K	$+3.91\%/K$	0.10.K	0.39%	LM35C differential
P	101.kPa	$+0.0004\%/Pa$	1.5.kPa	0.67%	MPXH6115A6U air pressure
η	0.340	$+119\%$	0.007	0.81%	anemometer calibration
Re_0	600	-0.0097%	60	0.58%	integration lower-bound
D_o	2.81.mm	$-11523\%/m$	500.um	5.76%	tube outer diameter
D_i	1.11.mm	$+17932\%/m$	200.um	3.59%	tube inner diameter
D_g	166.um	$-481\%/m$	750.um	0.36%	tube air gap
L_{wire}	38.0.mm	$+2005\%/m$	500.um	1.00%	wire length
k_{ABS}	$179. \frac{\text{mW}}{\text{K}\cdot\text{m}}$	$+0.202\%/ \frac{\text{mW}}{\text{K}\cdot\text{m}}$	$9.0. \frac{\text{mW}}{\text{K}\cdot\text{m}}$	1.80%	ABS thermal conductivity
d	12.0.mm	$+5139\%/m$	100.um	0.51%	disk diameter
ϵ_{ABS}	0.920	-37.9%	0.010	0.38%	ABS emissivity
ϵ_{wt}	0.900	-38.4%	0.025	0.96%	wind-tunnel emissivity
θ	$50.0.m^\circ$	$-4.59\%/^\circ$	$0.20.^\circ$	0.92%	plate angle
				7.37%	combined bias uncertainty
Symbol	Nominal	Sensitivity	Variability	Uncertainty	Component
ω	250.r/min	$+0.163\%/(r/min)$	0.99.r/min	0.16%	fan rotation rate
				7.37%	RSS combined uncertainty



$\theta = 0.0^\circ$; $\psi = 173.3^\circ$; $V = 1.467 \text{ m/s}$ (500 r/min)

Estimated measurement uncertainties at $Re = 1070$.

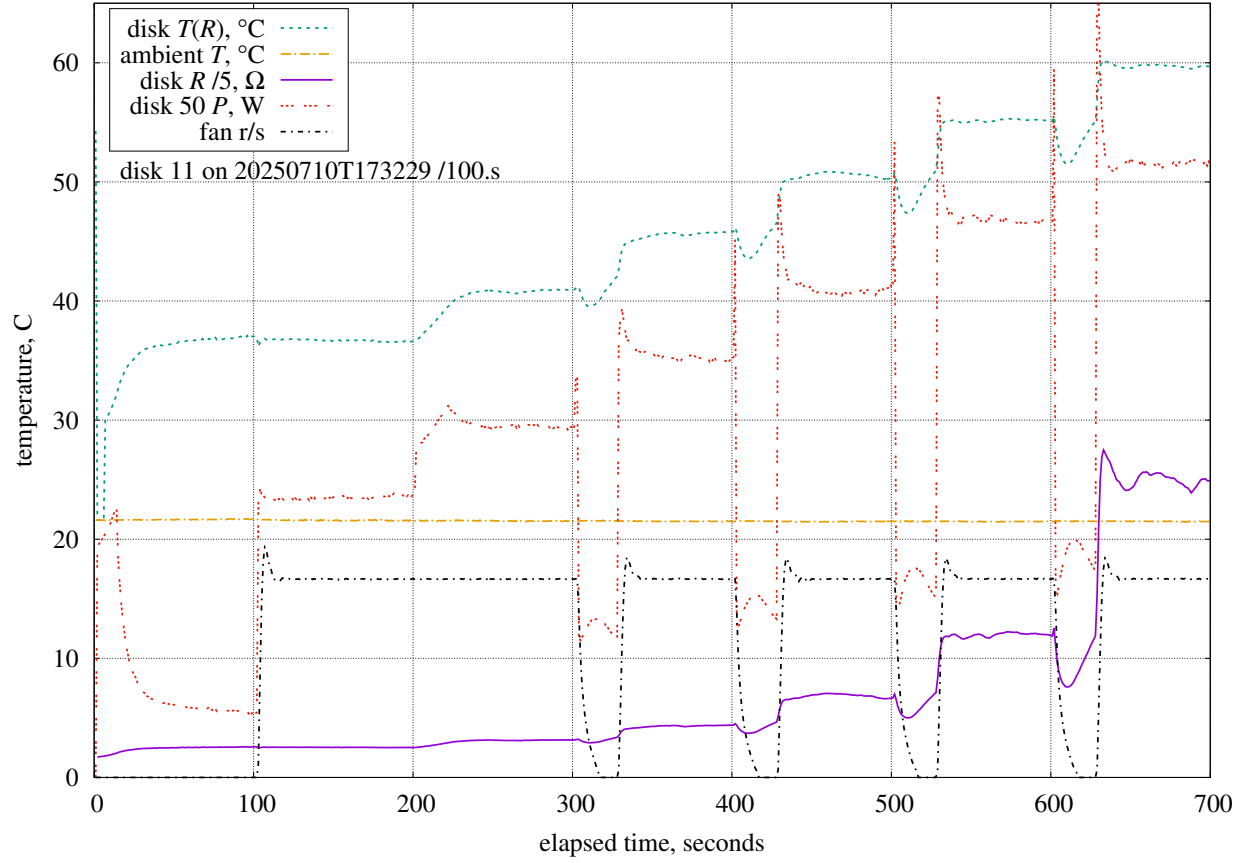
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
T	307.K	$-0.464\%/K$	0.50.K	0.23%	LM35C temperature sensor
ΔT	25.0.K	$+3.73\%/K$	0.10.K	0.37%	LM35C differential
P	101.kPa	$+0.0005\%/Pa$	1.5.kPa	0.71%	MPXH6115A6U air pressure
η	0.340	$+131\%$	0.007	0.89%	anemometer calibration
Re_0	600	-0.012%	60	0.73%	integration lower-bound
D_o	2.81.mm	$-15469\%/m$	500.um	7.73%	tube outer diameter
D_i	1.11.mm	$+22216\%/m$	200.um	4.44%	tube inner diameter
D_g	166.um	$-635\%/m$	750.um	0.48%	tube air gap
L_{wire}	38.0.mm	$+2646\%/m$	500.um	1.32%	wire length
k_{ABS}	179. $\frac{\text{mW}}{\text{K}\cdot\text{m}}$	$+0.224\%/ \frac{\text{mW}}{\text{K}\cdot\text{m}}$	9.0. $\frac{\text{mW}}{\text{K}\cdot\text{m}}$	2.00%	ABS thermal conductivity
d	12.0.mm	$+5289\%/m$	100.um	0.53%	disk diameter
ϵ_{ABS}	0.920	-43.7%	0.010	0.44%	ABS emissivity
ϵ_{wt}	0.900	-44.4%	0.025	1.11%	wind-tunnel emissivity
θ	50.0.m°	$-5.64\%/^\circ$	0.20.°	1.13%	plate angle
				9.52%	combined bias uncertainty
Symbol	Nominal	Sensitivity	Variability	Uncertainty	Component
ω	500.r/min	$+0.089\%/(r/min)$	1.1.r/min	0.10%	fan rotation rate
				9.52%	RSS combined uncertainty



$\theta = 0.0^\circ$; $\psi = 173.3^\circ$; $V = 2.131 \text{ m/s}$ (750 r/min)

Estimated measurement uncertainties at $Re = 1554$.

Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
T	307.K	$-0.461\%/K$	0.50.K	0.23%	LM35C temperature sensor
ΔT	25.0.K	$+3.65\%/K$	0.10.K	0.37%	LM35C differential
P	100.kPa	$+0.0005\%/Pa$	1.5.kPa	0.69%	MPXH6115A6U air pressure
η	0.340	$+120\%$	0.007	0.82%	anemometer calibration
Re_0	600	-0.012%	60	0.74%	integration lower-bound
D_o	2.81.mm	$-16836\%/m$	500.um	8.42%	tube outer diameter
D_i	1.11.mm	$+23681\%/m$	200.um	4.74%	tube inner diameter
D_g	166.um	$-708\%/m$	750.um	0.53%	tube air gap
L_{wire}	38.0.mm	$+2949\%/m$	500.um	1.47%	wire length
k_{ABS}	179. $\frac{\text{mW}}{\text{K}\cdot\text{m}}$	$+0.227\%/ \frac{\text{mW}}{\text{K}\cdot\text{m}}$	9.0. $\frac{\text{mW}}{\text{K}\cdot\text{m}}$	2.03%	ABS thermal conductivity
d	12.0.mm	$+5588\%/m$	100.um	0.56%	disk diameter
ϵ_{ABS}	0.920	-43.4%	0.010	0.43%	ABS emissivity
ϵ_{wt}	0.900	-44.1%	0.025	1.10%	wind-tunnel emissivity
θ	50.0.m°	$-4.88\%/^\circ$	0.20.°	0.98%	plate angle
				10.22%	combined bias uncertainty
Symbol	Nominal	Sensitivity	Variability	Uncertainty	Component
ω	750.r/min	$+0.054\%/(r/min)$	0.84.r/min	0.05%	fan rotation rate
				10.22%	RSS combined uncertainty



$\theta = 0.0^\circ$; $\psi = 173.3^\circ$; $V = 2.725$ m/s (1000 r/min)

Estimated measurement uncertainties at $Re = 1987$.

Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
T	307.K	$-0.461\%/K$	0.50.K	0.23%	LM35C temperature sensor
ΔT	25.0.K	$+3.59\%/K$	0.10.K	0.36%	LM35C differential
P	100.kPa	$+0.0005\%/Pa$	1.5.kPa	0.68%	MPXH6115A6U air pressure
η	0.340	$+108\%$	0.007	0.73%	anemometer calibration
Re_0	600	-0.012%	60	0.72%	integration lower-bound
D_o	2.81.mm	$-17820\%/m$	500.um	8.91%	tube outer diameter
D_i	1.11.mm	$+24499\%/m$	200.um	4.90%	tube inner diameter
D_g	166.um	$-758\%/m$	750.um	0.57%	tube air gap
L_{wire}	38.0.mm	$+3159\%/m$	500.um	1.58%	wire length
k_{ABS}	179. $\frac{mW}{K \cdot m}$	$+0.228\%/ \frac{mW}{K \cdot m}$	9.0. $\frac{mW}{K \cdot m}$	2.04%	ABS thermal conductivity
d	12.0.mm	$+5779\%/m$	100.um	0.58%	disk diameter
ϵ_{ABS}	0.920	-43.6%	0.010	0.44%	ABS emissivity
ϵ_{wt}	0.900	-44.4%	0.025	1.11%	wind-tunnel emissivity
θ	50.0.m°	$-4.43\%/^\circ$	0.20.°	0.89%	plate angle
				10.71%	combined bias uncertainty
Symbol	Nominal	Sensitivity	Variability	Uncertainty	Component
ω	1000.r/min	$+0.037\%/(r/min)$	1.4.r/min	0.05%	fan rotation rate
				10.71%	RSS combined uncertainty