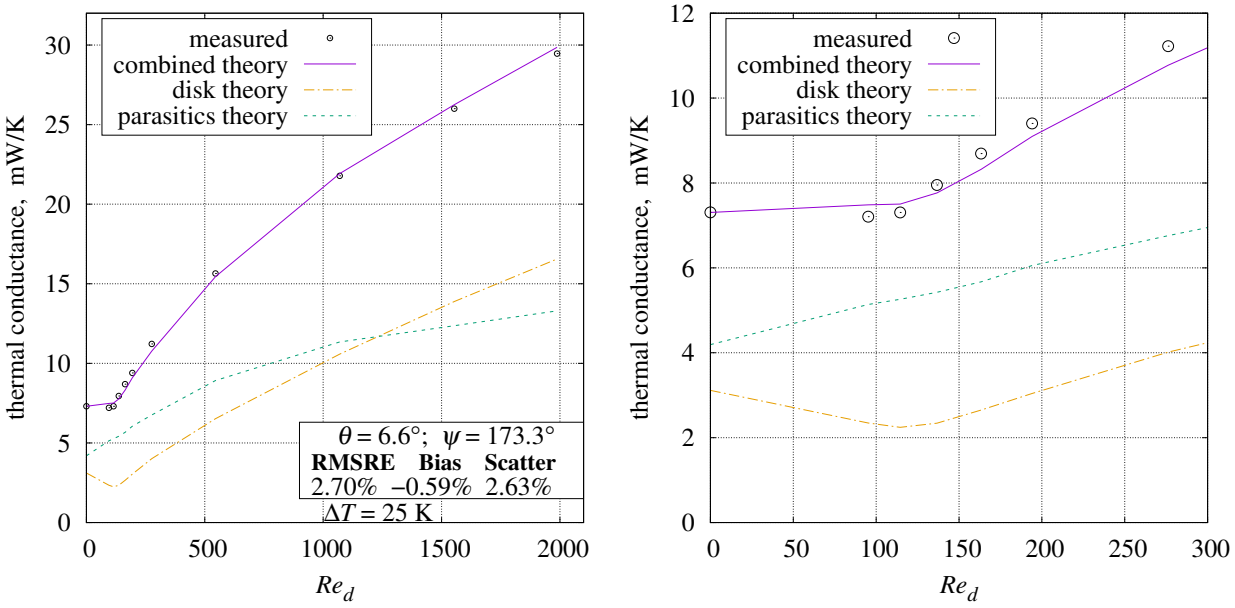
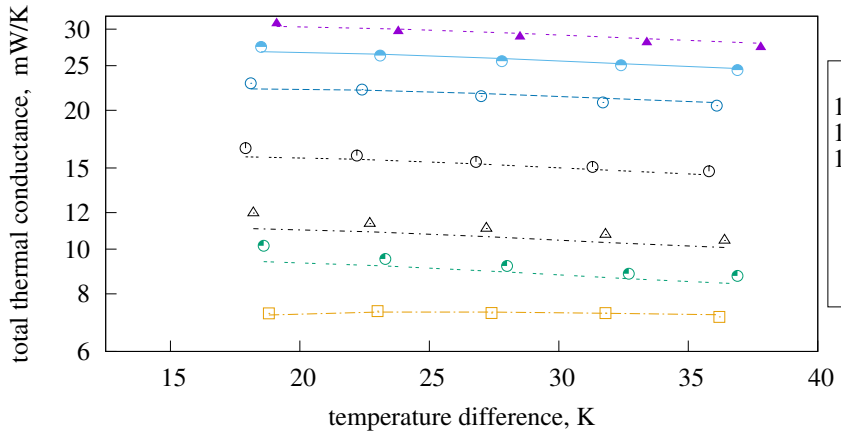
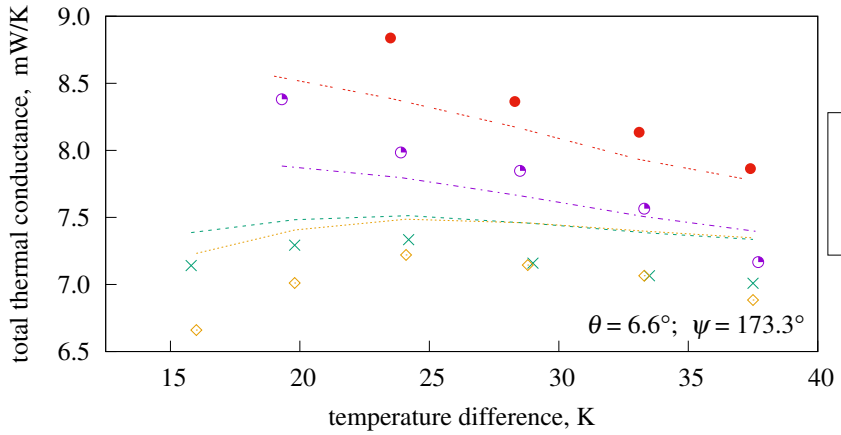
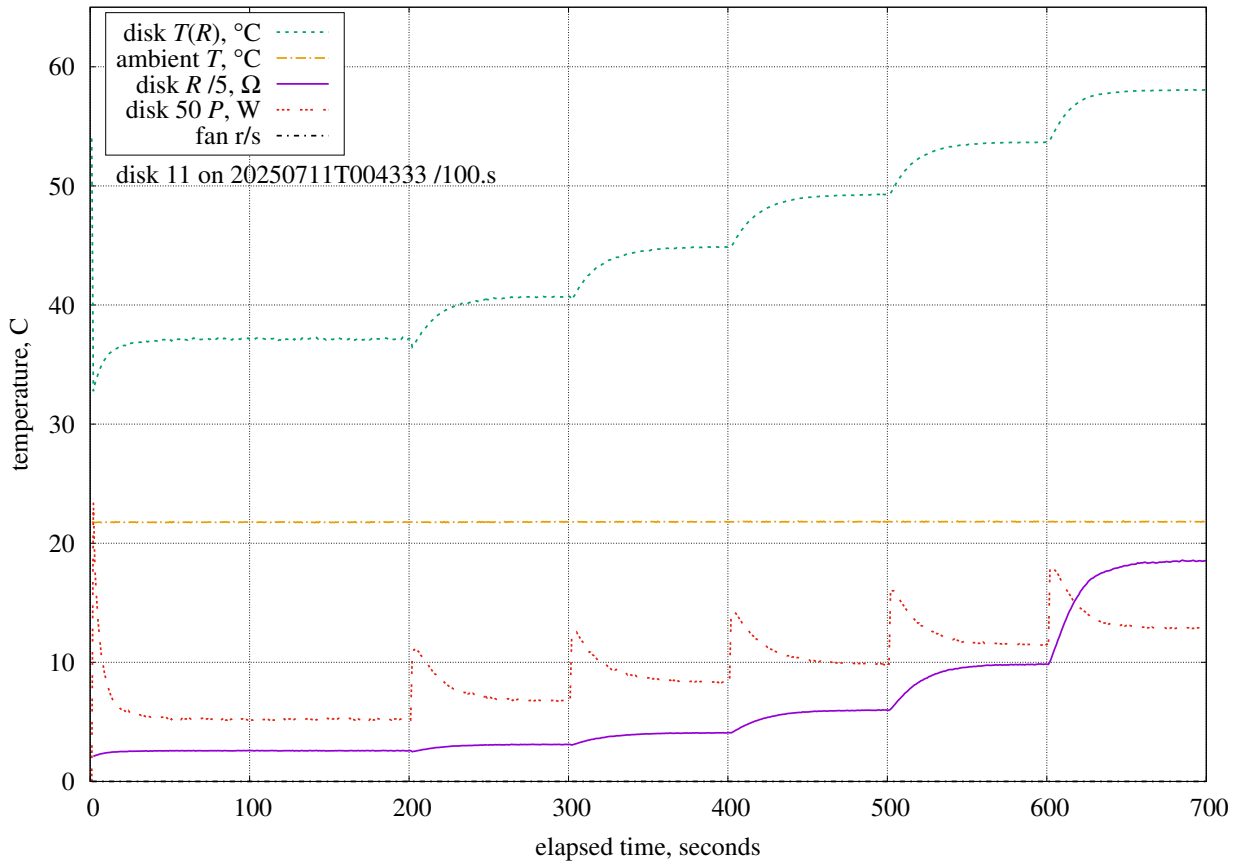




Re_d	RMSRE	Bias	Scatter
1968	1.69%	+1.07%	1.30%
1542	1.35%	+0.23%	1.33%
1063	1.82%	+0.37%	1.78%
543	2.42%	−2.08%	1.24%
275	5.10%	−4.83%	1.65%
192	4.75%	−4.29%	2.06%
0.0	0.69%	+0.03%	0.69%



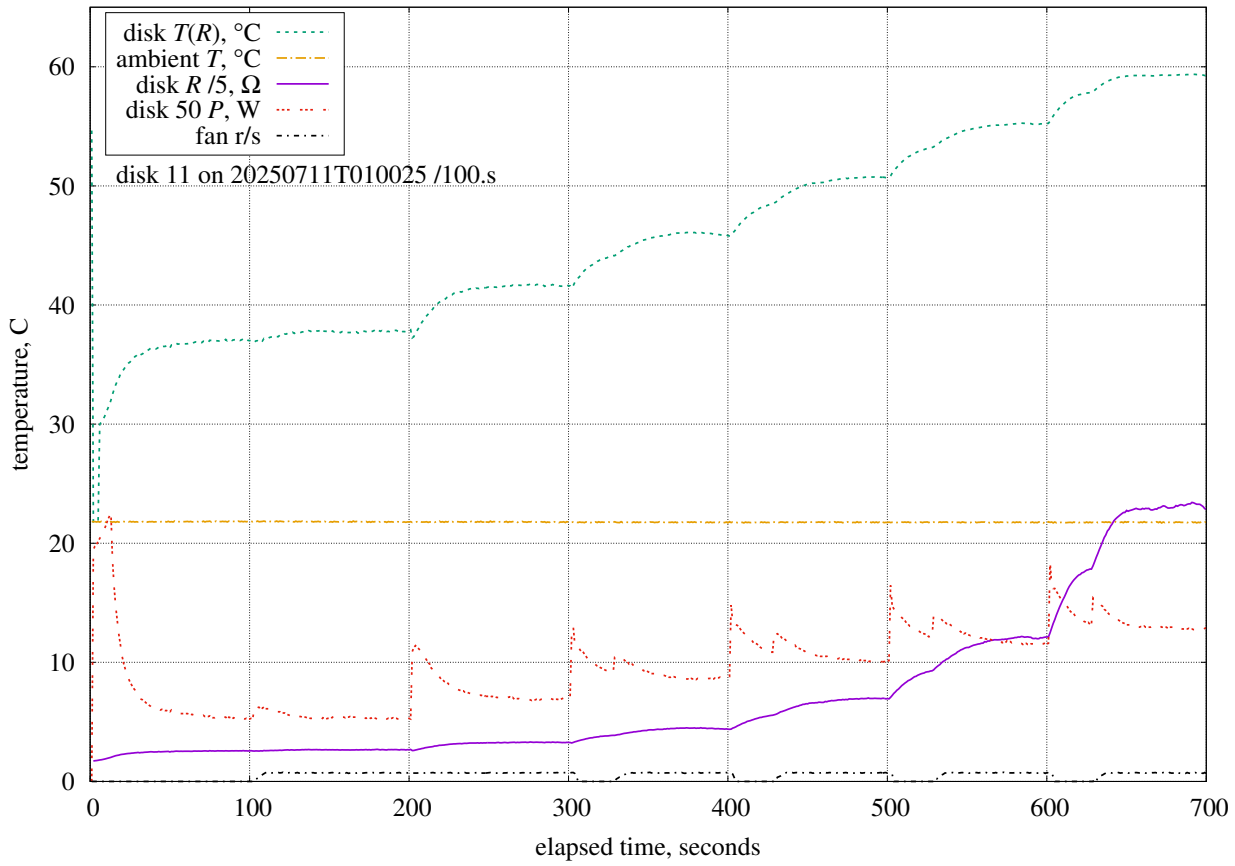
Re_d	RMSRE	Bias	Scatter
162	4.17%	−3.61%	2.09%
135	3.51%	−1.77%	3.03%
114	3.60%	+3.50%	0.82%
95	5.50%	+5.31%	1.45%



$\theta = 6.6°;\ \psi = 173.3°;\ V = 0.000$ **m/s (0 r/min)**

Estimated measurement uncertainties of natural convection at $\theta = 6.7$.

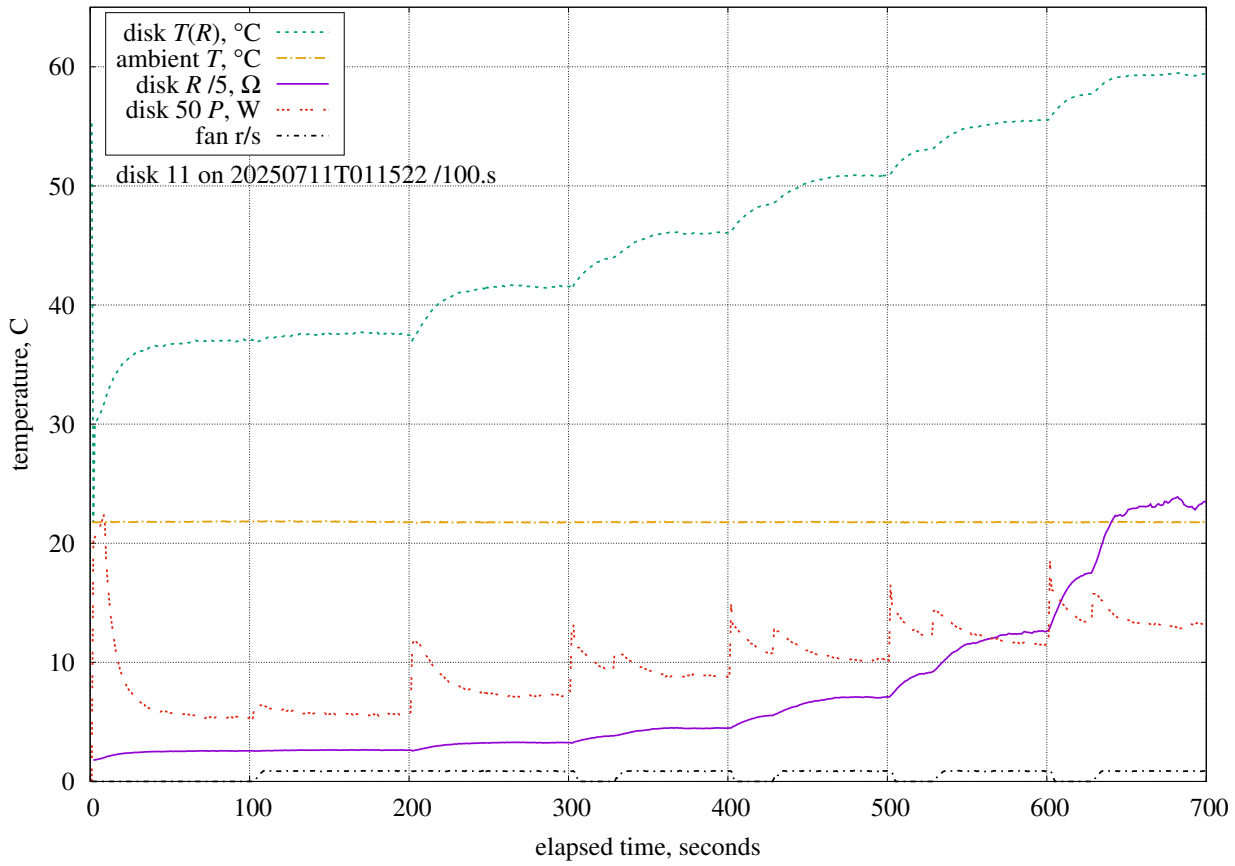
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+4.40%/K	0.10.K	0.44%	LM35C differential
P	101.kPa	+0.0002%/Pa	1.5.kPa	0.28%	MPXH6115A6U air pressure
Re_0	600	+0.0046%	60	0.27%	integration lower-bound
D_o	2.81.mm	+3322%/m	500.um	1.66%	tube outer diameter
D_i	1.11.mm	+5070%/m	200.um	1.01%	tube inner diameter
L_{wire}	38.0.mm	+1035%/m	500.um	0.52%	wire length
k_{ABS}	179.$\frac{\text{mW}}{\text{K·m}}$	+0.127%/$\frac{\text{mW}}{\text{K·m}}$	9.0.$\frac{\text{mW}}{\text{K·m}}$	1.14%	ABS thermal conductivity
d	12.0.mm	+4769%/m	100.um	0.48%	disk diameter
				2.45%	combined bias uncertainty



$\theta = 6.6°;\ \psi = 173.3°;\ V = 0.131$ **m/s (43 r/min)**

Estimated measurement uncertainties at $Re = 95$**.**

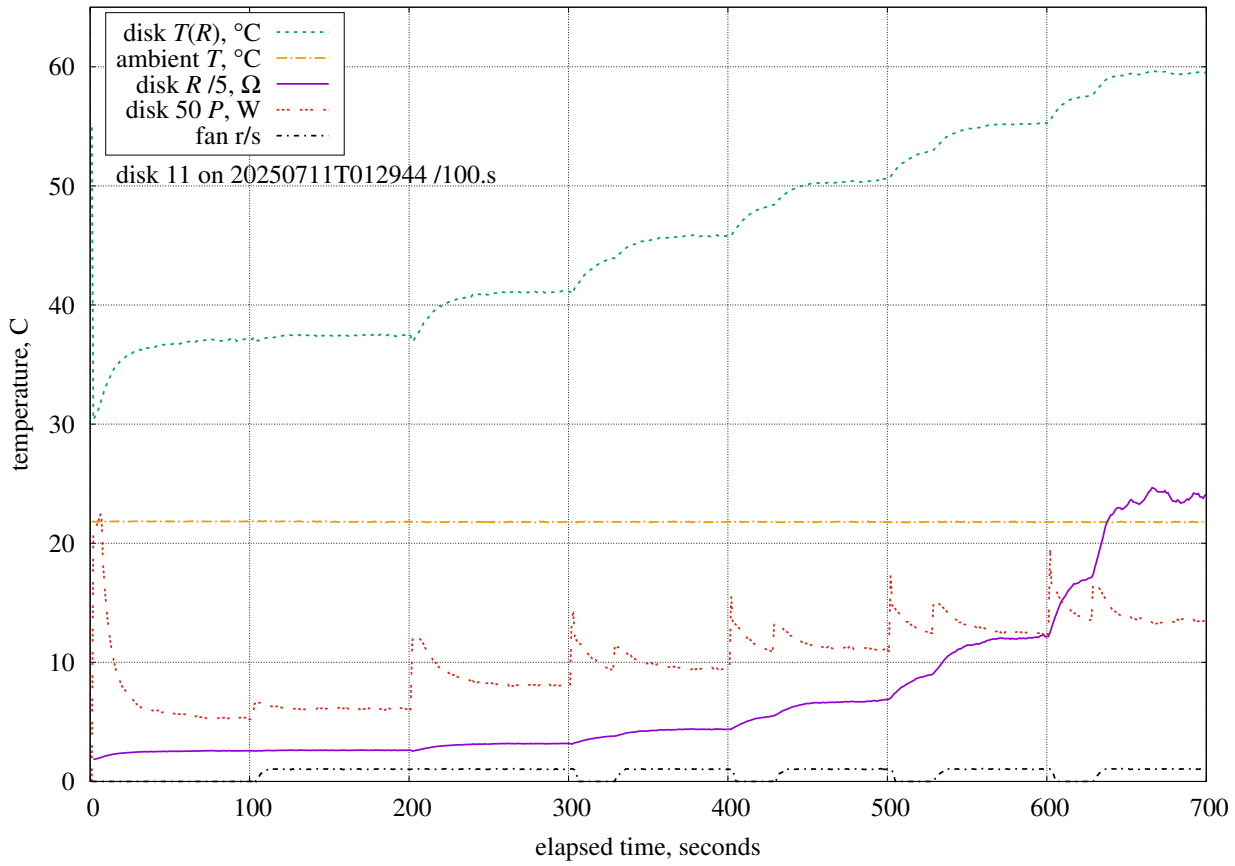
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+4.35%/K	0.10.K	0.44%	LM35C differential
P	101.kPa	+0.0002%/Pa	1.5.kPa	0.23%	MPXH6115A6U air pressure
Re_0	600	+0.0080%	60	0.48%	integration lower-bound
D_o	2.81.mm	+2624%/m	500.um	1.31%	tube outer diameter
D_i	1.11.mm	+5365%/m	200.um	1.07%	tube inner diameter
D_g	166.um	−284%/m	750.um	0.21%	tube air gap
L_{wire}	38.0.mm	+1182%/m	500.um	0.59%	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	+3800%/m	100.um	0.38%	disk diameter
				2.33%	combined bias uncertainty
Symbol	**Nominal**	**Sensitivity**	**Variability**	**Uncertainty**	**Component**
ω	43.4.r/min	−0.015%/(r/min)	1.4.r/min	0.02%	fan rotation rate
				2.33%	RSS combined uncertainty



$\theta = 6.6°;\ \psi = 173.3°;\ V = 0.157$ **m/s (52 r/min)**

Estimated measurement uncertainties at $Re = 114$**.**

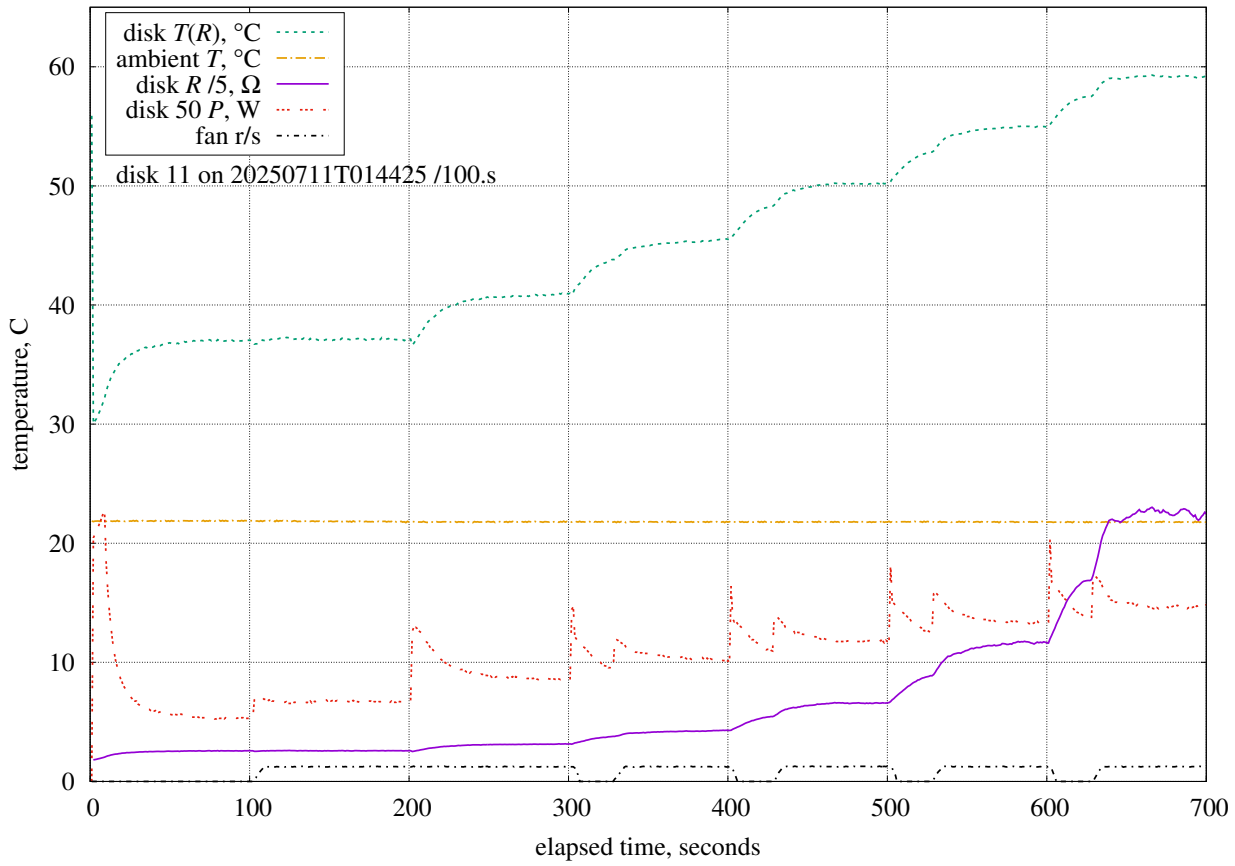
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+4.29%/K	0.10.K	0.43%	LM35C differential
P	101.kPa	+0.0002%/Pa	1.5.kPa	0.27%	MPXH6115A6U air pressure
Re_0	600	+0.0047%	60	0.28%	integration lower-bound
D_o	2.81.mm	+2419%/m	500.um	1.21%	tube outer diameter
D_i	1.11.mm	+5800%/m	200.um	1.16%	tube inner diameter
D_g	166.um	−301%/m	750.um	0.23%	tube air gap
L_{wire}	38.0.mm	+1255%/m	500.um	0.63%	wire length
k_{ABS}	179.$\frac{\text{mW}}{\text{K·m}}$	+0.142%/$\frac{\text{mW}}{\text{K·m}}$	9.0.$\frac{\text{mW}}{\text{K·m}}$	1.27%	ABS thermal conductivity
d	12.0.mm	+3767%/m	100.um	0.38%	disk diameter
				2.32%	combined bias uncertainty
Symbol	**Nominal**	**Sensitivity**	**Variability**	**Uncertainty**	**Component**
ω	52.2.r/min	+0.093%/(r/min)	0.82.r/min	0.08%	fan rotation rate
				2.33%	RSS combined uncertainty



$\theta = 6.6°;\ \psi = 173.3°;\ V = 0.188$ **m/s (62 r/min)**

Estimated measurement uncertainties at $Re = 137$**.**

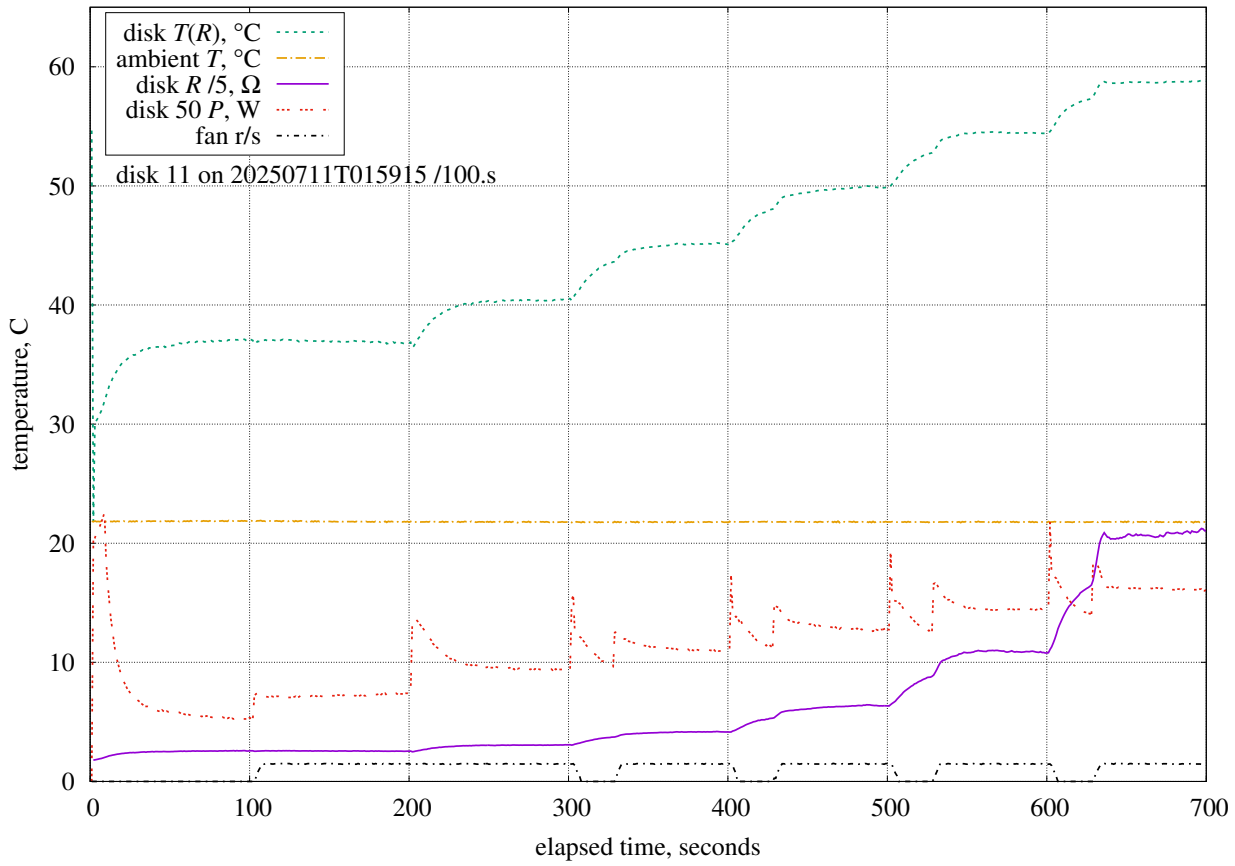
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+4.11%/K	0.10.K	0.41%	LM35C differential
P	101.kPa	+0.0003%/Pa	1.5.kPa	0.45%	MPXH6115A6U air pressure
η	0.340	+75.8%	0.007	0.52%	anemometer calibration
Re_0	600	−0.0086%	60	0.52%	integration lower-bound
C_B	0.541	+2.58%	0.100	0.26%	bypass coefficient
D_o	2.81.mm	+2005%/m	500.um	1.00%	tube outer diameter
D_i	1.11.mm	+6026%/m	200.um	1.21%	tube inner diameter
D_g	166.um	−316%/m	750.um	0.24%	tube air gap
L_{wire}	38.0.mm	+1315%/m	500.um	0.66%	wire length
k_{ABS}	179. $\frac{\text{mW}}{\text{K·m}}$	+0.143%/$\frac{\text{mW}}{\text{K·m}}$	9.0. $\frac{\text{mW}}{\text{K·m}}$	1.28%	ABS thermal conductivity
d	12.0.mm	+4436%/m	100.um	0.44%	disk diameter
				2.41%	combined bias uncertainty
Symbol	**Nominal**	**Sensitivity**	**Variability**	**Uncertainty**	**Component**
ω	62.3.r/min	+0.414%/(r/min)	1.1.r/min	0.44%	fan rotation rate
				2.56%	RSS combined uncertainty



$\theta = 6.6°$; $\psi = 173.3°$; $V = 0.224$ **m/s (74 r/min)**

Estimated measurement uncertainties at $Re = 163$**.**

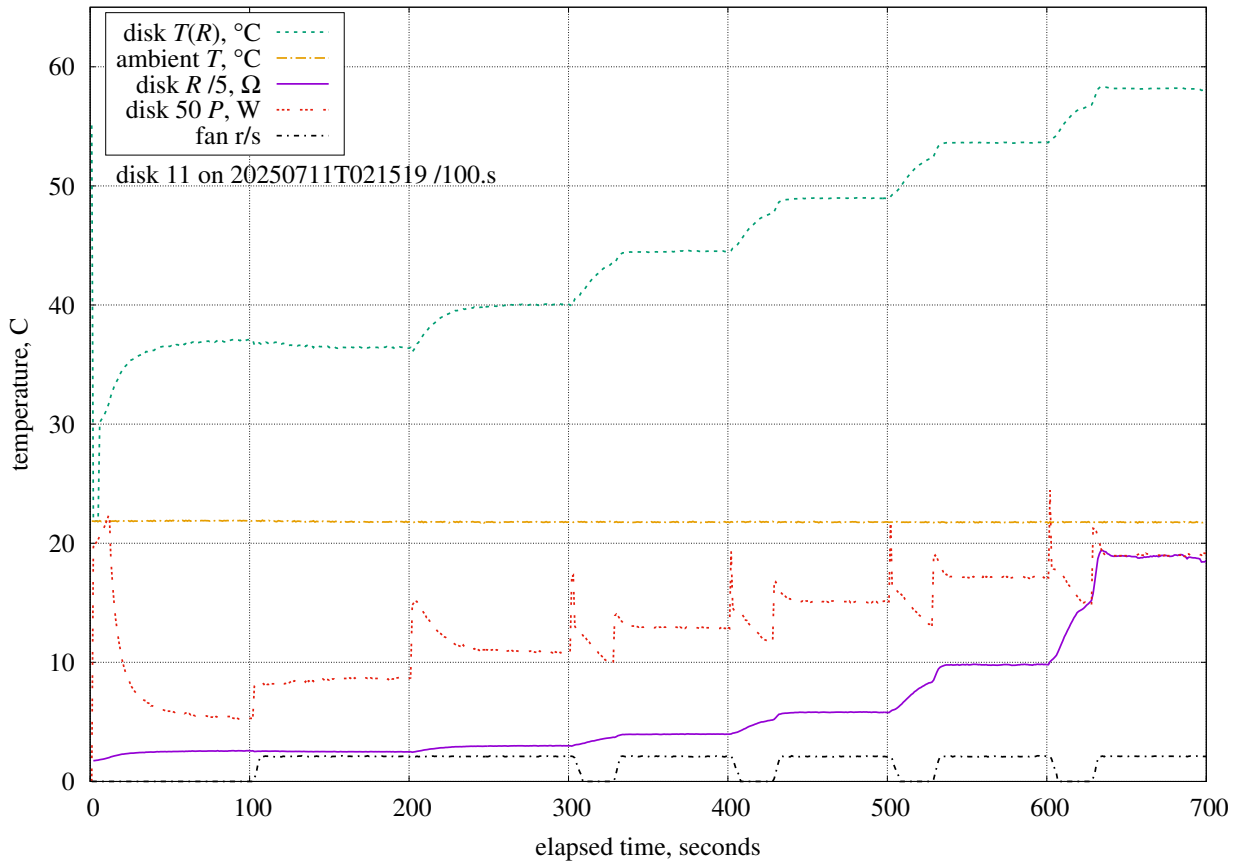
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+3.94%/K	0.10.K	0.39%	LM35C differential
P	101.kPa	+0.0004%/Pa	1.5.kPa	0.59%	MPXH6115A6U air pressure
η	0.340	+129%	0.007	0.87%	anemometer calibration
Re_0	600	−0.012%	60	0.75%	integration lower-bound
C_B	0.541	+5.23%	0.100	0.52%	bypass coefficient
D_o	2.81.mm	+453%/m	500.um	0.23%	tube outer diameter
D_i	1.11.mm	+5817%/m	200.um	1.16%	tube inner diameter
D_g	166.um	−326%/m	750.um	0.24%	tube air gap
L_{wire}	38.0.mm	+1360%/m	500.um	0.68%	wire length
k_{ABS}	179. $\frac{\text{mW}}{\text{K·m}}$	+0.147%/$\frac{\text{mW}}{\text{K·m}}$	9.0. $\frac{\text{mW}}{\text{K·m}}$	1.32%	ABS thermal conductivity
d	12.0.mm	+4952%/m	100.um	0.50%	disk diameter
				2.45%	combined bias uncertainty
Symbol	**Nominal**	**Sensitivity**	**Variability**	**Uncertainty**	**Component**
ω	74.4.r/min	+0.587%/(r/min)	1.0.r/min	0.60%	fan rotation rate
				2.73%	RSS combined uncertainty



$\theta = 6.6°;\ \psi = 173.3°;\ V = 0.267$ **m/s (88 r/min)**

Estimated measurement uncertainties at $Re = 194$**.**

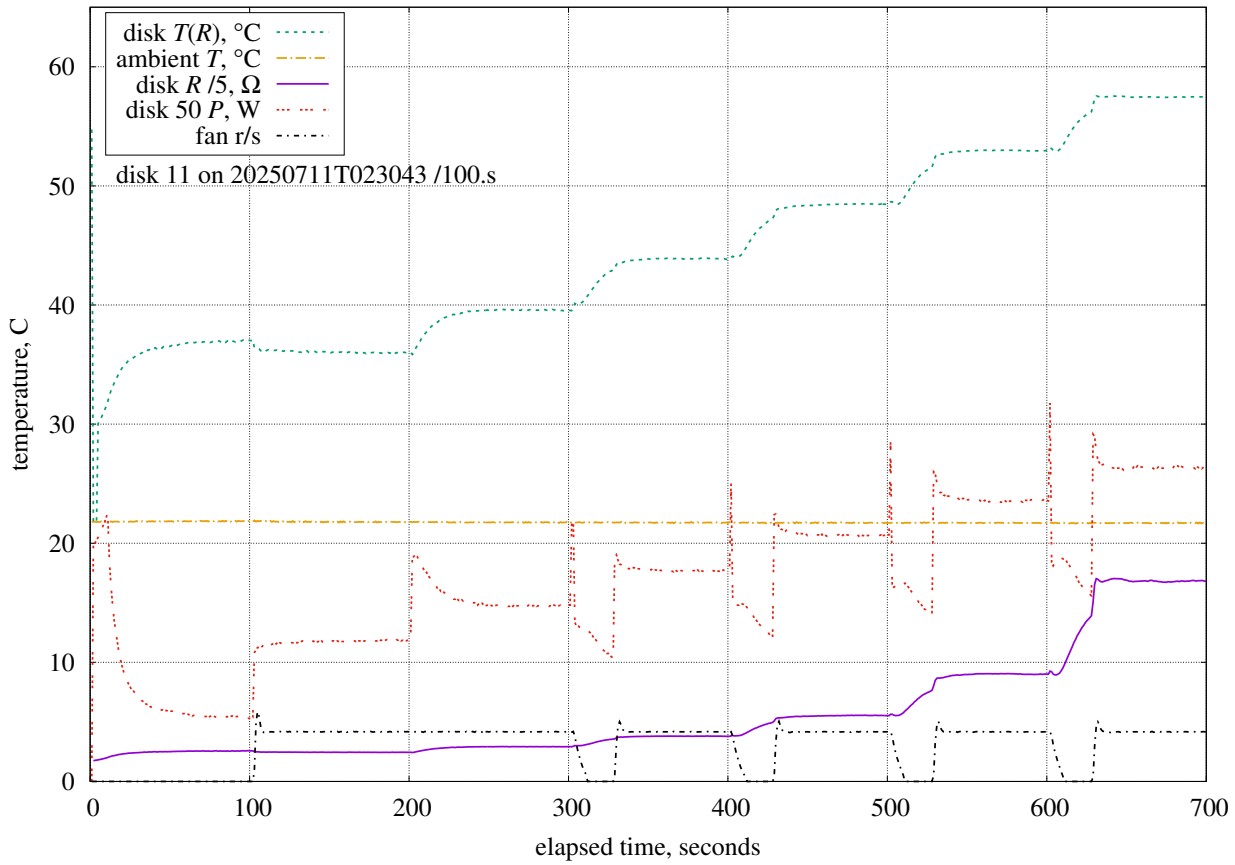
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+3.90%/K	0.10.K	0.39%	LM35C differential
P	101.kPa	+0.0004%/Pa	1.5.kPa	0.64%	MPXH6115A6U air pressure
η	0.340	+144%	0.007	0.98%	anemometer calibration
Re_0	600	−0.013%	60	0.77%	integration lower-bound
C_B	0.541	+6.74%	0.100	0.67%	bypass coefficient
D_o	2.81.mm	−479%/m	500.um	0.24%	tube outer diameter
D_i	1.11.mm	+6116%/m	200.um	1.22%	tube inner diameter
D_g	166.um	−339%/m	750.um	0.25%	tube air gap
L_{wire}	38.0.mm	+1413%/m	500.um	0.71%	wire length
k_{ABS}	179. $\frac{\text{mW}}{\text{K·m}}$	+0.148%/$\frac{\text{mW}}{\text{K·m}}$	9.0. $\frac{\text{mW}}{\text{K·m}}$	1.33%	ABS thermal conductivity
d	12.0.mm	+5261%/m	100.um	0.53%	disk diameter
				2.60%	combined bias uncertainty
Symbol	**Nominal**	**Sensitivity**	**Variability**	**Uncertainty**	**Component**
ω	88.5.r/min	+0.554%/(r/min)	0.84.r/min	0.47%	fan rotation rate
				2.76%	RSS combined uncertainty



$\theta = 6.6°;\ \psi = 173.3°;\ V = 0.379$ **m/s (126 r/min)**

Estimated measurement uncertainties at $Re = 276$**.**

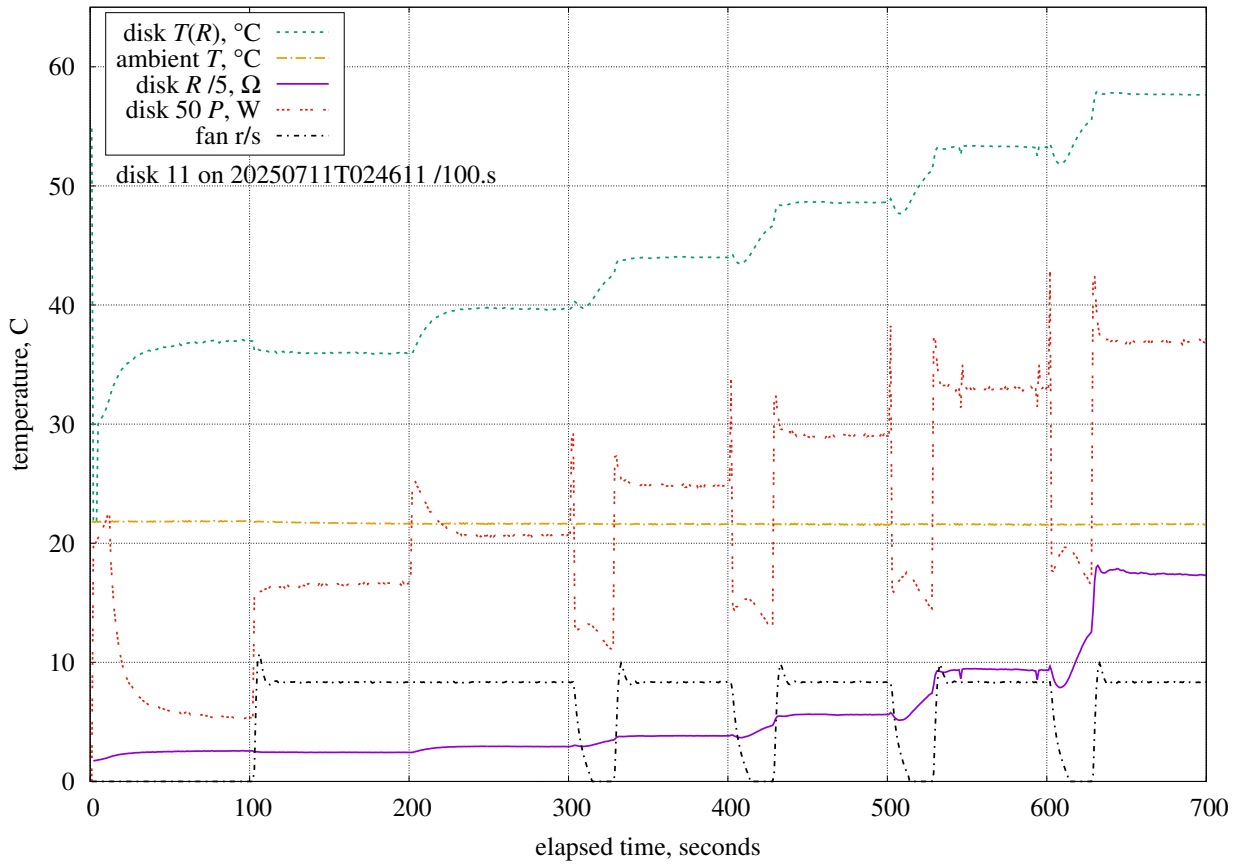
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+3.93%/K	0.10.K	0.39%	LM35C differential
P	101.kPa	+0.0003%/Pa	1.5.kPa	0.43%	MPXH6115A6U air pressure
η	0.340	+99.3%	0.007	0.67%	anemometer calibration
Re_0	600	−0.011%	60	0.69%	integration lower-bound
C_B	0.541	+7.75%	0.100	0.77%	bypass coefficient
D_o	2.81.mm	−6414%/m	500.um	3.21%	tube outer diameter
D_i	1.11.mm	+6657%/m	200.um	1.33%	tube inner diameter
D_g	166.um	−356%/m	750.um	0.27%	tube air gap
L_{wire}	38.0.mm	+1484%/m	500.um	0.74%	wire length
k_{ABS}	179. $\frac{\text{mW}}{\text{K·m}}$	+0.144%/$\frac{\text{mW}}{\text{K·m}}$	9.0. $\frac{\text{mW}}{\text{K·m}}$	1.29%	ABS thermal conductivity
d	12.0.mm	+5756%/m	100.um	0.58%	disk diameter
				4.07%	combined bias uncertainty
Symbol	**Nominal**	**Sensitivity**	**Variability**	**Uncertainty**	**Component**
ω	126.r/min	+0.268%/(r/min)	0.68.r/min	0.18%	fan rotation rate
				4.09%	RSS combined uncertainty



$\theta = 6.6°;\ \psi = 173.3°;\ V = 0.748$ **m/s (250 r/min)**

Estimated measurement uncertainties at $Re = 545$**.**

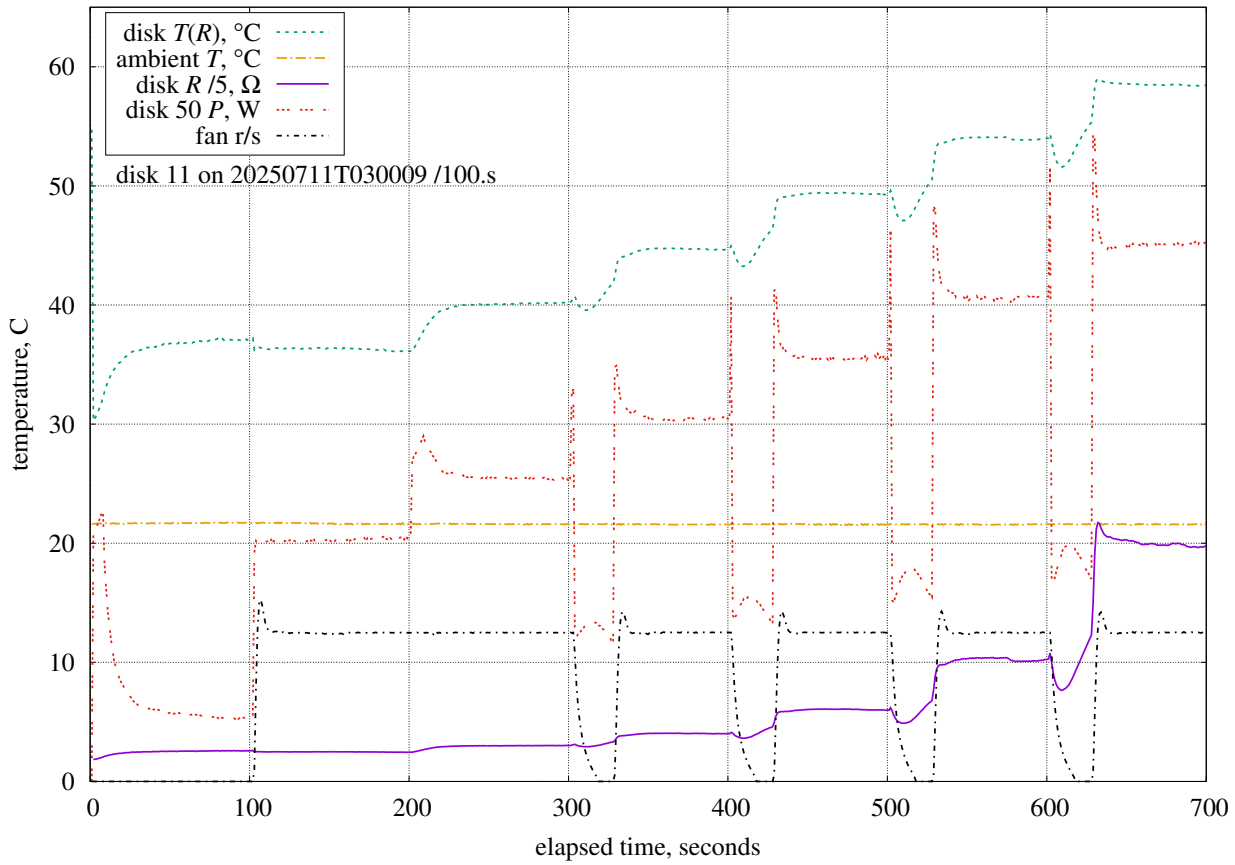
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+3.98%/K	0.10.K	0.40%	LM35C differential
P	101.kPa	+0.0005%/Pa	1.5.kPa	0.82%	MPXH6115A6U air pressure
η	0.340	+168%	0.007	1.14%	anemometer calibration
Re_0	600	−0.0097%	60	0.58%	integration lower-bound
C_B	0.541	+8.58%	0.100	0.86%	bypass coefficient
D_o	2.81.mm	+1691%/m	500.um	0.85%	tube outer diameter
D_i	1.11.mm	+9001%/m	200.um	1.80%	tube inner diameter
D_g	166.um	−424%/m	750.um	0.32%	tube air gap
L_{wire}	38.0.mm	+1768%/m	500.um	0.88%	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	+6292%/m	100.um	0.63%	disk diameter
				3.19%	combined bias uncertainty
Symbol	**Nominal**	**Sensitivity**	**Variability**	**Uncertainty**	**Component**
ω	250.r/min	+0.229%/(r/min)	0.88.r/min	0.20%	fan rotation rate
				3.22%	RSS combined uncertainty



$\theta = 6.6°;\ \psi = 173.3°;\ V = 1.467$ **m/s (500 r/min)**

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

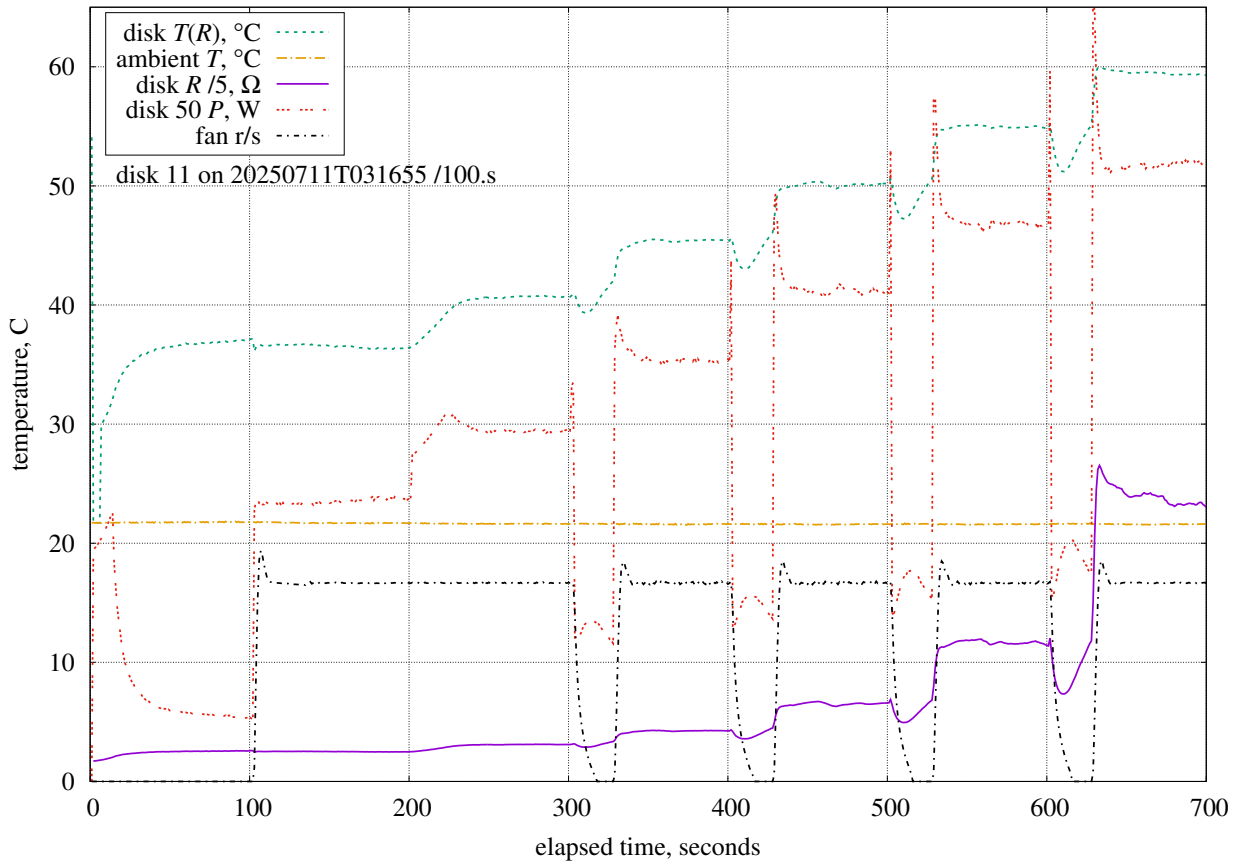
Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+4.04%/K	0.10.K	0.40%	LM35C differential
P	101.kPa	+0.0004%/Pa	1.5.kPa	0.60%	MPXH6115A6U air pressure
η	0.340	+112%	0.007	0.76%	anemometer calibration
Re_0	600	−0.0071%	60	0.43%	integration lower-bound
C_B	0.541	+7.35%	0.100	0.74%	bypass coefficient
D_o	2.81.mm	−4373%/m	500.um	2.19%	tube outer diameter
D_i	1.11.mm	+11372%/m	200.um	2.27%	tube inner diameter
D_g	166.um	−497%/m	750.um	0.37%	tube air gap
L_{wire}	38.0.mm	+2071%/m	500.um	1.04%	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	+6728%/m	100.um	0.67%	disk diameter
				3.91%	combined bias uncertainty
Symbol	**Nominal**	**Sensitivity**	**Variability**	**Uncertainty**	**Component**
ω	500.r/min	+0.076%/(r/min)	1.8.r/min	0.14%	fan rotation rate
				3.92%	RSS combined uncertainty



$\theta = 6.6°;\ \psi = 173.3°;\ V = 2.131$ **m/s (750 r/min)**

Estimated measurement uncertainties at $Re = 1554$**.**

Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+3.96%/K	0.10.K	0.40%	LM35C differential
P	101.kPa	+0.0004%/Pa	1.5.kPa	0.67%	MPXH6115A6U air pressure
η	0.340	+128%	0.007	0.87%	anemometer calibration
Re_0	600	−0.011%	60	0.67%	integration lower-bound
C_B	0.541	+9.77%	0.100	0.98%	bypass coefficient
D_o	2.81.mm	−5046%/m	500.um	2.52%	tube outer diameter
D_i	1.11.mm	+11888%/m	200.um	2.38%	tube inner diameter
D_g	166.um	−516%/m	750.um	0.39%	tube air gap
L_{wire}	38.0.mm	+2152%/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	+7387%/m	100.um	0.74%	disk diameter
				4.29%	combined bias uncertainty
Symbol	**Nominal**	**Sensitivity**	**Variability**	**Uncertainty**	**Component**
ω	750.r/min	+0.058%/(r/min)	2.1.r/min	0.12%	fan rotation rate
				4.29%	RSS combined uncertainty



$\theta = 6.6°;\ \psi = 173.3°;\ V = 2.726$ **m/s (1000 r/min)**

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

Symbol	Nominal	Sensitivity	Bias	Uncertainty	Component
ΔT	25.0.K	+3.97%/K	0.10.K	0.40%	LM35C differential
P	101.kPa	+0.0004%/Pa	1.5.kPa	0.67%	MPXH6115A6U air pressure
η	0.340	+117%	0.007	0.80%	anemometer calibration
Re_0	600	−0.011%	60	0.63%	integration lower-bound
C_B	0.541	+10.1%	0.100	1.01%	bypass coefficient
D_o	2.81.mm	−5274%/m	500.um	2.64%	tube outer diameter
D_i	1.11.mm	+11963%/m	200.um	2.39%	tube inner diameter
D_g	166.um	−522%/m	750.um	0.39%	tube air gap
L_{wire}	38.0.mm	+2174%/m	500.um	1.09%	wire length
k_{ABS}	179.$\frac{\text{mW}}{\text{K·m}}$	+0.142%/$\frac{\text{mW}}{\text{K·m}}$	9.0.$\frac{\text{mW}}{\text{K·m}}$	1.27%	ABS thermal conductivity
d	12.0.mm	+7736%/m	100.um	0.77%	disk diameter
				4.35%	combined bias uncertainty
Symbol	**Nominal**	**Sensitivity**	**Variability**	**Uncertainty**	**Component**
ω	1.00.kr/min	+0.040%/(r/min)	1.6.r/min	0.06%	fan rotation rate
				4.35%	RSS combined uncertainty