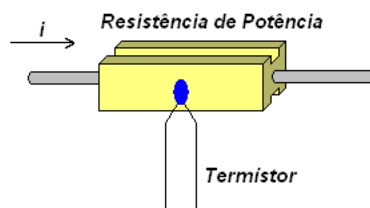


# MEDIÇÃO DA CORRENTE ELÉCTRICA COM TERMÍSTOR

## DESCRIÇÃO DO TRABALHO

Pretende-se medir, de forma indirecta, a corrente eléctrica (DC) que atravessa uma resistência eléctrica. A figura que se segue representa a ideia inicial.



Quando uma corrente eléctrica atravessa uma resistência eléctrica, parte da potência é dissipada sobre a forma de calor. A relação entre a intensidade da corrente eléctrica e o calor gerado é de proporcionalidade. Com este trabalho pretende-se relacionar a temperatura de uma resistência eléctrica com a corrente eléctrica que a atravessa. Para isso um termistor será mecanicamente acoplado a uma resistência de potência conforme se ilustrou anteriormente. O termistor a utilizar será um NTC de 10K. Uma cópia da sua tabela de calibração é anexada a este documento.

## OBJECTIVOS

No decorrer do trabalho o aluno deve:

- Estabelecer a gama de medida do sistema (valor máximo de corrente que se pretende medir). O limite superior dependerá da máxima potência da resistência escolhida.
- Construir o modelo experimental ilustrado na figura anterior assim como o circuito de condicionamento de sinal para o termistor.
- Efectuar um conjunto de ensaios onde regista o valor da corrente eléctrica que atravessa o condutor (utilizando um amperímetro digital) e o valor da tensão à saída do bloco de condicionamento de sinal (utilizando p. ex. um voltímetro digital).
- Utilizando o Excel obtenha uma função que relacione a tensão medida com a corrente eléctrica. Calcule o erro médio e máximo de modelação.
- Utilizando o **LabVIEW**, e a placa de aquisição de dados, desenvolva uma aplicação que apresente o valor da corrente eléctrica que atravessa o condutor.
- Escrever o relatório de acordo com o modelo adoptado.

# GE INFRASTRUCTURE SENSING

# NTC Thermistor Resistance - Temperature Data

GE Thermometrics (UK) Ltd +44 (0) 1823 335200

Customer:

Customer Ref:

Thm Ref: Material F W tolerance

Thermistor resistance calculated from  $R/R_{25} = \exp(A_0 + A1T + A2/T^2 + A3/T^3)$   
(T = Temperature in K = Temperature in C + 273.15)

Data outside 0°C to 70°C for guidance

RV T Coefficients		Reference Point		Resistance		Resistance		Resistance		Resistance		Alpha		B nominal	
ID	Material F	Temperature °C	Resistance ohm	Resistance ohm	Tolerance -%	Tolerance +%	Tolerance +%	Tolerance +%	Tolerance +%	Tolerance +%	Tolerance +%	Tolerance +%	°C / %	°C / %	K
Temp min °C	-40	25	10000	10000											
Temp max °C	105	0.88													
B tolerance ±%	0.3														
Temperature	R / R25	R nominal	R minimum	R maximum	Resistance Tolerance -%	Resistance Tolerance +%	Resistance Tolerance +%	Resistance Tolerance +%	Resistance Tolerance +%	Resistance Tolerance +%	Resistance Tolerance +%	Resistance Tolerance +%	Alpha °C / %	Alpha °C / %	B nominal K
°C		ohm	ohm	ohm											
-40	33.7240	337240.06	331463.23	343081.70	-1.71	1.73	0.26	-0.26	-6.64	3763					
-39	31.5632	315631.84	310286.79	321035.41	-1.69	1.71	0.26	-0.26	-6.60	3765					
-38	29.5541	295540.64	290593.15	300540.94	-1.67	1.69	0.26	-0.26	-6.55	3768					
-37	27.6851	276851.39	272270.13	281480.32	-1.65	1.67	0.25	-0.26	-6.51	3771					
-36	25.9458	259458.38	255214.60	263745.16	-1.64	1.65	0.25	-0.26	-6.47	3774					
-35	24.3264	243264.41	239331.77	247235.81	-1.62	1.63	0.25	-0.25	-6.42	3777					
-34	22.8180	228180.07	224534.40	231860.69	-1.60	1.61	0.25	-0.25	-6.38	3780					
-33	21.4123	214123.10	210742.22	217536.48	-1.58	1.59	0.25	-0.25	-6.34	3782					
-32	20.1018	201017.77	197891.31	204182.60	-1.56	1.57	0.24	-0.24	-6.30	3785					
-31	18.8794	188794.32	185883.55	191370.61	-1.54	1.56	0.25	-0.25	-6.25	3788					
-30	17.7388	177388.46	174866.20	180113.68	-1.52	1.54	0.25	-0.25	-6.21	3791					
-29	16.6741	166740.93	164231.37	168271.14	-1.51	1.52	0.24	-0.25	-6.17	3793					
-28	15.6789	156787.88	154465.67	157147.00	-1.49	1.50	0.24	-0.24	-6.13	3796					
-27	14.7506	147506.48	145339.85	146969.87	-1.47	1.48	0.24	-0.24	-6.09	3798					
-26	13.8823	138822.57	136808.39	140851.69	-1.45	1.46	0.24	-0.24	-6.05	3801					
-25	13.0702	130702.36	128629.29	132585.81	-1.43	1.44	0.24	-0.24	-6.01	3803					
-24	12.3106	123106.12	121363.70	124940.50	-1.42	1.43	0.24	-0.24	-5.97	3806					
-23	11.5997	115997.13	114375.74	117629.20	-1.40	1.41	0.24	-0.24	-5.93	3808					
-22	10.9341	109341.43	107832.19	110860.21	-1.38	1.39	0.23	-0.24	-5.89	3811					
-21	10.3108	103107.61	101702.32	104521.39	-1.36	1.37	0.23	-0.23	-5.85	3813					
-20	9.7267	97266.60	95957.71	98583.04	-1.35	1.35	0.23	-0.23	-5.81	3816					
-19	9.1791	91791.47	90572.00	93017.64	-1.33	1.34	0.23	-0.23	-5.77	3818					
-18	8.6657	86657.29	85520.79	87799.71	-1.31	1.32	0.23	-0.23	-5.74	3820					
-17	8.1841	81840.95	80781.47	82905.65	-1.29	1.30	0.23	-0.23	-5.70	3823					
-16	7.7321	77321.01	76333.06	78310.93	-1.28	1.28	0.22	-0.22	-5.67	3825					
-15	7.3078	73077.63	72156.11	74003.18	-1.26	1.27	0.22	-0.22	-5.63	3827					
-14	6.9092	69092.35	68232.56	69955.65	-1.24	1.25	0.22	-0.22	-5.59	3829					
-13	6.5348	65348.06	64454.86	66153.53	-1.23	1.23	0.22	-0.22	-5.55	3832					
-12	6.1829	61829.83	61079.83	62694.93	-1.22	1.22	0.22	-0.22	-5.52	3834					
-11	5.8520	58520.04	57820.22	59221.74	-1.20	1.20	0.22	-0.22	-5.48	3836					
-10	5.5408	55407.83	54754.58	56063.01	-1.18	1.18	0.22	-0.22	-5.45	3838					
-9	5.2479	52479.49	51869.21	53091.39	-1.16	1.17	0.21	-0.22	-5.41	3840					
-8	4.9723	49723.15	49152.88	50298.78	-1.15	1.15	0.21	-0.22	-5.38	3842					
-7	4.7128	47127.79	46594.78	47661.91	-1.13	1.13	0.21	-0.21	-5.34	3844					
-6	4.4683	44683.13	44184.82	45182.32	-1.12	1.12	0.21	-0.21	-5.31	3846					
-5	4.2380	42379.60	41913.54	42846.26	-1.10	1.10	0.21	-0.21	-5.28	3848					
-4	4.0203	40203.30	39772.49	40444.43	-1.08	1.08	0.21	-0.21	-5.25	3850					
-3	3.8161	38160.92	37753.22	38568.99	-1.07	1.07	0.21	-0.21	-5.21	3852					
-2	3.6230	36229.73	35848.24	36611.44	-1.05	1.05	0.20	-0.20	-5.18	3854					
-1	3.4407	34407.50	34050.48	34784.63	-1.04	1.04	0.20	-0.20	-5.14	3856					
0	3.2688	32687.51	32033.31	33021.71	-1.02	1.02	0.2	-0.2	-5.10	3858					
1	3.1063	31063.47	30685.60	31443.57	-1.22	1.22	0.2	-0.2	-5.08	3860					
2	2.9530	29529.53	29174.74	29886.31	-1.20	1.21	0.2	-0.2	-5.05	3862					
3	2.8080	28080.19	27747.00	28415.17	-1.19	1.19	0.2	-0.2	-5.02	3864					
4	2.6710	26710.34	26397.37	27024.93	-1.17	1.18	0.2	-0.2	-4.99	3866					
5	2.5415	25415.21	25121.16	25710.71	-1.16	1.16	0.2	-0.2	-4.95	3868					
6	2.4190	24190.32	23911.99	24467.95	-1.14	1.15	0.2	-0.2	-4.92	3870					
7	2.3031	23031.49	22777.74	23292.39	-1.13	1.13	0.2	-0.2	-4.89	3871					
8	2.1935	21935.60	21694.60	22180.03	-1.11	1.12	0.2	-0.2	-4.86	3873					
9	2.0897	20896.61	20666.97	21127.16	-1.10	1.10	0.2	-0.2	-4.83	3875					
10	1.9913	19913.47	19697.49	20130.26	-1.08	1.09	0.2	-0.2	-4.80	3877					
11	1.8982	18982.19	18779.00	19186.08	-1.07	1.07	0.2	-0.2	-4.77	3878					
12	1.8107	18107.75	18008.57	18291.56	-1.06	1.06	0.2	-0.2	-4.75	3880					
13	1.7283	17283.34	17083.41	17443.80	-1.04	1.05	0.2	-0.2	-4.72	3882					
14	1.6470	16470.31	16300.95	16640.14	-1.03	1.03	0.2	-0.2	-4.69	3884					
15	1.5718	15718.20	15558.76	15870.05	-1.01	1.02	0.2	-0.2	-4.66	3885					
16	1.5025	15025.15	14854.54	15155.15	-1.00	1.00	0.2	-0.2	-4.63	3887					
17	1.4328	14327.55	14186.16	14469.24	-0.99	0.99	0.2	-0.2	-4.60	3889					
18	1.3685	13684.80	13551.61	13818.22	-0.97	0.97	0.2	-0.2	-4.58	3890					
19	1.3074	13074.48	12949.00	13200.15	-0.96	0.96	0.2	-0.2	-4.55	3892					
20	1.2495	12494.79	12376.57	12613.17	-0.95	0.95	0.2	-0.2	-4.52	3893					
21	1.1944	11944.05	11832.64	12055.58	-0.93	0.93	0.2	-0.2	-4.49	3895					
22	1.1421	11420.65	11315.64	11522.75	-0.92	0.92	0.2	-0.2	-4.47	3897					
23	1.0923	10923.11	10824.11	11025.15	-0.91	0.91	0.2	-0.2	-4.44	3898					
24	1.0450	10450.67	10356.67	10543.38	-0.89	0.89	0.2	-0.2	-4.41	3900					
25	1.0000	10000.00	9912.00	10088.00	-0.88	0.88	0.2	-0.2	-4.39	3901					
26	0.9572	9571.87	9486.39	9657.37	-0.89	0.89	0.2	-0.2	-4.36	3903					
27	0.9164	9164.44	9081.41	9247.50	-0.91	0.91	0.2	-0.2	-4.34	3904					
28	0.8777	8776.59	8696.95	8857.29	-0.92	0.92	0.2	-0.2	-4.32	3905					
29	0.8407	8407.29	8328.97	8485.69	-0.93	0.93	0.2	-0.2	-4.29	3907					
30	0.8056	8055.56	7979.49	8131.72	-0.94	0.95	0.2	-0.2	-4.26	3909					
31	0.7720	7720.46	7646.59	7794.45	-0.95	0.95	0.2	-0.2	-4.24	3910					
32	0.7401	7401.14	7329.39	7473.02	-0.97	0.97	0.2	-0.2	-4.21	3912					
33	0.7097	7096.77	7027.09	7166.59	-0.98	0.98	0.2	-0.2	-4.19	3913					
34	0.6807	6806.58	6738.90	6874.40	-0.99	1.00	0.2	-0.2	-4.16	3914					
35	0.6530	6529.82	6464.09	6595.71	-1.01	1.01	0.2	-0.2	-4.14	3916					
36	0.6266	6265.82	6201.98	6329.83	-1.02	1.02	0.2	-0.2	-4.12	3917					
37	0.6014	6013.93	5951.92	6078.11	-1.03	1.03	0.2	-0.2	-4.09	3919					
38	0.5774	5773.52	5713.29	5833.93	-1.04	1.05	0.2	-0.2	-4.07	3920					
39	0.5544	5544.02	5485.51	5602.71	-1.06	1.06	0.2	-0.2	-4.04	3921					
40	0.5325	5324.04	5368.04	5381.90	-1.07	1.07	0.2	-0.2	-4.02	3922					
41	0.5116	5115.57	5060.36	5170.97	-1.08	1.08	0.2	-0.2	-4.00	3924					
42	0.4916	4915.61	4861.98	4969.44	-1.09	1.10	0.2	-0.2	-3.98	3925					
43	0.4725	4724.54	4672.44	4776.85	-1.10	1.11	0.2	-0.2	-3.95	3927					
44	0.4542	4542.30	4491.30	4592.74	-1.11	1.12	0.2	-0.2	-3.93	3928					
45	0.4367	4367.32	4318.14	4416.72	-1.13	1.13	0.2	-0.2	-3.91	3929					
46	0.4200	4200.37	4152.58	4248.37	-1.14	1.14	0.2	-0.2	-3.89	3930					
47	0.4041	4040.68	3994.25	4087.34	-1.15	1.15	0.2	-0.2	-3.87	3931					
48	0.3888	3888.97	3842.79	3833.26	-1.16	1.17	0.2	-0.2	-3.84	3933					
49	0.3742	3741.73	3697.88	3785.80	-1.17	1.18	0.2	-0.2	-3.82	3934					
50	0.3602	3601.81	3559.19	3644.65	-1.18	1.19	0.2	-0.2	-3.80	3935					
51	0.3469	3467.86	3426.44	3505.01	-1.19	1.20	0.2	-0.2	-3.78	3936					
52	0.3340	3339.59	3299.33	3380.09	-1.21	1.21	0.2	-0.2	-3.76	3938					
53	0.3217	3216.75	3177.61	3256.11	-1.22	1.22	0.2	-0.2	-3.74	3939					
54	0.3099	3099.06	3061.01	3132.14	-1.23	1.24	0.2	-0.2	-3.72	3940					
55	0.2986	2986.29	2948.30	3020.51	-1.24	1.25	0.2	-0.2	-3.70	3941					
56	0.2879	2878.21	2842.25	2914.11	-1.25	1.26	0.2	-0.2	-3.68	3943					
57	0.2775	2774.61	273												