ASAIR®

Analog Temperature & Humidity Module

CM2011 User Manual

1. Dimensions

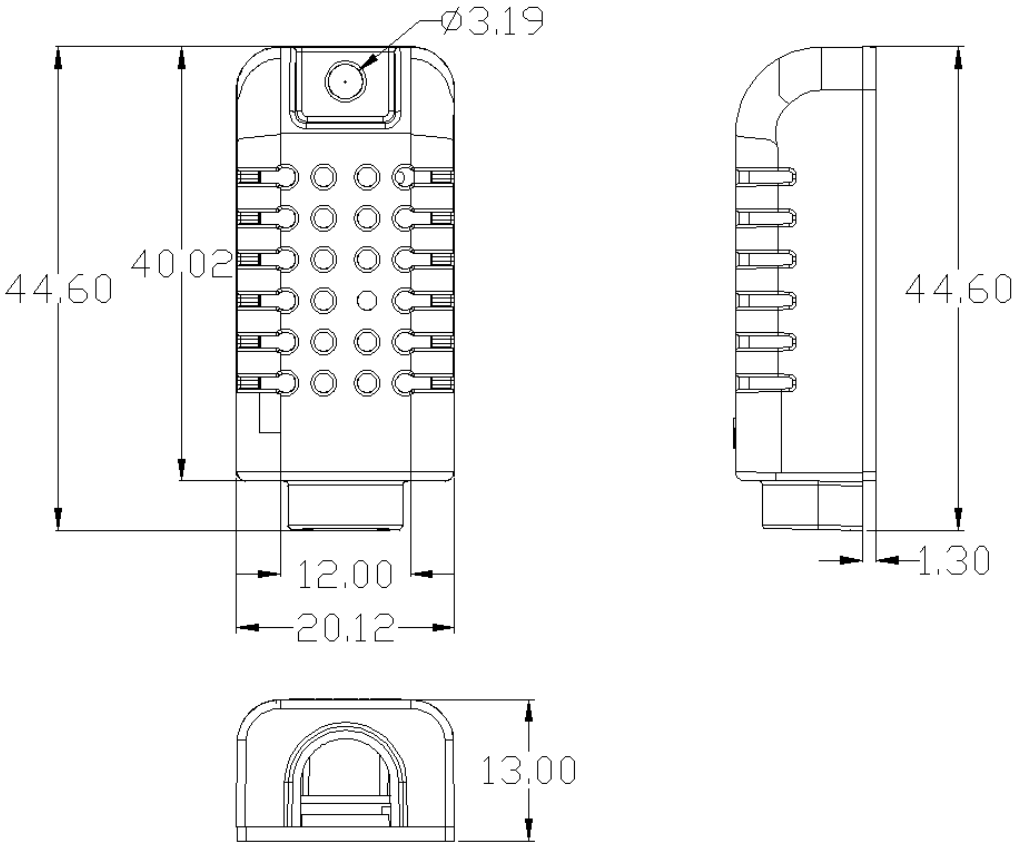


Figure 1 Dimension (Units: mm)

2. Sensor Performance

2.1 Relative Humidity(RH%)

Parameter	Condition	min	typ.	max	units
Resolution			0.1		%RH
Measuring range		0		99.9	%RH
Accuracy[1]	25℃		±3		%RH
Repeat-ability			±0.1		%RH
Interchangeability				Completely interchangeable	
Response time[2]	1/e(63%)		<5		Sec
Hysteresis			±0.3		%RH
Drift[3]	Typical		<0.5		%RH/yr

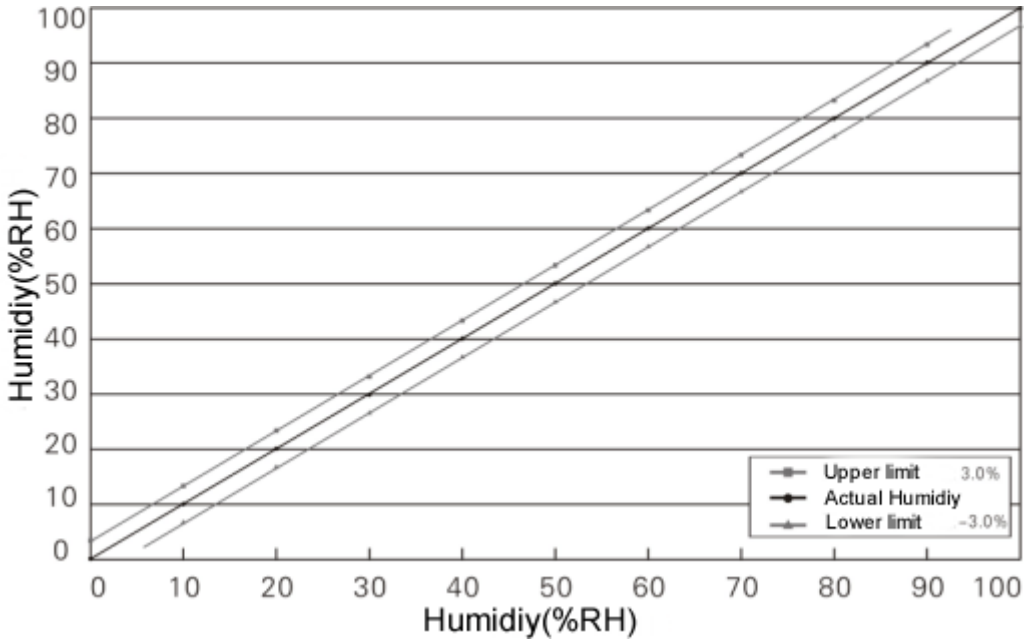


Figure 2 Typical RH% Accuracy at 25℃

Note:

1 *Accuracy measured at 25 ℃, 5.0V.*

2 Measured at 25 ℃,1m/sec airflow for achieving 63% of time.

3 In volatile organic compounds, values may be higher.

2.2 Temperature

Specifications	Rated zero power resistance(R25)	B（K）	Dissipation factor （mw/℃）	Thermal time constant（S）	Rated power （mw）	Measuring range（℃）
CN0603R103B3435FT	10KΩ	3435	≥2.5	≤18	150	-40~80

3. Electrical Specifications

Electrical specification, such as energy consumption, input, output voltage, etc., depend on the power supply. Table 1illustrates the electrical specification of the sensor in detail. If not indicated, the power supply voltage is 5V. To get the best results from the sensor, please design it in strict accordance with the conditions of table below.

Table 1 CM2011 Sensor Direct-Current Characteristic

Parameter	Condition	min	typ	max	units
Supply Voltage		3.3	5	5.5	V
output voltage range		0		3	V
Power consumption	measuring		1.5		mA
Humidity sampling period		2.5			S
Temperature applicable range		0		80	℃
Temperature measuring range	NTC 10K	-40		80	℃
Output Temperature	NTC 10K	-	-	-	-

3.1 Standard humidity output voltage(no debug) (Condition: at 25℃,Vin=5.0V) Unit: V

Table 2 Standard humidity output voltage table

Relative humidity (%RH)	0	10	20	30	40	50	60	70	80	90	100
Output Voltage(V)	0	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0

Full range temperature compensation, full scale microcontroller calibration output, output impedance: 5K below.

3.2 Relationship Between Humidity and Output Voltage

Humidity conversion formula: humidity = Voltage (output voltage)/0.03 (%RH)

3.3 Linear Curve of Voltage Output and Humidity

Humidity sensor measurement range is 0-100%RH, and the output voltage between 0.0-3.0V is a linear relationship with humidity as shown in figure 3:

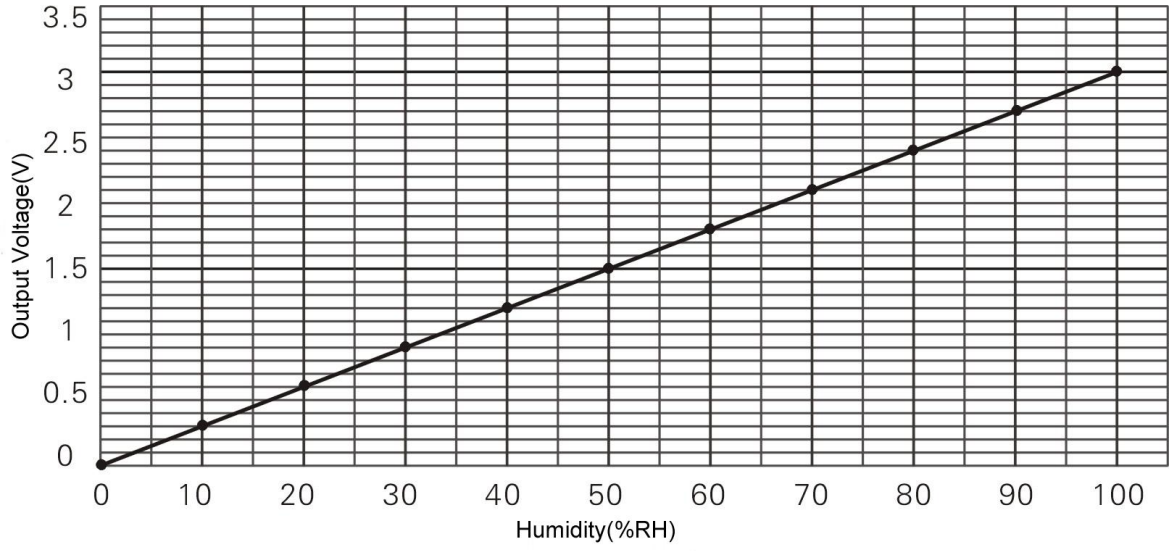


Figure 3 The linear curve of output voltage and humidity

3.4 Temperature and Resistance of NTC 10K Thermistor Corresponding Table

Standard temperature output resistance(no debug):

Table 3 10K NTC B.3435 temperature and resistance corresponding table

Temperature（℃）	0	10	20	30	40	50	60	70	80
Resistance（kΩ）	27.90	18.22	12.12	8.31	5.80	4.12	3.00	2.21	1.66

For details of 10K NTC, see attached: Resistance-temperature characteristics sheet

4. Standard Test Condition

In the atmosphere, the temperature is 25 degrees, and the supply voltage is 5.0V DC as the benchmark. For characteristic measurement, place the temperature and humidity module in 25℃/0%RH dry air for 5 minutes , then place the module in 60%RH humidity generator for 5 minutes before voltage testing.

5. Stability test

No	Item	Testing method	Spec
1	Impact resistance	Natural fall from hard floor for 1m height and repeat 3 times.	No damage, no component soldering, normal electrical specification.
2	Vibration resistance	Frequency number is 10~55Hz, amplitude is 1.5mm (10~55Hz~10Hz) to the direction of X-Y-Z for 2 hours vibration test.	No damage, no component soldering, normal electrical specification.
3	Heat resistance	Under temperature 80℃, humidity 30%RH placed in the air for 1000 hours.	Less than ±3%RH
4	Cold resistance	Under temperature 10℃, humidity 70%RH placed in the air for 1000 hours.	Less than ±3%RH
5	Humidity resistance	Temperature 40℃, humidity 90%RH placed in the air for 1000 hours.	Less than ±3%RH
6	Temperature cycle	Temperature 0℃ below for 30 minutes, and then transferred to 50℃ for 30 minutes, and then transferred to 0℃ for 30 minutes, 5 cycles.	Less than ±3%RH
7	Organic solvents resistance	Organic solvents in normal atmospheric temperature: ethanol gas(30 minutes), acetone gas(30 minutes)	Less than ±3%RH

Note:

1) The specifications are based on 60%RH moisture change.

2) After each test, the humidity module is placed in normal air at normal temperature and humidity for 4

hours, and the humidity variation is measured.

6. Pin Definitions

6.1 Pin Assignment

Pin-No	Color	Name	Description
1	Red	VDD	Power Supply (3.3V-5.5V)
2	Yellow	Hout	Humidity output voltage(0-3V DC)
3	Black	GND	Ground supply
4	White	Tout	Temperature of NTC10K thermistor.

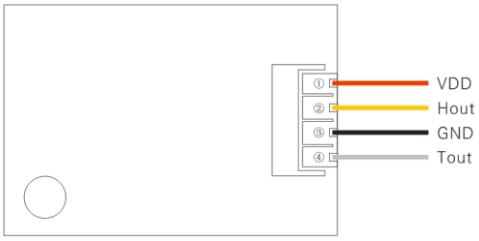


Figure 4 CM2011 Wiring Diagram

6.2 Power Pin (VDD)

Supply voltage is between 3.3V-5.5V, 5.0V is suggested.

6.3 Voltage output signal line (Hout)

The humidity signal is the output voltage from the signal line, the range is 0-3V, detail for specific humidity and voltage refer to the voltage and humidity characteristics table (Table 2).

6.4 Temperature output signal line (Tout)

The temperature sensor is the 10K NTC B.3435 thermistor, not the analog signal output. The user needs to read the circuit additionally, the temperature range is -40~80℃.

6.5 Connection mode of temperature sensor

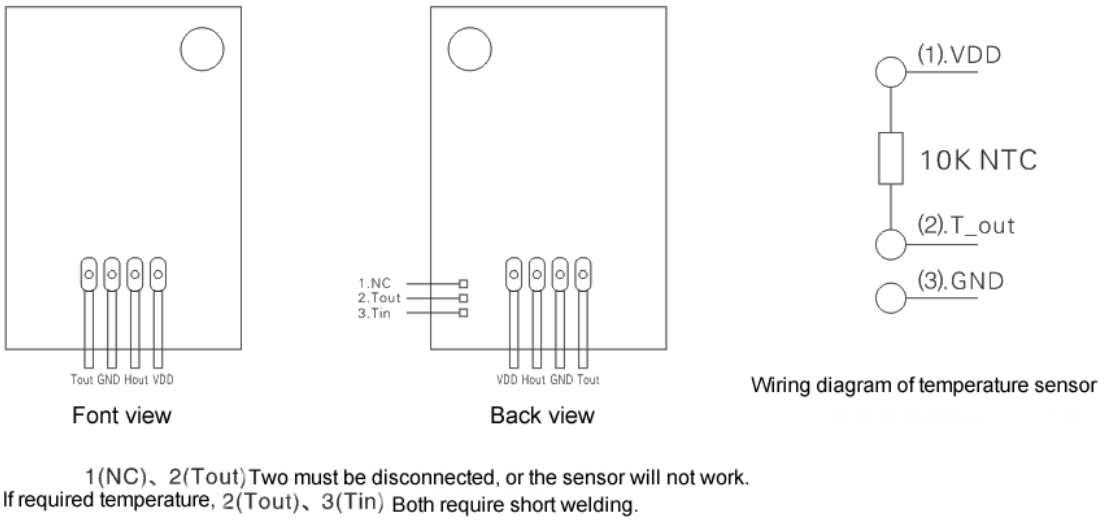


Figure 5 Connection mode of temperature schematic diagram

7. Application information

7.1 Working and storage conditions

Beyond the recommended range of work, the sensor may cause temporary drift signals up to 3%RH. After returning to normal operating condition, the sensor will slowly return to the calibration state. To speed up the recovery process, see “recovery processing". Long hours working under abnormal working conditions will accelerate the aging of the product.

Avoid placing components in the dew and dry environment for long periods of time and the following circumstances:

A. Salt fog

B. Acid or oxidizing gas, such as sulfur dioxide, hydrochloric acid

Recommended storage environment

Temperature: 10~40℃., humidity: 60%RH below

7.2 Exposure to chemicals

The sensing layer of capacitive humidity sensor will be disturbed by chemical vapor, and the diffusion of chemical in the induction layer may lead to drift of measurement value and decrease of sensitivity. In a clean environment, pollutants will slowly release. The recovery process described below will accelerate the process. High levels of chemical contamination, such as ethanol, can cause complete damage to the sensing layer of the sensor.

1) Temperature influence

The relative humidity of gases depends largely on temperature. Therefore, when measuring humidity, humidity sensors should work at the same temperature as far as possible. If a printed circuit board is shared with the heat releasing electronic component, the sensor shall be kept away from the electronic component as far as possible. The humidity sensors should be installed below the heat source, while keeping the enclosure well ventilated. To reduce thermal conductivity, the sensor and the copper plating on the other part of the printed circuit board should be as minimal as possible and leave a gap between the two.

7.3 Light Effects

Exposure to sunlight or intense ultraviolet radiation for a long time will cause performance

degradation.

7.4 Recovery Processing

Sensors operating under extreme operating conditions or chemical vapors can be restored to calibration state by following procedures: At 45℃ and <10%RH humidity for 2 hours (drying), then at 20-30℃ and >70%RH humidity for more than 5 hours.

7.5 Wiring Notes

The quality of signal wire will affect the quality of voltage output, recommended to use high quality shielding wire.

7.6 Welding Information

For manual welding, at a maximum temperature of 300℃, the contact time shall be less than 3 seconds.

7.7 Product Upgrade

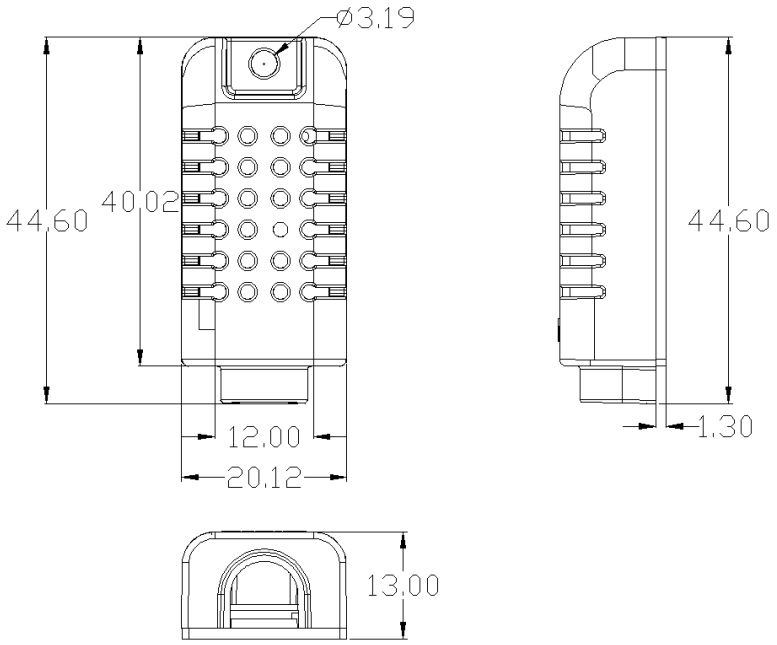
Please consult the Aosong electronic technology sector.

7.8 Packing specification

1). Each standard sensor number is 1000.

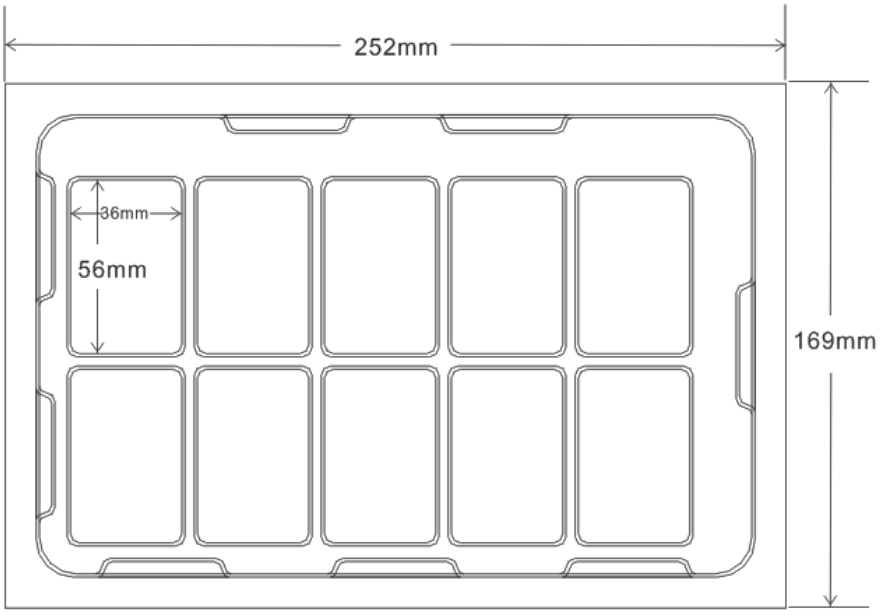
2).Outside the carton for carton packaging, packaging containing 100 plate of plastic packaging.

3). Each plastic tray packaging 10 sensors.



Product size：44.6mm*20.12mm*13mm

Net weight： 5g

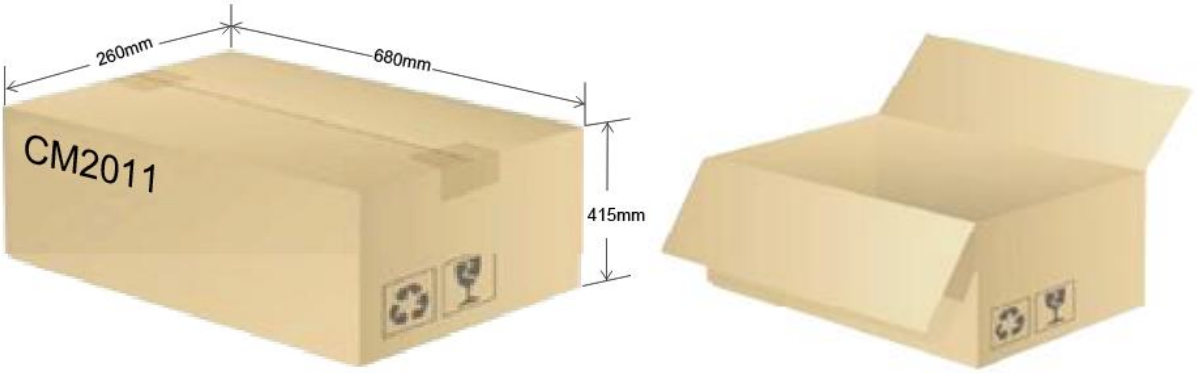


Pallet size: 252mm*169mm*19.7mm

Net weight： 50g

Gross weight： 70g

Warning: carton packing to should take put down gently



Carton size: 680mm * 260mm * 415mm

Net weight： 7kg

Gross weight：8Kg

8. License Agreement

1) Without the written permission of the company, it shall not copy or disseminate the content of this specification in any form, nor shall it be disclosed to a third party.

2) The company and the third party have the ownership of the software, and the user can only use it after signing the contract or obtaining the software license.

3) The contents of this instruction manual are subject to change without prior notice.

NTC 10K Resistance-Temperature Characteristics Sheet

T(℃)	RMin(KΩ)	RNor(KΩ)	RMax(KΩ)	T(℃)	RMin(KΩ)	RNor(KΩ)	RMax(KΩ)
-40	218.9971	228.2376	237.8441	-1	28.9630	29.5745	30.1959
-39	206.2948	214.8696	223.7783	0	27.6951	28.2671	28.8480
-38	194.4226	202.3826	210.6475	1	26.4908	27.0257	27.5687
-37	183.3204	190.7126	198.3831	2	25.3463	25.8466	26.3542
-36	172.9331	179.8005	186.9219	3	24.2585	24.7264	25.2008
-35	163.2098	169.5919	176.2059	4	23.2242	23.6617	24.1051
-34	154.1034	160.0366	166.1815	5	22.2404	22.6495	23.0638
-33	145.5707	151.0884	156.7995	6	21.3044	21.6869	22.0739
-32	137.5716	142.7046	148.0144	7	20.4136	20.7711	21.1327
-31	130.0693	134.8459	139.7840	8	19.5655	19.8996	20.2373
-30	123.0294	127.4759	132.0698	9	18.7578	19.0700	19.3854
-29	116.4204	120.5608	124.8359	10	17.9884	18.2801	18.5746
-28	110.2132	114.0696	118.0492	11	17.2553	17.5276	17.8025
-27	104.3805	107.9735	111.6791	12	16.5564	16.8108	17.0673
-26	98.8973	102.2459	105.6972	13	15.8901	16.1275	16.3668

-25	93.7405	96.8620	100.0775	14	15.2547	15.4762	15.6994
-24	88.8883	91.7990	94.7955	15	14.6484	14.8550	15.0631
-23	84.3209	87.0357	89.8288	16	14.0699	14.2625	14.4564
-22	80.0197	82.5523	85.1565	17	13.5176	13.6972	13.8778
-21	75.9675	78.3306	80.7593	18	12.9903	13.1576	13.3257
-20	72.1481	74.3538	76.6191	19	12.4867	12.6425	12.7989
-19	68.5468	70.6058	72.7194	20	12.0056	12.1505	12.2960
-18	65.1498	67.0723	69.0446	21	11.5459	11.6806	11.8158
-17	61.9440	63.7394	65.5803	22	11.1064	11.2316	11.3571
-16	58.9176	60.5946	62.3132	23	10.6862	10.8025	10.9190
-15	56.0594	57.6261	59.2307	24	10.2844	10.3923	10.5002
-14	53.3589	54.8228	56.3212	25	9.9000	10.0000	10.1000
-13	50.8065	52.1745	53.5741	26	9.5249	9.6248	9.7248
-12	48.3931	49.6717	50.9791	27	9.1662	9.2658	9.3656
-11	46.1103	47.3056	48.5269	28	8.8230	8.9223	9.0218
-10	43.9502	45.0676	46.2088	29	8.4946	8.5934	8.6925
-9	41.9055	42.9503	44.0166	30	8.1803	8.2786	8.3772
-8	39.9693	40.9462	41.9428	31	7.8794	7.9770	8.0750
-7	38.1351	39.0487	39.9801	32	7.5913	7.6882	7.7855
-6	36.3970	37.2514	38.1219	33	7.3153	7.4114	7.5080
-5	34.7494	35.5484	36.3621	34	7.0509	7.1461	7.2419
-4	33.1869	33.9342	34.6949	35	6.7976	6.8919	6.9867
-3	31.7047	32.4037	33.1148	36	6.5547	6.6480	6.7420
-2	30.2982	30.9520	31.6167	37	6.3219	6.4142	6.5072

T(℃)	RMin(KΩ)	RNor(KΩ)	RMax(KΩ)	T(℃)	RMin(KΩ)	RNor(KΩ)	RMax(KΩ)
38	6.0986	6.1899	6.2818	82	1.5032	1.5469	1.5918
39	5.8845	5.9746	6.0655	83	1.4613	1.5043	1.5484
40	5.6790	5.7680	5.8578	84	1.4208	1.4630	1.5063
41	5.4818	5.5697	5.6584	85	1.3816	1.4231	1.4656
42	5.2926	5.3793	5.4669	86	1.3437	1.3844	1.4262
43	5.1109	5.1964	5.2829	87	1.3070	1.3470	1.3880
44	4.9364	5.0208	5.1060	88	1.2715	1.3107	1.3510
45	4.7688	4.8520	4.9361	89	1.2371	1.2756	1.3152
46	4.6079	4.6898	4.7727	90	1.2038	1.2416	1.2805
47	4.4532	4.5339	4.6156	91	1.1716	1.2087	1.2469
48	4.3045	4.3840	4.4645	92	1.1404	1.1768	1.2143
49	4.1616	4.2398	4.3191	93	1.1101	1.1459	1.1827
50	4.0242	4.1012	4.1793	94	1.0808	1.1159	1.1520
51	3.8920	3.9678	4.0447	95	1.0524	1.0868	1.1223
52	3.7649	3.8395	3.9152	96	1.0248	1.0587	1.0936
53	3.6426	3.7160	3.7905	97	0.9981	1.0314	1.0656

54	3.5249	3.5971	3.6704	98	0.9723	1.0049	1.0385
55	3.4116	3.4826	3.5547	99	0.9472	0.9792	1.0123
56	3.3025	3.3724	3.4433	100	0.9228	0.9543	0.9868
57	3.1975	3.2662	3.3360	101	0.8992	0.9302	0.9620
58	3.0964	3.1639	3.2325	102	0.8764	0.9067	0.9380
59	2.9990	3.0654	3.1328	103	0.8542	0.8840	0.9147
60	2.9052	2.9704	3.0367	104	0.8326	0.8619	0.8921
61	2.8148	2.8788	2.9440	105	0.8117	0.8405	0.8702
62	2.7276	2.7905	2.8547	106	0.7914	0.8197	0.8488
63	2.6436	2.7054	2.7684	107	0.7717	0.7995	0.8281
64	2.5626	2.6233	2.6853	108	0.7526	0.7799	0.8080
65	2.4845	2.5442	2.6050	109	0.7341	0.7608	0.7885
66	2.4091	2.4678	2.5276	110	0.7161	0.7423	0.7695
67	2.3365	2.3940	2.4528	111	0.6986	0.7244	0.7511
68	2.2663	2.3229	2.3806	112	0.6816	0.7069	0.7332
69	2.1987	2.2542	2.3109	113	0.6650	0.6900	0.7158
70	2.1334	2.1879	2.2436	114	0.6490	0.6735	0.6988
71	2.0703	2.1239	2.1786	115	0.6334	0.6575	0.6824
72	2.0094	2.0620	2.1158	116	0.6183	0.6419	0.6664
73	1.9506	2.0023	2.0551	117	0.6036	0.6268	0.6508
74	1.8938	1.9446	1.9964	118	0.5893	0.6121	0.6357
75	1.8390	1.8888	1.9397	119	0.5754	0.5978	0.6210
76	1.7860	1.8349	1.8849	120	0.5618	0.5839	0.6067

T(℃)	RMin(KΩ)	RNor(KΩ)	RMax(KΩ)	T(℃)	RMin(KΩ)	RNor(KΩ)	RMax(KΩ)
77	1.7348	1.7828	1.8319	121	0.5487	0.5703	0.5928
78	1.6853	1.7324	1.7807	122	0.5359	0.5572	0.5793
79	1.6374	1.6837	1.7311	123	0.5235	0.5444	0.5661
80	1.5912	1.6366	1.6831	124	0.5114	0.5319	0.5533
81	1.5464	1.5910	1.6367	125	0.4996	0.5198	0.5408