

# WET & DRY BULB HYGROMETER

## INSTRUCTIONS FOR USE.

### INSTALLATION.

The instrument should be hung in a shaded position with a steady flow of air around the mercury bulbs. For outdoor use, a ventilated screen of the Stevenson type is recommended.

### OPERATION.

Fill the cistern with distilled or clean rain water to avoid the wick becoming clogged with impurities. The wick should be changed regularly to ensure a constant flow of moisture to the wet bulb.

### TO TAKE A READING.

1. Fan the bulbs gently until the mercury columns remain steady.
2. Take the reading of the wet and dry bulb columns.
3. Subtract the reading of the wet bulb column from that of the dry, thus arriving at the depression value.

### USE OF TABLES.

The dry bulb temperatures from  $-1^{\circ}\text{C}$ . to  $+60^{\circ}\text{C}$ . are given down the left-hand side of each table and the depression readings of the wet bulb from  $0.5^{\circ}$  to  $7.0^{\circ}$ ,  $7.5^{\circ}$  to  $16^{\circ}$  and  $17^{\circ}$  to  $30^{\circ}$  respectively across the top. It should be noted that the depression value increases by  $0.5^{\circ}$  from  $0^{\circ}$  to  $10^{\circ}$  and by  $1^{\circ}$  from  $10^{\circ}$  to  $30^{\circ}$ . Similarly the dry bulb readings increase by  $1^{\circ}$  from  $-1^{\circ}$  to  $+30^{\circ}$  and by  $2^{\circ}$  from  $30^{\circ}$  to  $60^{\circ}$ . Locate the readings of the dry bulb and the depression value given by the Hygrometer and at the intersection of the two columns, read off the percentage humidity. In the case of temperatures falling between those given on the tables, interpolation is necessary. Interpolation should never be made across the thick zig-zag line but the required value should be obtained by extra-polation downwards or upwards according as to whether the wet bulb is water covered or ice covered. The values of relative humidity above the thick line are valid only when the wet bulb is coated with ice. The following examples illustrate the method of using the tables:—

(a) Dry Bulb ... ..  $30^{\circ}\text{C}$   
Wet Bulb ... ..  $25^{\circ}\text{C}$

Hence, the Depression of the Wet Bulb =  $30^{\circ} - 25^{\circ} = 5^{\circ}\text{C}$ .  
Reading directly from the tables, the relative humidity is 65%.

(b) Dry Bulb ... ..  $28.5^{\circ}\text{C}$   
Wet Bulb ... ..  $17^{\circ}\text{C}$

The Depression of the Wet Bulb =  $28.5^{\circ} - 17^{\circ} = 11.5^{\circ}\text{C}$ . In order to find the relative humidity, it is necessary to interpolate between the "Dry Bulb" columns  $28^{\circ}$  and  $29^{\circ}$  and the "Depression of Wet Bulb" columns  $11^{\circ}$  and  $12^{\circ}$ . The result is 26%.

(c) Dry Bulb ... ..  $5.5^{\circ}\text{C}$   
Wet Bulb ... ..  $-0.25^{\circ}\text{C}$

The Depression of the Wet Bulb =  $5.5^{\circ} - (-0.25^{\circ}) = 5.75^{\circ}\text{C}$ . To obtain the relative humidity, it is necessary to interpolate between the "Dry Bulb" columns  $5^{\circ}$  and  $6^{\circ}$  and the "Depression of Wet Bulb" columns  $5.5^{\circ}$  and  $6.0^{\circ}$ . As the wet bulb is below  $0^{\circ}\text{C}$ , it is assumed that it is covered with ice, hence extra-polation should be numerically upwards from the figures below the line. The values for "Dry Bulb"  $5^{\circ}$  and Depression  $5.5^{\circ}$  and  $6.0^{\circ}$  are respectively 21 and 15. Looking at the run of figures outwards from the line and extra-polating numerically upwards, the corresponding value for "Dry Bulb"  $5^{\circ}$  would be 24 and 19. Hence the value required is found by interpolating midway between 24 and 19.

This gives a relative humidity of 19.75%.

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# HYGROMETRIC TABLES

FOR THE  
COMPUTATION OF  
RELATIVE HUMIDITY

CELSIUS

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## INSTRUCTIONS FOR USE.

### INSTALLATION.

The instrument should be hung in a shaded position with a steady flow of air around the mercury bulbs. For outdoor use, a ventilated screen of the Stevenson type is recommended.

### OPERATION.

Fill the cistern with distilled or clean rain water to avoid the wick becoming clogged with impurities. The wick should be changed regularly to ensure a constant flow of moisture to the wet bulb.

### TO TAKE A READING.

1. Fan the bulbs gently until the mercury columns remain steady.
2. Take the reading of the wet and dry bulb columns.
3. Subtract the reading of the wet bulb column from that of the dry, thus arriving at the depression value.

### USE OF TABLES.

The dry bulb temperatures from  $30^{\circ}$  to  $140^{\circ}\text{F}$ . are given down the left hand side of each table, the depression readings of the wet bulb from  $1^{\circ}$  to  $14^{\circ}$ ,  $15^{\circ}$  to  $26^{\circ}$  and  $27^{\circ}$  to  $40^{\circ}$  respectively across the top.

Locate the readings of the dry bulb and the depression value, given by the Hygrometer and at the intersection of the two columns, read off the percentage relative humidity.

If the case of temperatures falling between those given on the tables, interpolation is necessary. Interpolation should never be made across the thick zig-zag line, but the required value should be obtained by extra-polation downwards or upwards according as to whether the wet bulb is water covered or ice covered. The values of relative humidity above the thick line are valid only when the wet bulb is coated with ice. The following examples illustrate the method of using the tables:—

(a) Dry Bulb ... ..  $80^{\circ}\text{F}$   
Wet Bulb ... ..  $60^{\circ}\text{F}$

Hence the Depression of Wet Bulb =  $80^{\circ} - 60^{\circ} = 20^{\circ}\text{F}$ . Reading directly from the tables, the relative humidity is 25 per cent.

(b) Dry Bulb ... ..  $76.5^{\circ}\text{F}$   
Wet Bulb ... ..  $65^{\circ}\text{F}$

The Depression of Wet Bulb =  $76.5^{\circ} - 65^{\circ} = 11.5^{\circ}\text{F}$ . In order to find the relative humidity, it is necessary to interpolate between the "Dry bulb" columns  $76^{\circ}$  and  $78^{\circ}$  and the "Depression of Wet bulb" columns  $11^{\circ}$  and  $12^{\circ}$ . The result is 51.25 per cent.

(c) Dry Bulb ... ..  $41^{\circ}\text{F}$   
Wet Bulb ... ..  $31.5^{\circ}\text{F}$

The Depression of Wet Bulb =  $41^{\circ} - 31.5^{\circ} = 9.5^{\circ}\text{F}$ .

To obtain the relative humidity it is necessary to interpolate between the "Dry Bulb" columns  $40^{\circ}$  and  $42^{\circ}$  and the "Depression of Wet Bulb" columns  $9^{\circ}$  and  $10^{\circ}$ . As the "wet" bulb is below  $32^{\circ}\text{F}$ , it is assumed that it is covered with ice, hence extra-polation should be numerically upwards from the figures below the line.

### INSTRUCTIONS TO REPLACE TUBE AND SCALE

Remove existing tube and scale by pressing top of metal scale inwards and at same time sliding upwards. This will free bottom of scale and make it possible to remove tube and scale from case. To fit replacement, carry out these instructions in the reverse order.

More comprehensive data can be obtained from the Hygrometric Tables prepared by the Meteorological Office, M.O. 365 (4th Edition 1946) published by Her Majesty's Stationery Office.

# HYGROMETRIC TABLES

FOR THE  
COMPUTATION OF  
RELATIVE HUMIDITY

FAHRENHEIT

 ZEAL

**TABLE OF WET & DRY BULB THERMOMETER READINGS**

**WITH CORRESPONDING PERCENTAGES OF HUMIDITY**

**CELSIUS SCALE**

Dry Bulb °C	DEPRESSION OF WET BULB °C														Dry Bulb °C					
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0						
-1	90	79	69	59	49	39	30	20	10	1										
0	90	81	71	61	52	44	34	25	16	7										
1	90	81	73	64	55	47	38	29	20	13	4									
2	91	82	73	64	57	49	41	33	24	17	9	1								
3	91	83	74	65	57	49	43	36	28	21	14	7								
4	92	83	75	67	59	51	43	35	27	23	18	11	4							
5	92	84	76	68	61	53	46	38	31	24	21	15	8	2						
6	92	85	77	70	63	55	48	41	34	27	20	14	12	6						
7	93	85	78	71	64	57	50	44	37	30	24	17	11	5						
8	93	86	79	72	65	59	52	46	39	33	27	21	15	9						
9	93	86	80	73	67	60	54	48	42	36	30	24	18	12						
10	93	87	81	74	68	62	56	50	44	38	33	27	21	16						
11	94	87	81	75	69	63	58	52	46	41	35	30	24	19						
12	94	88	82	76	70	65	59	54	48	43	37	32	27	22						
13	94	88	83	77	71	66	60	55	50	45	40	35	30	25						
14	94	89	83	78	72	67	62	57	52	47	42	37	32	27						
15	94	89	84	78	73	68	63	58	53	48	43	38	34	30						
16	95	89	84	79	74	69	64	59	55	50	45	41	37	32						
17	95	90	85	80	75	70	65	61	56	52	47	43	39	34						
18	95	90	85	80	76	71	66	62	57	53	49	45	41	37						
19	95	90	86	81	76	72	67	63	59	54	50	46	42	38						
20	95	91	86	81	77	73	68	64	60	56	52	48	44	40						
21	95	91	86	82	78	74	69	65	61	57	53	49	45	42						
22	95	91	87	83	79	74	70	66	62	58	54	50	47	43						
23	96	91	87	83	79	75	71	67	63	59	55	52	48	45						
24	96	91	87	83	79	75	71	68	64	60	57	53	49	46						
25	96	92	88	84	80	76	72	68	65	61	58	54	51	47						
26	96	92	88	84	80	76	73	69	66	62	59	55	53	49						
27	96	92	88	84	81	77	74	70	66	63	59	56	53	50						
28	96	92	88	85	81	77	74	70	67	64	60	57	54	51						
29	96	92	89	85	81	78	74	71	68	64	61	58	55	52						
30	96	93	89	85	82	78	75	72	69	65	62	59	56	53						
31	96	93	89	86	82	79	76	73	70	67	64	61	58	55						
32	96	93	89	86	83	80	77	74	71	68	65	62	59	56						
33	96	93	90	87	84	81	78	75	72	69	66	63	61	58						
34	96	94	90	87	84	81	78	75	73	70	67	64	62	59						
35	96	94	91	88	85	82	79	76	74	71	68	65	63	61						
36	96	94	91	88	85	82	79	76	74	72	70	67	65	63						
37	97	94	91	89	86	83	80	77	75	73	70	67	65	63						
38	97	94	91	88	86	83	81	78	75	73	71	68	66	64						
39	97	94	91	89	86	83	81	78	76	74	72	69	67	65						
40	97	95	92	89	86	83	81	78	76	74	72	69	67	65						
41	97	95	92	89	87	84	82	79	77	74	72	70	67	65						
42	97	95	92	89	87	84	82	79	77	75	73	71	68	66						
43	97	95	93	90	87	85	83	80	78	75	73	71	69	67						
44	97	95	93	90	87	85	83	81	79	76	74	72	70	68						
45	97	95	93	90	87	85	83	81	79	76	74	72	70	68						
46	98	96	93	90	87	85	83	81	79	77	75	73	71	69						

**CELSIUS SCALE**

Dry Bulb °C	DEPRESSION OF WET BULB °C														Dry Bulb °C					
	7.5	8.0	8.5	9.0	9.5	10	11	12	13	14	15	16								
-1																				
0																				
1																				
2																				
3																				
4																				
5																				
6																				
7																				
8	3																			
9	7	1																		
10	10	5																		
11	14	9	4																	
12	17	12	7	2																
13	20	15	11	6	1															
14	23	18	14	9	6	1														
15	25	21	17	12	8	4														
16	28	24	19	15	11	7														
17	30	26	22	18	14	10	3													
18	33	28	24	21	17	13	6													
19	34	30	27	23	19	16	9	2												
20	36	32	29	25	22	18	11	5												
21	38	34	31	27	24	20	14	7	1											
22	40	36	33	29	26	23	16	10	4											
23	41	38	34	31	28	25	18	12	6	1										
24	43	39	36	33	30	27	20	15	9	3										
25	44	41	38	35	31	28	22	17	11	6	1									
26	45	42	39	36	33	30	24	19	13	8	3									
27	47	44	41	38	35	32	26	21	15	10	5	1								
28	48	45	42	39	36	33	28	23	17	12	8	3								
29	49	46	43	40	37	35	29	24	19	14	10	5								
30	50	47	44	42	39	36	31	26	21	16	12	7								
31	52	49	46	44	41	39	34	29	24	20	15	11								
32	53	51	48	45	42	40	35	30	25	21	16	12								
33	55	53	50	48	45	43	38	34	30	26	22	18								
34	57	54	52	50	47	45	40	36	32	28	24	20								
35	58	56	53	51	49	47	42	38	34	30	27	23								
36	60	57	55	53	50	48	44	40	36	32	29	25								
37	61	58	56	54	52	50	46	42	38	34	31	27								
38	62	59	57	55	53	51	47	43	39	36	33	29								
39	63	60	58	56	54	52	48	44	41	37	34	31								
40	64	61	59	57	55	53	49	45	42	38	36	32								
41	64	62	60	58	56	54	50	47	43	40	37	34								
42	65	63	61	59	57	55	51	48	44	41	38	35								
43	66	64	62	60	58	56	52	49	45	42	39	37								
44	66	64	63	61	59	57	53	50	47	43	40	38								
45	67	65	64	62	60	57	54	51	48	45	42	39								

**CELSIUS SCALE**