

DS75 Power Consumption Characteristics using data from Lighting Industry Association measurements

Date 15/11/2017
By J Shires

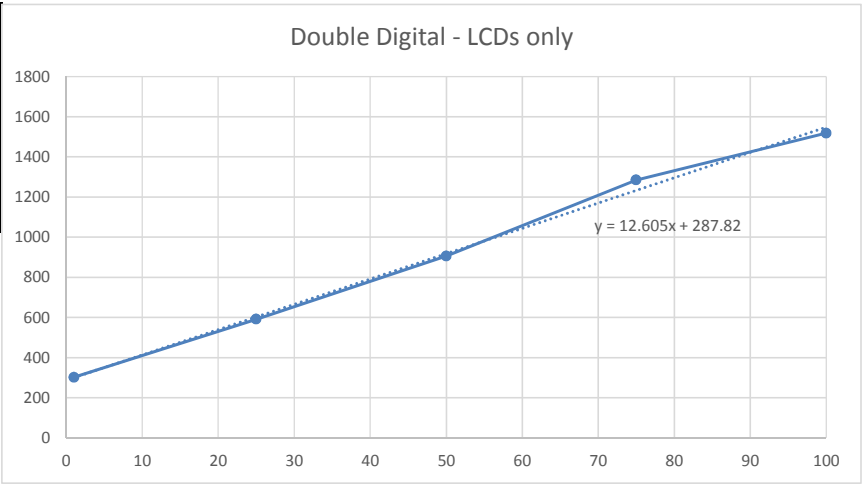
Data at 240VACrms

DOUBLE DIGITAL DISPLAY

LCDs only (x2)	TEST SAMPLE #						
	Brightness	1	2	3	4	5	Average
Smart brightness	100	1523	1516	1514	1508	1531	1518
	75	1289	1279	1279	1281	1296	1285
	50	908	905	904	906	909	906
	25	593	593	588	591	591	591
	1	304	307	300	300	300	302
Standby (DD)	0	131	131	125	125	124	127

- Notes
- 1 1% brightness setting is actually minimum 10% brightness level from the LCD panel

2 Nominal wattage of equipment (average 100% brightness/ fan load)
- 1883W



GENERIC COOLING SYSTEM

Fans (plus DD background)

Fan drive	TEST SAMPLE #					
	1	2	3	4	5	Average
100	491	494	493	490	492	492
75	443	451	446	443	445	446
50	365	374	369	366	369	369
25	274	282	276	275	275	276
1	200	206	200	199	200	201

Note that this figure includes the background PS so fans only has to subtract the PS (DD) values to get:

Average (10 fans only)	
100	365
75	319
50	242
25	149
1	74

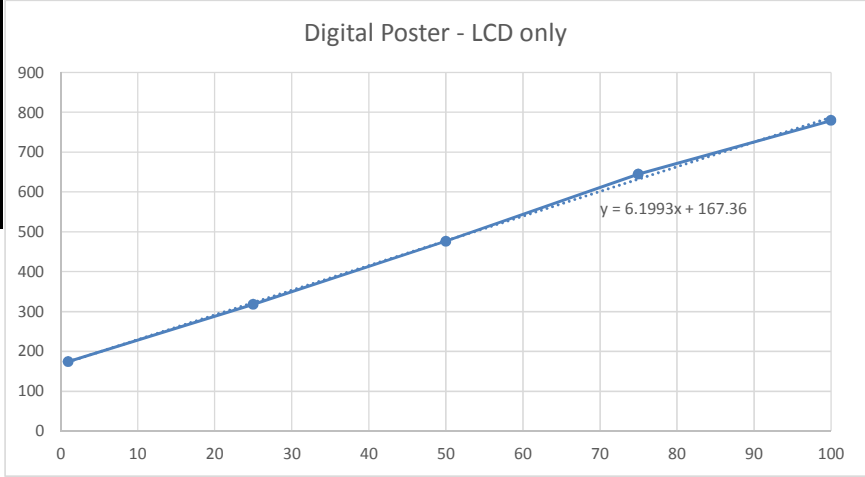
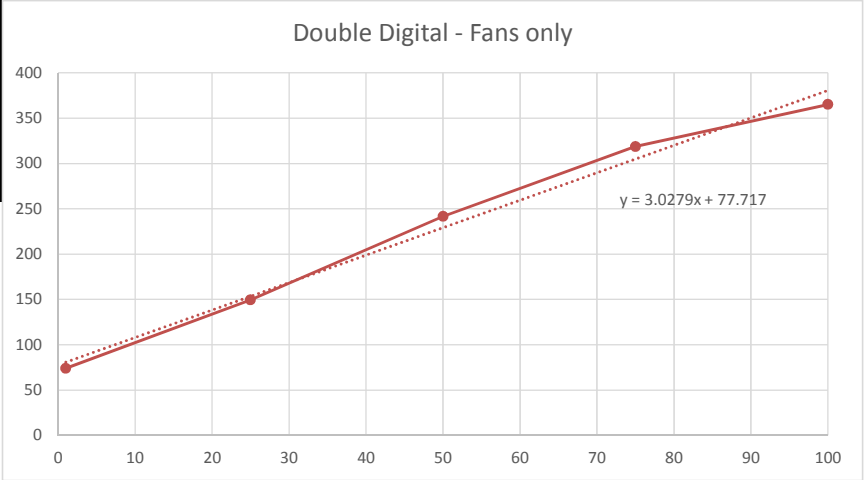
Note that these figures are entirely consistent with the fan specifications - 10 fans rated at 7.2W quiescent; 36W full power

SINGLE DIGITAL DISPLAY

LCD only (x1)		TEST SAMPLE #					
	Brightness	1	2	3	4	5	Average
Smart brightness	100	782	779	776	774	786	779
	75	645	644	637	639	660	645
	50	478	475	469	471	488	476
	25	318	320	312	316	324	318
	1	174	176	170	172	179	174
Standby (DP)	0	85	86	81	82	89	85

- Notes
- 1 1% brightness setting is actually minimum 10% brightness level from the LCD panel

2 Nominal wattage of equipment (average 100% brightness/ 75% max fan load)
- 1067W



DOUBLE DIGITAL UNIT

LCD power draw	Min	Max	Ave	
Power save		127		W
Smart brightness		302		W
Normal running	302	1518	910	W

Note: normal running average brightness of 50% is a realistic figure for bright days

Fan power draw	Combined average			
Power save	44	730	4	W
Smart brightness	44	3422	17	W
Normal running	173	4613	91	W
Total (combined averages)		8765	112	W
% maximum fan power rating			31%	

Note: in both power save and smart brightness the external fans are off; internal fans running at minimum speed

Combined power draw	Average	Oper. Hours	Weighted	
Power save	171	730	14	W
Smart brightness	346	3422	135	W
Normal running	1083	4613	570	W
Total (combined averages)		8765	719	W

SINGLE DIGITAL UNIT

LCD power draw	Min	Max	Ave	
Power save		85		W
Smart brightness		174		W
Normal running	174	779	477	W

Fan power draw	Combined average			
Power save	44	730	4	W
Smart brightness	44	3422	17	W
Normal running	139	4613	73	W
Total (combined averages)		8765	94	W
% maximum fan power rating			26%	

Combined power draw	Average	Oper. Hours	Weighted	
Power save	129	730	11	W
Smart brightness	218	3422	85	W
Normal running	616	4613	324	W
Total (combined averages)		8765	420	W

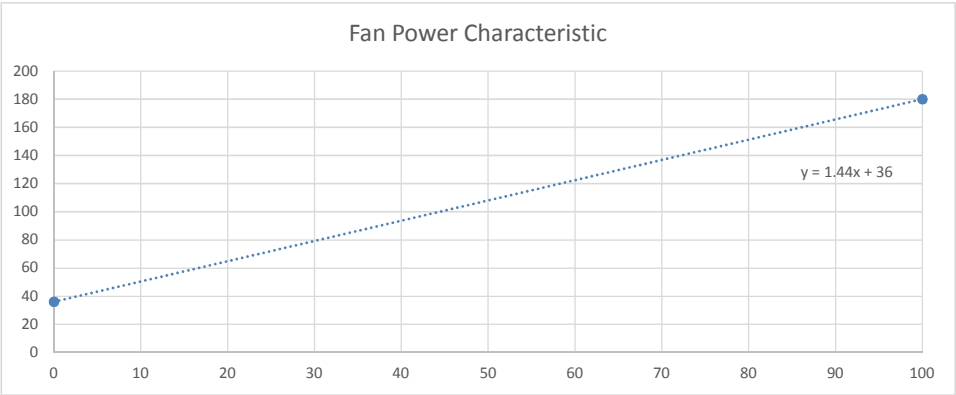
Fan Power (for DS75 Double Digital UMSUG application)

Date 15/11/2017
By J Shires

Fan Power (extracted from datasheet for standard fans)

INTERNAL FANS		Individual	Set (5)
PWM	RPM	Power	Total
0	4700	7.2	36
100	10200	36	180

EXTERNAL FANS		Individual	Set (5)
PWM	RPM	Power	Total
0	4500	7.2	36
100	9700	36	180

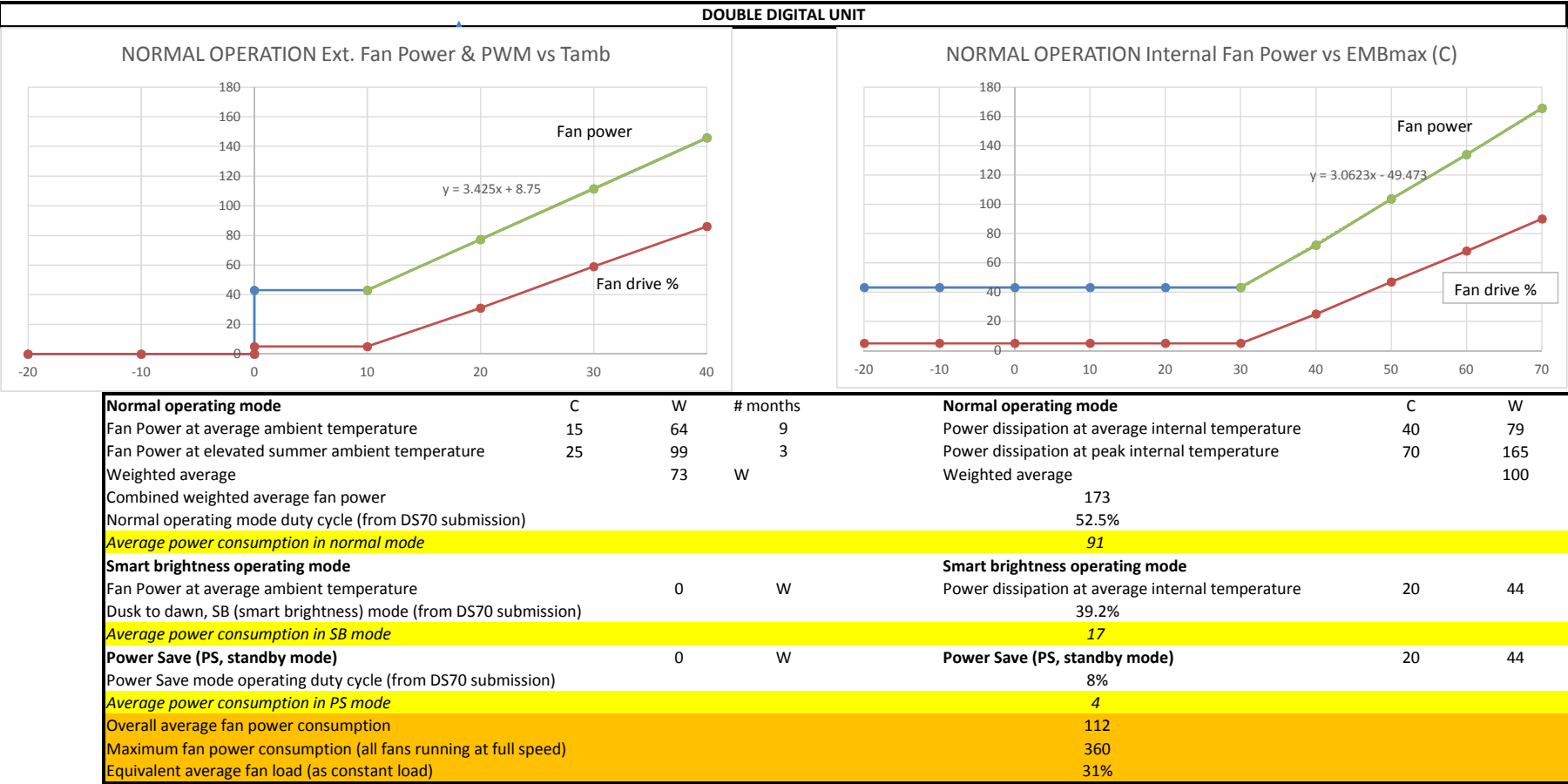


EXTERNAL FANS (5 off)

Tamb	Std PWM	Fan Power	LINEAR
50	100	180	180
40	86	146	146
30	59	112	112
20	31	77	77
10	5	43	43
0	5	43	
0	0	0	
-10	0	0	
-20	0	0	

INTERNAL FANS (5 off)

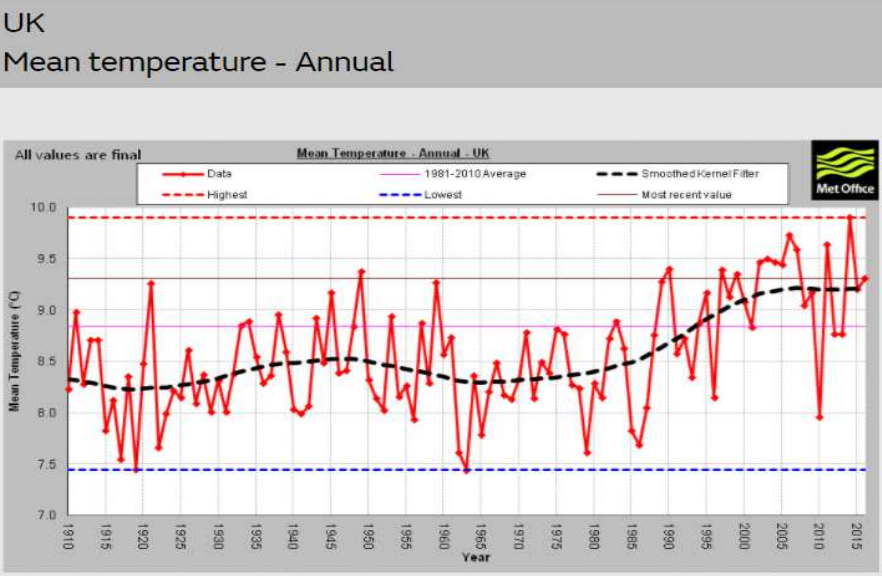
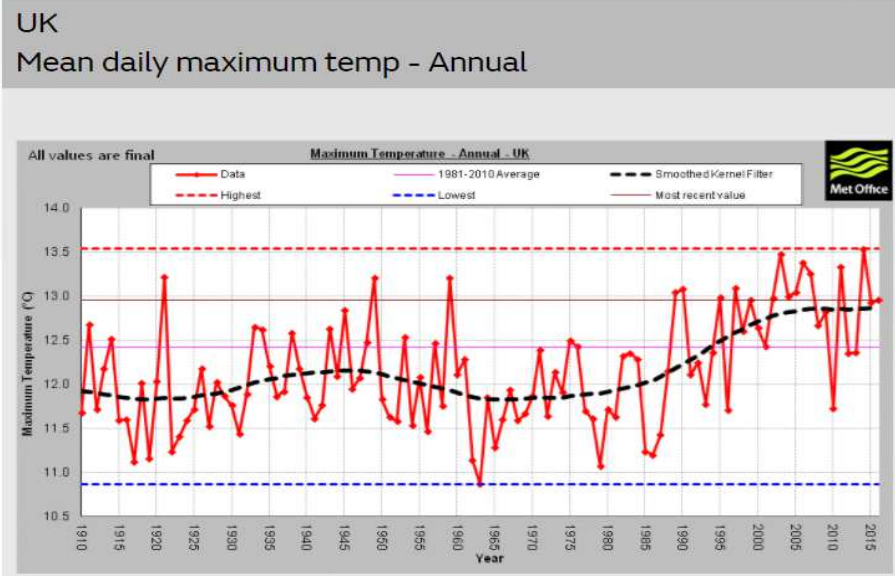
EMB temp	Std PWM	Fan Power	LINEAR
75	100	180	180
70	90	166	166
60	68	134	134
50	47	104	104
40	25	72	72
30	5	43	43
20	5	43	
10	5	43	
0	5	43	
-10	5	43	
-20	5	43	



Notes

- 1 Normal operating mode is when the LCD panel is on and brightness and fans are controlled in response to environmental conditions
- 2 Fan power calculations have been run using Met Office historic average daily temperature data for all but summer months (>640 hours sunshine rounded to 3 months) when numbers boosted to factor cooling requirements
- 3 In SB mode no solar gain, LCD at min brightness, internal fans running at minimum speed, external fans are off
- 4 In PS mode the LCD is turned off and so too are the external fans; internal fans running at min speed
- 5 The overall average calculated here for the DD unit works out at 31% of maximum fan power which is very close to the 4 months at 100% power (33%) used for the DS70 submission

Source <https://www.metoffice.gov.uk/climate/uk/summaries/actualmonthly>



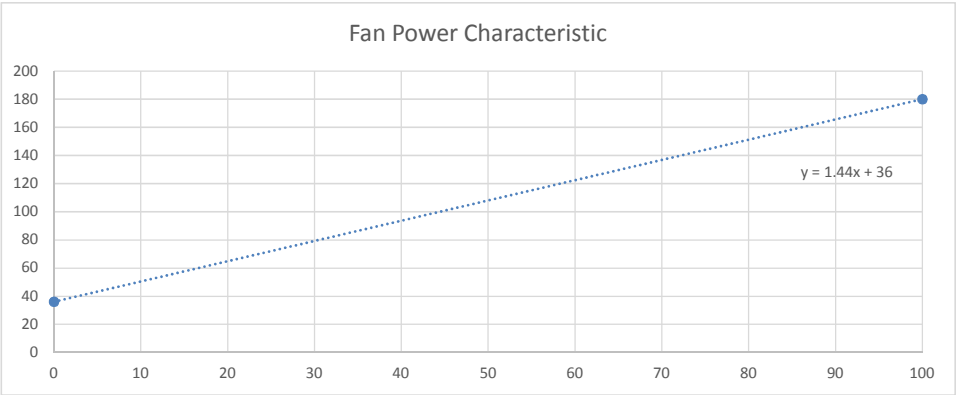
Fan Power (for DS75 Single Digital UMSUG application)

Date 15/11/2017
By J Shires

Fan Power (extracted from datasheet for standard fans)

INTERNAL FANS		Individual	Set (5)
PWM	RPM	Power	Total
0	4700	7.2	36
100	10200	36	180

EXTERNAL FANS		Individual	Set (5)
PWM	RPM	Power	Total
0	4500	7.2	36
100	9700	36	180

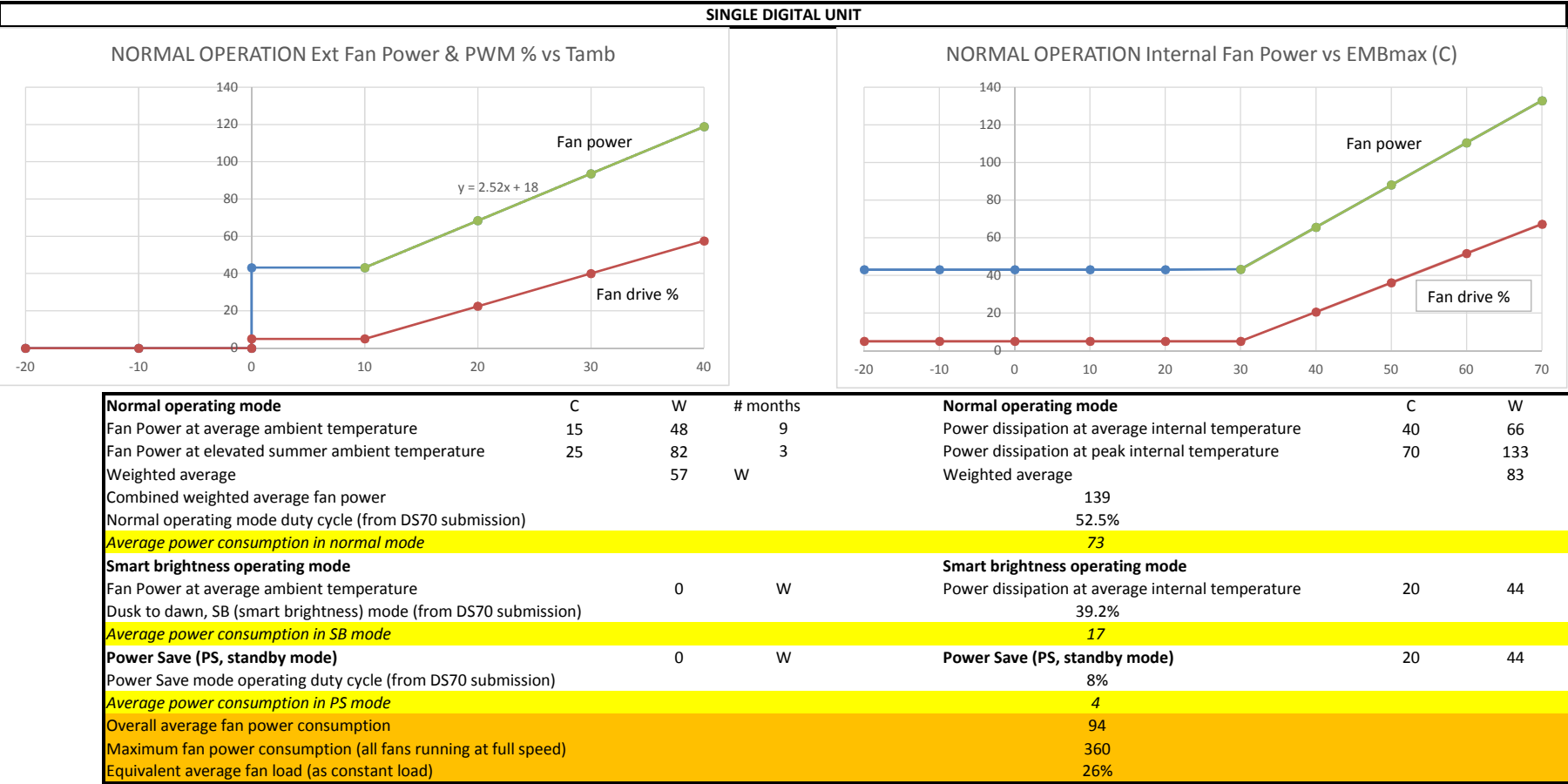


EXTERNAL FANS (5 off)

Tamb	Std PWM	Fan Power	LINEAR
50	75	144	144
40	58	119	119
30	40	94	94
20	23	68	68
10	5	43	43
0	5	43	
0	0	0	
-10	0	0	
-20	0	0	

INTERNAL FANS (5 off)

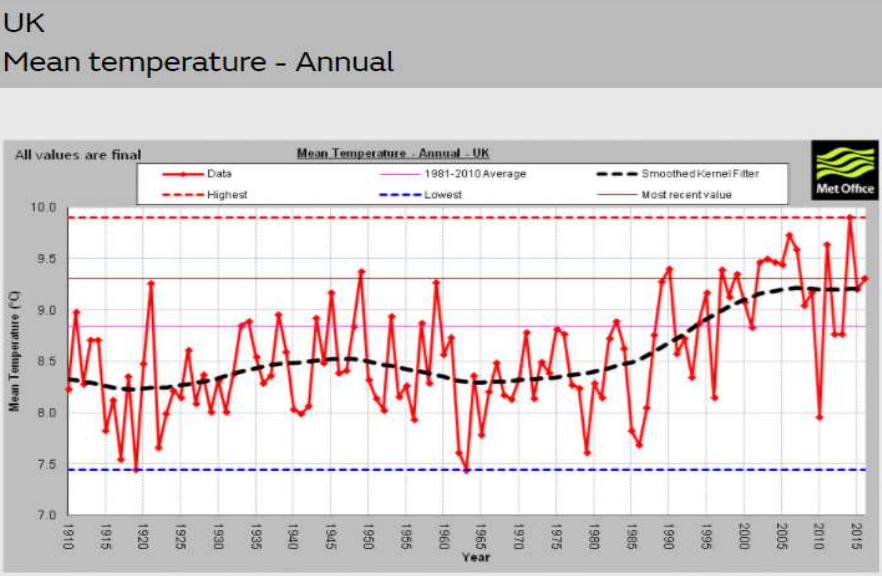
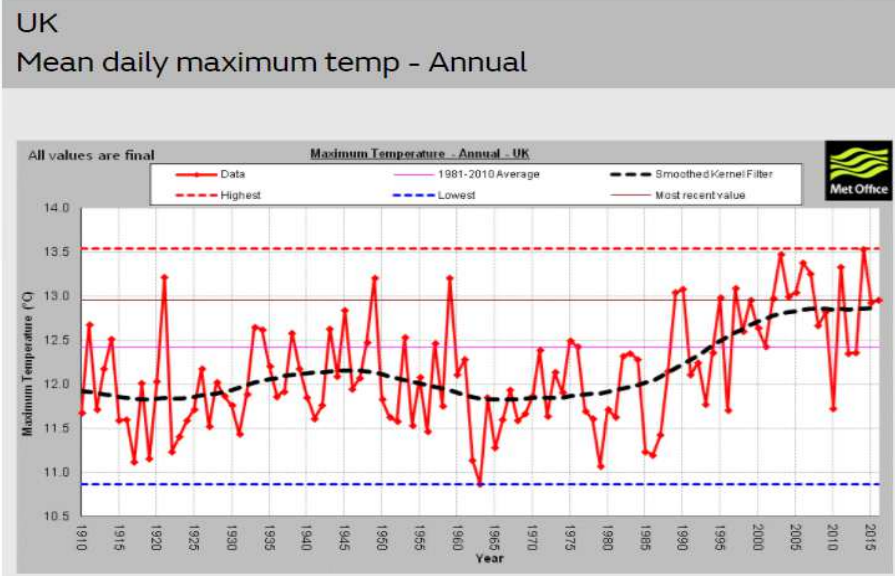
EMB temp	Std PWM	Fan Power	LINEAR
75	75	144	144
70	67	133	133
60	52	110	110
50	36	88	88
40	21	66	66
30	5	43	43
20	5	43	
10	5	43	
0	5	43	
-10	5	43	
-20	5	43	



Notes

- 1 Normal operating mode is when the LCD panel is on and brightness and fans are controlled in response to environmental conditions
- 2 Fan power calculations have been run using Met Office historic average daily temperature data for all but summer months (>640 hours sunshine rounded to 3 months) when numbers boosted to factor cooling requirements; **maximum fan power 75% rating for single digital display due to reduced heat load**
- 3 In SB mode no solar gain, LCD at min brightness, internal fans running at minimum speed, external fans are off
- 4 In PS mode the LCD is turned off and so too are the external fans; internal fans running at min speed
- 5 The overall average calculated here for the DD unit works out at 31% of maximum fan power which is very close to the 4 months at 100% power (33%) used for the DS70 submission

Source <https://www.metoffice.gov.uk/climate/uk/summaries/actualmonthly>



AVERAGE TEMPERATURE DATA FOR UK - TO SUPPORT DS75 UMSUG APPLICATION

Date 31/10/2017
By J Shires

LONDON

Temperature			
Months	Normal	Warmest	Coldest
January	5.9°C	8.3°C	3.7°C
February	6.0°C	8.5°C	3.4°C
March	8.0°C	11.1°C	5.0°C
April	9.9°C	13.5°C	6.4°C
May	13.3°C	17.1°C	9.4°C
June	16.2°C	20.0°C	12.3°C
July	18.6°C	22.6°C	14.6°C
August	18.6°C	22.5°C	14.7°C
September	15.9°C	19.3°C	12.5°C
October	12.4°C	15.3°C	9.6°C
November	8.7°C	11.2°C	6.2°C
December	6.9°C	9.1°C	4.7°C

MANCHESTER

Temperature			
Months	Normal	Warmest	Coldest
January	4.2°C	6.9°C	1.5°C
February	4.4°C	7.3°C	1.6°C
March	6.3°C	9.5°C	3.1°C
April	8.2°C	11.9°C	4.5°C
May	11.5°C	15.7°C	7.4°C
June	14.1°C	18.0°C	10.1°C
July	16.3°C	20.3°C	12.3°C
August	16.1°C	20.1°C	12.1°C
September	13.6°C	17.1°C	10.0°C
October	10.4°C	13.5°C	7.2°C
November	6.7°C	9.6°C	3.9°C
December	5.0°C	7.6°C	2.3°C

GLASGOW

Temperature			
Months	Normal	Warmest	Coldest
January	3.7°C	6.6°C	0.7°C
February	4.0°C	7.1°C	0.8°C
March	5.5°C	9.0°C	2.0°C
April	7.6°C	11.8°C	3.4°C
May	10.5°C	15.2°C	5.9°C
June	13.1°C	17.5°C	8.7°C
July	15.1°C	19.4°C	10.8°C
August	14.7°C	18.9°C	10.5°C
September	12.2°C	16.1°C	8.3°C
October	9.3°C	12.8°C	5.7°C
November	5.8°C	9.2°C	2.4°C
December	4.1°C	7.2°C	1.1°C

ABERDEEN

Temperature			
Months	Normal	Warmest	Coldest
January	3.1°C	6.1°C	0.2°C
February	3.5°C	6.6°C	0.4°C
March	5.0°C	8.5°C	1.6°C
April	6.7°C	10.5°C	2.9°C
May	9.3°C	13.3°C	5.3°C
June	12.1°C	16.0°C	8.1°C
July	14.3°C	18.3°C	10.3°C
August	14.1°C	18.2°C	10.0°C
September	11.8°C	15.5°C	8.1°C
October	8.9°C	12.3°C	5.6°C
November	5.5°C	8.6°C	2.4°C
December	3.8°C	6.8°C	0.9°C

INVERNESS

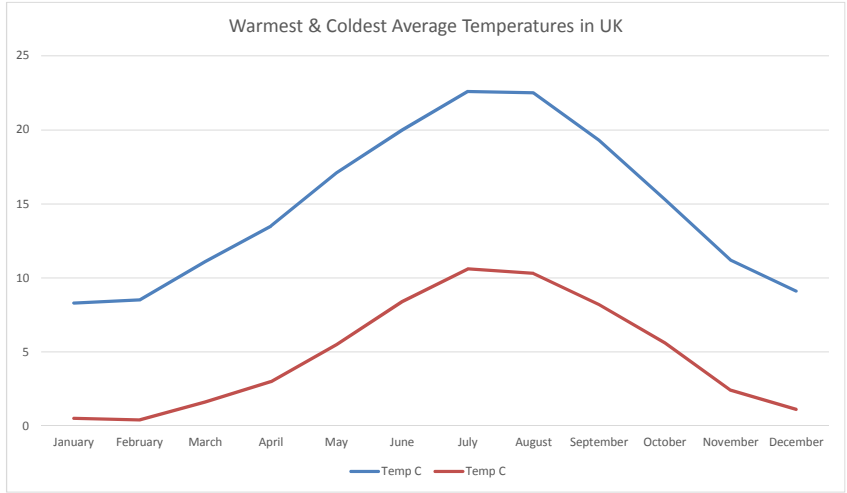
Temperature			
Months	Normal	Warmest	Coldest
January	3.2°C	5.9°C	0.5°C
February	3.5°C	6.5°C	0.4°C
March	5.0°C	8.3°C	1.6°C
April	6.9°C	10.9°C	3.0°C
May	9.9°C	14.3°C	5.5°C
June	12.4°C	16.4°C	8.4°C
July	14.5°C	18.4°C	10.6°C
August	14.2°C	18.2°C	10.3°C
September	11.7°C	15.2°C	8.2°C
October	8.7°C	11.8°C	5.6°C
November	5.3°C	8.2°C	2.4°C
December	3.7°C	6.4°C	1.1°C

Data Source

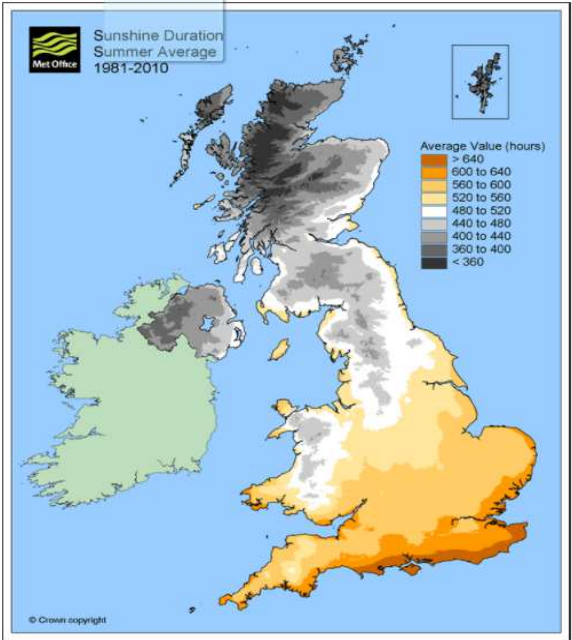
https://www.yr.no/place/United_Kingdom/England/Manchester/statistics.html

Months	Warmest		Coldest	
	London	Inverness	Temp C	Temp C
January	8.3	0.5		
February	8.5	0.4		
March	11.1	1.6		
April	13.5	3		
May	17.1	5.5		
June	20	8.4		
July	22.6	10.6		
August	22.5	10.3		
September	19.3	8.2		
October	15.3	5.6		
November	11.2	2.4		
December	9.1	1.1		

Annual Ave 15 4.8



Sunshine - Summer average: 1981-2010



Region
United Kingdom

Averaging period
1981-2010

Please note that regional averages are only available for 1971-2000.

Climate variable
Sunshine

Maps of cooling degree days, heat degree days, growing degree days and growing season length are only available for the annual period. For definition of these variables, see UKCP09: Annual data sets.

Months
Jan Feb Mar
Apr May Jun
Jul Aug Sep
Oct Nov Dec

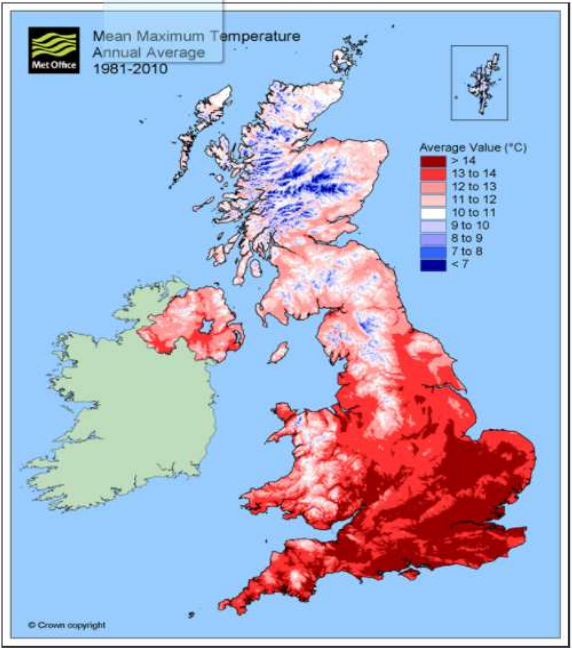
Seasons
Spring Summer Autumn
Winter

Annual
Annual

NOTES

1 This is supported by the MET OFFICE mean maximum temperature annual average data

Mean daily maximum temperature - Annual average: 1981-2010



Region
United Kingdom

Averaging period
1981-2010

Please note that regional averages are only available for 1971-2000.

Climate variable
Mean daily maximum temperature

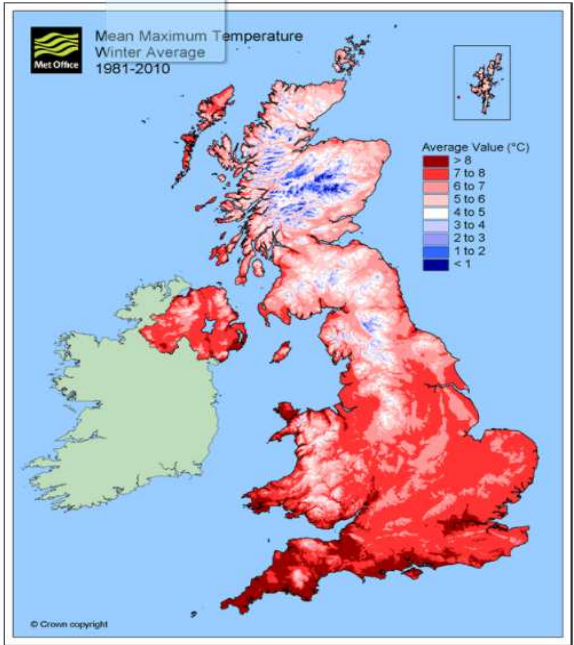
Maps of cooling degree days, heating degree days, growing degree days and growing season length are only available for the annual period. For a definition of these variables, see UKCP09: Annual data sets.

Months
Jan Feb Mar
Apr May Jun
Jul Aug Sep
Oct Nov Dec

Seasons
Spring Summer Autumn
Winter

Annual
Annual

Mean daily maximum temperature - Winter average: 1981-2010



Region
United Kingdom

Averaging period
1981-2010

Please note that regional averages are only available for 1971-2000.

Climate variable
Mean daily maximum temperature

Maps of cooling degree days, heating degree days, growing degree days and growing season length are only available for the annual period. For a definition of these variables, see UKCP09: Annual data sets.

Months
Jan Feb Mar
Apr May Jun
Jul Aug Sep
Oct Nov Dec

Seasons
Spring Summer Autumn
Winter

Annual
Annual

2 Use mean temperatures as basis for calculations adding in summer months sunshine (heating effect)