

LG ELECTRONICS INC.

TEST REPORT

SCOPE OF WORKS

CLOTHES SHRINKAGE RATE COMPARISON TEST BETWEEN '옷감케어' COURSE OF NEW CLOTHES DRYER AND '표준' COURSE OF CONVENTIONAL CLOTHES DRYER

MODEL

RD20VS (New model)
RH17VTS (Conventional model)

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TEST REPORT FOR LG ELECTRONICS INC.

Report No.: 210900060SEL-001

Date: 08-Dec-2021

OBJECTIVE

This test is performed to compare the clothes shrinkage rate between the '옷감케어' course of new heat pump clothes dryer and the '표준' course of conventional clothes dryer when testing with various types of clothes.

HYPOTHESIS

1. The total clothes shrinkage rate (%) for the '옷감케어' course of new heat pump clothes dryer will be improved from the '표준' course of conventional model.
2. The improvement rate (%) for the test clothes will be satisfied with below criteria.
 - 반팔 면 티셔츠(천연섬유): More than 5 %
 - 아동 맨투맨 티셔츠(혼방): More than 15 %
 - 바람막이 점퍼(합성섬유): More than 45 %

NOTE: 1. Total clothes shrinkage rate(전체 수축율) is the average value of the '소매' + '몸통' of the tested clothes.

2. Improvement rate (%) = $((\text{'표준'} - \text{'옷감케어'}) / \text{'표준'}) \times 100$

CONCLUSION

Based on the data collected the Hypothesis is **accepted**:

1. The total clothes shrinkage rate (%) for the '옷감케어' course of new heat pump clothes dryer was improved from the '표준' course of conventional model.
2. The improvement rate (%) for the test clothes was satisfied with below criteria.
 - 반팔 면 티셔츠(천연섬유): More than 5 %
 - 아동 맨투맨 티셔츠(혼방): More than 15 %
 - 바람막이 점퍼(합성섬유): More than 45 %

James Woo
ENGINEER

Alexander Porter
REVIEWER



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SECTION 2 OBJECTIVE

This test is performed to compare the clothes shrinkage rate between the '옷감케어' course of new heat pump clothes dryer and the '표준' course of conventional clothes dryer when testing with various types of clothes.

Accuracy Needed 5 %

Accuracy and Repeatability should be determined from the multiple samples run as needed for the analysis conducted.

SECTION 3 PARAMETERS

The following parameters are controlled.

VALUE	DESCRIPTION	UNITS	METHOD	MU
23	Test room temperature	°C	Thermo-hygrometer	0.5 °C (Approx. 95 %, k=2)
45	Test room humidity	% R.H.	Thermo-hygrometer	2.4 % R.H. (Approx. 95 %, k=2)
220	Supply voltage	VAC	Socket outlet	-
60	Frequency	Hz	Socket outlet	-

The following parameters are monitored

VALUE	DESCRIPTION	UNITS	METHOD	MU
23	Test room temperature	°C	Thermo-hygrometer	0.5 °C (Approx. 95 %, k=2)
45	Test room humidity	% R.H.	Thermo-hygrometer	2.4 % R.H. (Approx. 95 %, k=2)
220	Supply voltage	VAC	Socket outlet	-
60	Frequency	Hz	Socket outlet	-
-	Dimensions of test clothes	mm	Ruler	0.26 mm (Approx. 95 %, k=2)

SECTION 4 SAMPLE ACQUISITION

Test samples were prepared by LG Electronics Inc. Washing machine Division

Sample #	Model Name	Description	Serial #	Purchase Location	Date	Condition
1	RD20VS	New model, Dual Inverter Heat Pump Clothes Dryer, 20 kg)	111KWVQCR887	Prepared by LG Electronics	16-Nov-2021	Unpackaged & undamaged
2	RH17VTS	Conventional model, Dual Inverter Heat Pump Clothes Dryer, 17 kg)	009KWZH5T909	Prepared by LG Electronics	16-Nov-2021	Unpackaged & undamaged

NOTE

1. The model RD20VS and RH17VTS were selected as representative test models.

2. The model description for the new heat pump clothes dryer is as below.

*** Model number: RD20**** and W20******

The asterisk * can be 0 to 9 or A to Z or blank depending on the exterior changes and specifications not related to the performance covered by this test report.

3. The models RD20**** and W20**** are exactly same in all aspects of mechanical, electrical and operating algorithm only except the installation ways.

(RD20****: Series or parallel installation, W20****: Series installation only)

SECTION 5 HYPOTHESIS

1. The total clothes shrinkage rate (%) for the '옷감케어' course of new heat pump clothes dryer will be improved from the '표준' course of conventional model.

2. The improvement rate (%) for the test clothes will be satisfied with below criteria.

- 반팔 면 티셔츠(천연섬유): More than 5 %
- 아동 맨투맨 티셔츠(혼방): More than 15 %
- 바람막이 점퍼(합성섬유): More than 45 %

NOTE: 1. Total clothes shrinkage rate(전체 수축율) is the average value of the '소매' + '몸통' of the tested clothes.

2. Improvement rate (%) = $((\text{'표준'} - \text{'옷감케어'}) / \text{'표준'}) \times 100$

SECTION 6 EQUIPMENT LIST

#	EQUIPMENT DESCRIPTION	MANUFACTURER'S NAME / MODEL # / SERIAL #	INTERTEK ASSET #	CALIBRATION DATE	CALIBRATION DUE	RANGE USED
1	Thermo-hygrometer	SEKONIC / ST-50A / HE21-001591	ES891	2021-07-16	2022-07-16	(-20 ~ +50) °C (0 ~ 90) % R.H.
2	Ruler	Hoechst mass / 1.5 m / 101260	ISTT-902-01-02S	2021-05-13	2022-05-13	(0 ~ 1 500) mm

Note: The equipment measurement uncertainty is stated in the Test Procedure.

SECTION 7 TECHNICAL STAFF

#	Staff Name	Area of Expertise
1	Augustine Heo	Sr. Technical Manager / Intertek Softlines
2	Kim Minji	Chief research engineer / LG Living Appliance Advanced R&D
3	Kim Yongtae	Senior research engineer / LG Dryer Development
4	Lee Yeongju	Senior research engineer / LG Dryer Development

Note: Complete training records for staff are available upon request

Testing was conducted at:

51, Gasan digital 1-ro, Geumcheon-gu, Seoul, Republic of Korea
Gasan R&D Campus, LG Electronics

SECTION 8 TEST PROCEDURE**1. Test conditions**

ITEMS	REQUIREMENT	MEASURED
Test room temperature	$(23 \pm 2) ^\circ\text{C}$	$(23.6 \sim 23.9) ^\circ\text{C}$
Test room humidity	$(40 \pm 5) \% \text{ R.H.}$	$(38.9 \sim 41.1) \% \text{ R.H.}$
Power supply	220 V 60 Hz	N/A (Power supply by socket outlet)
Test program	RD20VS (New model): '옷감케어' course RH17VTS (Conventional model): '표준' course	
Mass of test loads & composition	Total mass: 3.0 kg Load composition: <ul style="list-style-type: none"> · 반팔 면 티셔츠: 3 ea. · 아동 맨투맨 티셔츠: 1 ea. · 바람막이 점퍼: 1 ea. · 면(Cotton) 시험포: 1 ea. · 울(Wool) 시험포: 1 ea. NOTE: For detailed specification of test clothes, refer to the Appendix I.	

2. Test method

- 1) Prepare two clothes dryer units.
 - Sample 1: RD20VS (New model)
 - Sample 2: RH17VTS (Conventional model)
- 2) Measure the initial dimensions for each part of the test clothes before testing as Figure 1.

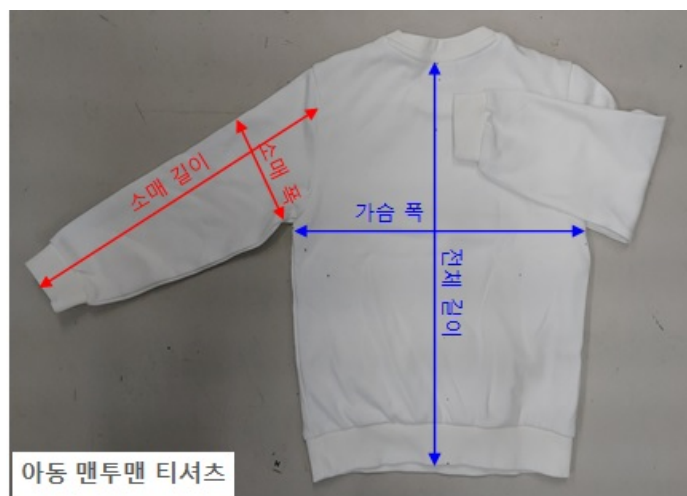
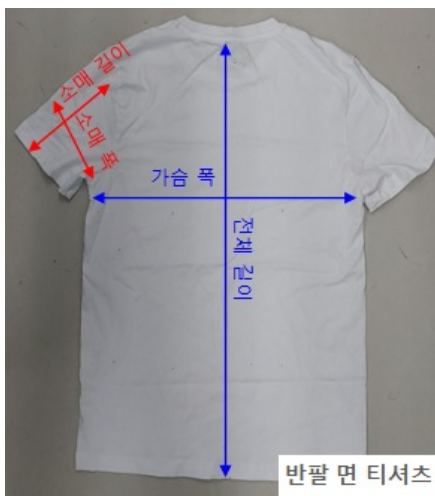




Figure 1. How to measure the dimensions

- 3) Wash the test clothes with washing machine at '헹굼탈수' course. Then, complete extraction water from the wet test loads by spinning.
- 4) Make a final mass adjustment, such that the initial moisture content is set at 60 % by adding water uniformly distributed among all of the test loads in a very fine spray using a spray bottle.
- 5) Load the test cloths by grasping them in the center, shaking them to hang loosely, and then dropping them in the dryer at random.
- 6) Set the dryer at the defined course and start operation.
- 7) After the operating cycle, leave the test clothes samples in the room for 60 minutes with room temperature.
- 8) Measure the dimensions for the same points of the test clothes after drying.
- 9) Calculate the shrinkage rate as below formula.

$$\therefore \text{Shrinkage rate after drying (\%)} = ((\text{After drying length} - \text{Initial length}) / \text{Initial length}) \times 100$$

SECTION 9 TEST RESULTS

‘표준’ course (Conventional model: RH17VTS)

TEST No.	의류 종류	측정 부위	시험 전 (mm)	시험 후 (mm)	수축율 (%)	평균 (%)	
TEST 1	반팔 면 티셔츠(1)	소매 길이	232	214	-7.76	-5.48	-4.79
		소매 폭	187	181	-3.21		
		가슴 폭	497	485	-2.41	-4.10	
		전체 길이	673	634	-5.79		
	반팔 면 티셔츠(2)	소매 길이	230	221	-3.91	-3.46	-3.42
		소매 폭	200	194	-3.00		
		가슴 폭	502	489	-2.59	-3.38	
		전체 길이	695	666	-4.17		
	반팔 면 티셔츠(3)	소매 길이	214	207	-3.27	-3.21	-3.79
		소매 폭	190	184	-3.16		
		가슴 폭	517	493	-4.64	-4.37	
		전체 길이	682	654	-4.11		
	아동 맨투맨 티셔츠	소매 길이	439	420	-4.33	-3.12	-3.47
		소매 폭	157	154	-1.91		
		가슴 폭	392	380	-3.06	-3.81	
		전체 길이	482	460	-4.56		
	바람막이 점퍼	소매 길이	604	604	0.00	-0.24	-0.34
		소매 폭	206	205	-0.49		
		가슴 폭	550	546	-0.73	-0.44	
		전체 길이	662	661	-0.15		
TEST 2	반팔 면 티셔츠(1)	소매 길이	213	202	-5.16	-2.85	-3.52
		소매 폭	190	189	-0.53		
		가슴 폭	529	515	-2.65	-4.20	
		전체 길이	679	640	-5.74		
	반팔 면 티셔츠(2)	소매 길이	217	212	-2.30	-3.65	-3.61
		소매 폭	200	190	-5.00		
		가슴 폭	520	510	-1.92	-3.57	
		전체 길이	710	673	-5.21		
	반팔 면 티셔츠(3)	소매 길이	220	210	-4.55	-4.29	-4.11
		소매 폭	198	190	-4.04		
		가슴 폭	526	507	-3.61	-3.94	
		전체 길이	681	652	-4.26		
	아동 맨투맨 티셔츠	소매 길이	442	422	-4.52	-2.90	-3.67
		소매 폭	156	154	-1.28		
		가슴 폭	393	378	-3.82	-4.44	
		전체 길이	474	450	-5.06		
	바람막이 점퍼	소매 길이	620	616	-0.65	-1.04	-0.86
		소매 폭	208	205	-1.44		
		가슴 폭	546	542	-0.73	-0.67	
		전체 길이	665	661	-0.60		

TEST 3	반팔 면 티셔츠(1)	소매 길이	212	203	-4.25	-3.66	-3.91
		소매 폭	195	189	-3.08		
		가슴 폭	518	494	-4.63	-4.15	
		전체 길이	680	655	-3.68		
	반팔 면 티셔츠(2)	소매 길이	220	210	-4.55	-4.00	-3.66
		소매 폭	203	196	-3.45		
		가슴 폭	530	512	-3.40	-3.33	
		전체 길이	673	651	-3.27		
	반팔 면 티셔츠(3)	소매 길이	210	201	-4.29	-4.96	-5.16
		소매 폭	195	184	-5.64		
		가슴 폭	520	492	-5.38	-5.35	
		전체 길이	677	641	-5.32		
	아동 맨투맨 티셔츠	소매 길이	430	410	-4.65	-3.29	-3.44
		소매 폭	156	153	-1.92		
		가슴 폭	389	380	-2.31	-3.59	
		전체 길이	473	450	-4.86		
	바람막이 점퍼	소매 길이	612	605	-1.14	-1.32	-1.08
		소매 폭	200	197	-1.50		
		가슴 폭	545	540	-0.92	-0.84	
		전체 길이	662	657	-0.76		

‘옷감케어’ course (New model: RD20VS)

TEST No.	의류 종류	측정 부위	시험 전 (mm)	시험 후 (mm)	수축율 (%)	평균 (%)	
TEST 1	반팔 면 티셔츠(1)	소매 길이	229	221	-3.49	-4.22	-3.98
		소매 폭	202	192	-4.95		
		가슴 폭	512	495	-3.32		
		전체 길이	698	669	-4.15	-3.74	
	반팔 면 티셔츠(2)	소매 길이	223	215	-3.59	-3.10	-3.49
		소매 폭	192	187	-2.60		
		가슴 폭	510	490	-3.92		
		전체 길이	677	651	-3.84	-3.88	
	반팔 면 티셔츠(3)	소매 길이	222	211	-4.95	-3.48	-3.72
		소매 폭	199	195	-2.01		
		가슴 폭	514	500	-2.72		
		전체 길이	691	655	-5.21	-3.97	
	아동 맨투맨 티셔츠	소매 길이	436	419	-3.90	-2.88	-2.76
		소매 폭	161	158	-1.86		
		가슴 폭	395	390	-1.27		
		전체 길이	472	453	-4.03	-2.65	
	바람막이 점퍼	소매 길이	591	591	0.00	-0.24	-0.28
		소매 폭	211	210	-0.47		
		가슴 폭	552	551	-0.18		
		전체 길이	658	655	-0.46	-0.32	

TEST 2	반팔 면 티셔츠(1)	소매 길이	217	212	-2.30	-3.18	-3.54
		소매 폭	197	189	-4.06		
		가슴 폭	515	496	-3.69	-3.89	
		전체 길이	683	655	-4.10		
	반팔 면 티셔츠(2)	소매 길이	228	219	-3.95	-3.49	-3.52
		소매 폭	198	192	-3.03		
		가슴 폭	511	492	-3.72	-3.54	
		전체 길이	712	688	-3.37		
	반팔 면 티셔츠(3)	소매 길이	219	212	-3.20	-3.12	-3.42
		소매 폭	197	191	-3.05		
		가슴 폭	522	506	-3.07	-3.71	
		전체 길이	666	637	-4.35		
	아동 맨투맨 티셔츠	소매 길이	442	425	-3.85	-2.90	-2.75
		소매 폭	154	151	-1.95		
		가슴 폭	389	381	-2.06	-2.60	
		전체 길이	476	461	-3.15		
	바람막이 점퍼	소매 길이	617	614	-0.49	-0.48	-0.51
		소매 폭	210	209	-0.48		
		가슴 폭	542	541	-0.18	-0.55	
		전체 길이	658	652	-0.91		
TEST 3	반팔 면 티셔츠(1)	소매 길이	221	210	-4.98	-3.50	-3.88
		소매 폭	198	194	-2.02		
		가슴 폭	517	498	-3.68	-4.25	
		전체 길이	683	650	-4.83		
	반팔 면 티셔츠(2)	소매 길이	215	210	-2.33	-2.19	-2.89
		소매 폭	195	191	-2.05		
		가슴 폭	515	495	-3.88	-3.60	
		전체 길이	663	641	-3.32		
	반팔 면 티셔츠(3)	소매 길이	220	213	-3.18	-4.37	-4.13
		소매 폭	198	187	-5.56		
		가슴 폭	511	492	-3.72	-3.89	
		전체 길이	664	637	-4.07		
	아동 맨투맨 티셔츠	소매 길이	438	421	-3.88	-3.25	-2.86
		소매 폭	153	149	-2.61		
		가슴 폭	390	385	-1.28	-2.47	
		전체 길이	464	447	-3.66		
	바람막이 점퍼	소매 길이	607	607	0.00	-0.26	-0.25
		소매 폭	195	194	-0.51		
		가슴 폭	548	547	-0.18	-0.24	
		전체 길이	657	655	-0.30		

Measurement uncertainty: 0.2 %

SECTION 10 TEST SUMMARY

‘표준’ (Conventional model) vs. ‘옷감케어’ (New model)

의류 종류	측정 부위	수축율 (%)		Improvement rate (%)
		‘표준’ (Conventional model)	‘옷감케어’ (New model)	
반팔 면 티셔츠	소매	-4.0	-3.4	15.0
	몸통	-4.0	-3.8	5.0
	전체	-4.0	-3.6	10.0
아동 맨투맨 티셔츠	소매	-3.1	-3.0	3.2
	몸통	-3.9	-2.6	33.3
	전체	-3.5	-2.8	20.0
바람막이 점퍼	소매	-0.9	-0.3	66.7
	몸통	-0.6	-0.4	33.3
	전체	-0.8	-0.3	62.5

NOTE

1. 소매 = (소매 길이 + 소매 폭)/2, 몸통 = (가슴 폭 + 전체 길이)/2
2. Improvement rate (%) = ((‘표준’ - ‘옷감케어’)/‘표준’) × 100

SECTION 11 CONCLUSION

Based on the data collected the Hypothesis is **accepted**:

1. The total clothes shrinkage rate (%) for the '옷감케어' course of new heat pump clothes dryer was improved from the '표준' course of conventional model.
2. The improvement rate (%) for the test clothes was satisfied with below criteria.
 - 반팔 면 티셔츠(천연섬유): More than 5 %
 - 아동 맨투맨 티셔츠(혼방): More than 15 %
 - 바람막이 점퍼(합성섬유): More than 45 %

The test is for information only, the data is supplied to the client without conclusion. Final evaluation to be conducted by the client.

Appendix I. Test clothes samples

Test load	Description	Photo
반팔 면 티셔츠	천연섬유 (면 100%)	
아동 맨투맨 티셔츠	혼방 (면 84 %, 폴리에스터 16%)	
바람막이 점퍼	합성섬유 (나일론 100%)	

Appendix II. Photos



RD20VS (New model)



RH17VTS (Conventional model)