



**TOGETHER**  
*for a sustainable future*

## OCCASION

This publication has been made available to the public on the occasion of the 50<sup>th</sup> anniversary of the United Nations Industrial Development Organisation.



**TOGETHER**  
*for a sustainable future*

## DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

## FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

## CONTACT

Please contact [publications@unido.org](mailto:publications@unido.org) for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at [www.unido.org](http://www.unido.org)

22209



## FINAL REPORT MODIFICATIONS

### DIFFERENT CHARACTERISTICS BETWEEN CIRCUIT FOR R 134a AND R12

APPLIANCE: DD300		UNITS	R 12	R 134a
REFRIGERANT	Charge	[gr]	140	150
COMPRESSOR	Model	name	Embraco B3116B	Zanussi GL 80 AN
	Capacity Ashrae	[kcal/h]	147	182
CAPILLARY	N2 flow rate	[l/min]	6.9	6.0
	Lenght	[mm]	2600	3500
	Inside diameter	[mm]	0.70	0.70
FILTER	Weight	[gr]	9	9

APPLIANCE: DD410		UNITS	R 12	R 134a
REFRIGERANT	Charge	[gr]	210	210
COMPRESSOR	Model	name	Embraco B3118B	Zanussi GL 90 AN
	Capacity Ashrae	[kcal/h]	165	200
CAPILLARY	N2 flow rate	[l/min]	7.3	6.5
	Lenght	[mm]	2500	3000
	Inside diameter	[mm]	0.70	0.70
FILTER	Weight	[gr]	9	9

APPLIANCE: DD460		UNITS	R 12	R 134a
REFRIGERANT	Charge	[gr]	220	290
COMPRESSOR	Model	name	Embraco B3118B	Zanussi GL 90 AN
	Capacity Ashrae	[kcal/h]	165	200
CAPILLARY	N2 flow rate	[l/min]	7.3	6.5
	Lenght	[mm]	2500	3000
	Inside diameter	[mm]	0.70	0.70
FILTER	Weight	[gr]	9	9

**Note : the filter should be suitable for R134A**



# FINAL REPORT

## summary of DD 300 Lt.

APPLIANCE	<b>DD 300 (N° 00000008)</b>										
COMPRESSOR : GL 80 AN	CONDENSER : WIRES AND TUBES					REFRIGERANT R 134a : 150 gr					
<b>THERMOSTAT CONTROLS</b>											
Ambient temperature °C	43			38			25		18		
Thermostat setting	7 / 7	1.5 / 7	1 / 7	7 / 7	3 / 7	2.5 / 7	5 / 7	4 / 7	6 / 7	4 / 7	
Refrigerator temperature (average) °C	+5.7	+9.4	+9.9	+2.4	+6.7	+7.8	+3.2	+5.1	+1.5	+3.7	
Freezer temperature (average) °C	-18.5	-14.2	-13.8	-20.7	-16.1	-15.0	-17.4	-15.8	-17.6	-16.0	
Running time %	100	77.2	76.8	100	73.3	65.1	47	39.7	35.6	27.5	
Energy consumption Kwh/24h		3.692	3.645		3.267	2.970	1.968	1.747	1.449	1.168	
<b>STORAGE TESTS</b>											
Ambient temperature °C	43	38	18	25			32				
Thermostat setting	2 / 7	3.5 / 7	4 / 7	5 / 7	4 / 7	Interp. +5 °C	5 / 7	4 / 7	Interp. -18 °C		
Refrigerator temperature (average) °C	+7.3	+4.5	+4.4	+3.2	+5.1	+5.0	+0.9	+5.2	+3.2		
Warmer package °C	-14.9	-17.2	-22.3	-18.3	-18.1	-18.1	-19.8	-16.5	-18.0		
Average of packages °C	-16.6	-19.4	-24.4	-20.5	-20.3		-22.1	-18.6			
Running time %	83.2	81.4	39.3	47.5	39.2	39.6	82.4	58.3	69.3		
Energy consumption Kwh/24h	3.924	3.485	1.690	1.975	1.760	1.771	3.495	2.595	3.004		
<b>Lower starting voltage test</b>	at 43°C :			142 Volts			at 38°C :			162 Volts	

APPLIANCE	<b>DD 300 (N° 00000009)</b>										
COMPRESSOR : GL 80 AN	CONDENSER : WIRES AND TUBES					REFRIGERANT R 134a : 150 gr					
<b>THERMOSTAT CONTROLS</b>											
Ambient temperature °C	43			38			25		18		
Thermostat setting	7 / 7	2.5 / 7	1.5 / 7	7 / 7	3.5 / 7	3 / 7	5 / 7	3 / 7	6 / 7	4 / 7	
Refrigerator temperature (average) °C	+5.0	+7.4	+10.7	+1.5	+5.7	+7.1	+5.4	+7.3	+2.0	+3.0	
Freezer temperature (average) °C	-18.1	-14.6	-11.4	-21.3	-17.1	-16.3	-20.1	-19.4	-23.1	-23.5	
Running time %	100	84.3	64.7	100	75.9	69.1	50.5	47.7	49.1	46.2	
Energy consumption Kwh/24h		4.054	3.253		3.500	3.265	2.100	1.964	1.810	1.780	
<b>STORAGE TESTS</b>											
Ambient temperature °C	43	38	18	25			32				
Thermostat setting	2 / 7	4 / 7	4 / 7	4 / 7	2 / 7	Interp. +5 °C	5 / 7	4 / 7	Interp. -18 °C		
Refrigerator temperature (average) °C	+7.2	+3.7	+2.3	+5.6	+6.5	+5.0	+0.6	+5.0	+3.3		
Warmer package °C	-14.8	-17.5	-22.5	-18.7	-18.6	-18.8	-20.0	-16.7	-18.0		
Average of packages °C	-16.6	-19.6	-24.6	-20.7	-20.5		-22.3	-18.8			
Running time %	86.4	84.7	46.7	49.2	47.9	50	83.6	60.4	69.5		
Energy consumption Kwh/24h	4.251	3.800	1.800	2.005	1.985	2.018	3.527	2.637	2.988		
<b>Lower starting voltage test</b>	at 43°C :			142 Volts			at 38°C :			162 Volts	



# FINAL REPORT

## summary of DD 410 Lt.

<b>APPLIANCE</b>	<b>DD 410 (N° 00000006)</b>
------------------	-----------------------------

COMPRESSOR : GL 90 AN	CONDENSER : WIRES AND TUBES	REFRIGERANT R 134a : 210 gr
-----------------------	-----------------------------	-----------------------------

### THERMOSTAT CONTROLS

Ambient temperature °C	43			38			25		18	
Thermostat setting	7 / 7	3 / 7	1.5 / 7	7 / 7	4.5 / 7	3.5 / 7	5 / 7	4 / 7	6 / 7	4 / 7
Refrigerator temperature (average) °C	+4.1	+8.2	+10.2	+1.3	+4.9	+7.6	+4.5	+6.0	+2.4	+6.0
Freezer temperature (average) °C	-19.6	-13.5	-11.2	-21.6	-15.8	-13.1	-14.6	-12.1	-15.3	-11.6
Running time %	100	72.2	58.3	100	78.2	56.9	38.2	31.6	30.1	20.4
Energy consumption Kwh/24h		3.772	3.216		3.723	2.924	1.802	1.570	1.343	0.988

### STORAGE TESTS

Ambient temperature °C	43	38	18	25			32		
Thermostat setting	3 / 7	4.5 / 7	4.5 / 7	3.5 / 7	2 / 7	Extrap. -18 °C	3.5 / 7	2.5 / 7	Extrap. -18 °C
Refrigerator temperature (average) °C	+7.6	+4.7	+4.9	+3.5	+6.7	+1.5	+3.4	+5.9	+2.2
Warmer package °C	-13.5	-14.3	-16.5	-15.5	-11.5	-18.0	-16.7	-14.0	-18.0
Average of packages °C	-15.7	-17.0	-18.8	-17.7	-13.9		-18.8	-16.3	
Running time %	76.8	68.4	23.3	41.8	33.4	47	57.5	48.7	61.7
Energy consumption Kwh/24h	3.980	3.395	1.080	2.067	1.727	2.280	2.495	2.090	2.690

<b>Lower starting voltage test</b>	at 43°C :	182 Volts	at 38°C :	182 Volts
------------------------------------	-----------	-----------	-----------	-----------

### APPLIANCE

## DD 410 (N° 00000007)

COMPRESSOR : GL 90 AN	CONDENSER : WIRES AND TUBES	REFRIGERANT R 134a : 210 gr
-----------------------	-----------------------------	-----------------------------

### THERMOSTAT CONTROLS

Ambient temperature °C	43			38			25		18	
Thermostat setting	7 / 7	2.5 / 7	2 / 7	7 / 7	4 / 7	3.5 / 7	5 / 7	4 / 7	5.5 / 7	4.5 / 7
Refrigerator temperature (average) °C	+5.0	+10.1	+11.0	+0.9	+6.2	+7.7	+3.8	+6.2	+2.7	+4.6
Freezer temperature (average) °C	-18.6	-11.3	-10.0	-22.1	-14.4	-12.9	-15.4	-12.4	-15.3	-13.7
Running time %	100	65.3	59.4	100	66.7	60.9	40.9	31.3	25.9	21.5
Energy consumption Kwh/24h		3.646	3.353		3.432	3.205	1.947	1.606	1.199	1.039

### STORAGE TESTS

Ambient temperature °C	43	38	18	25			32		
Thermostat setting	3 / 7	4 / 7	3.5 / 7	3.5 / 7	2 / 7	Extrap. -18 °C	4 / 7	3 / 7	Extrap. -18 °C
Refrigerator temperature (average) °C	+8.2	+6.1	+2.0	+3.5	+6.8	+0.9	+4.3	+6.1	+3.3
Warmer package °C	-13.1	-14.2	-16.4	-15.3	-11.8	-18.0	-16.5	-13.9	-18.0
Average of packages °C	-15.4	-16.8	-18.7	-17.6	-14.0		-18.8	-16.1	
Running time %	78.3	69.1	25.2	43	34.5	49.7	59.5	50	65
Energy consumption Kwh/24h	4.085	3.412	1.220	2.080	1.740	2.342	2.580	2.160	2.822

<b>Lower starting voltage test</b>	at 43°C :	182 Volts	at 38°C :	182 Volts
------------------------------------	-----------	-----------	-----------	-----------



# FINAL REPORT

## summary of DD 460 Lt.

<b>APPLIANCE</b>	<b>DD 460 (N° 00000002)</b>									
COMPRESSOR : GL 90 AN	CONDENSER : WIRES AND TUBES					REFRIGERANT R 134a : 290 gr				
<b>THERMOSTAT CONTROLS</b>										
Ambient temperature °C	43			38			25		18	
Thermostat setting	7 / 7	3 / 7	1 / 7	7 / 7	4 / 7	2 / 7	4 / 7	2 / 7	5 / 7	3 / 7
Refrigerator temperature (average) °C	-0.8	+4.2	+8.2	-3.9	+2.6	+7.0	+3.5	+5.5	+1.8	+4.3
Freezer temperature (average) °C	-23.0	-17.3	-11.4	-25.1	-18.4	-12.1	-15.2	-13.9	-16.1	-15.7
Running time %	100	70.9	53.1	100	63.3	45.1	34.1	31.8	26.7	25
Energy consumption Kwh/24h		4.080	3.330		3.444	2.655	1.844	1.767	1.352	1.328
<b>STORAGE TESTS</b>										
Ambient temperature °C	43	38	18	25			32			
Thermostat setting	3 / 7	4 / 7	6 / 7	6 / 7	3 / 7	Interp. +5 °C	5 / 7	4 / 7	Interp. -18 °C	
Refrigerator temperature (average) °C	+4.3	+2.0	-1.3	-1.2	+5.6	+5.0	0.0	+3.3	+0.3	
Warmer package °C	-14.7	-16.3	-15.2	-17.8	-9.0	-9.8	-18.6	-12.7	-18.0	
Average of packages °C	-17.5	-19.3	-19.2	-22.3	-12.3		-22.0	-15.8		
Running time %	74.8	66	27.4	58.1	29.5	32	67.3	44.3	65	
Energy consumption Kwh/24h	4.198	3.641	1.506	2.809	1.647	1.750	3.467	2.309	3.349	
<b>Lower starting voltage test</b>	at 43°C :		187 Volts			at 38°C :		187 Volts		

<b>APPLIANCE</b>	<b>DD 460 (N° 00000003)</b>									
COMPRESSOR : GL 90 AN	CONDENSER : WIRES AND TUBES					REFRIGERANT R 134a : 290 gr				
<b>THERMOSTAT CONTROLS</b>										
Ambient temperature °C	43			38			25		18	
Thermostat setting	7 / 7	3 / 7	1 / 7	7 / 7	5.5 / 7	4.5 / 7	6 / 7	5 / 7	6 / 7	4 / 7
Refrigerator temperature (average) °C	-1.4	+6.0	+7.9	-3.0	+3.7	+6.2	+3.6	+5.2	+4.3	+6.6
Freezer temperature (average) °C	-22.0	-13.4	-12.0	-23.9	-14.7	-12.8	-14.2	-12.4	-14.6	-13.8
Running time %	100	62.7	54.1	100	57.7	48.6	32.2	28	22.9	20.3
Energy consumption Kwh/24h		3.305	2.992		2.852	2.581	1.565	1.418	1.089	1.014
<b>STORAGE TESTS</b>										
Ambient temperature °C	43	38	18	25			32			
Thermostat setting	3 / 7	4.5 / 7	6 / 7	6 / 7	5 / 7	Extrap. -18 °C	5 / 7	4 / 7	Interp. -18 °C	
Refrigerator temperature (average) °C	+4.1	+3.6	+3.5	+3.3	+5.1	+3.1	+0.5	+3.4	+0.7	
Warmer package °C	-14.9	-16.5	-15.7	-17.3	-9.0	-18.0	-18.4	-12.5	-18.0	
Average of packages °C	-17.7	-19.3	-19.3	-18.8	-12.2		-21.9	-15.8		
Running time %	75.2	63.4	32.2	45.6	28	47.1	65.1	43.8	63.7	
Energy consumption Kwh/24h	4.205	3.535	1.558	1.850	1.585	1.872	3.358	2.278	3.285	
<b>Lower starting voltage test</b>	at 43°C :		187 Volts			at 38°C :		187 Volts		