



TOGETHER
for a sustainable future

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TOGETHER
for a sustainable future

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FINAL REPORT

SYNOPSIS

The Delta Industrial Co. "IDEAL" has been selected among other Egyptian Companies to be part of the project aimed to phase out the ozone depleting materials from the refrigerators manufacturing processes.

UNIDO had the task to follow and finance the project implementation and upon contacts with The Delta Industrial CO: "IDEAL" awarded Electrolux International S.p.A. with the contract N.° 96/052 which was aiming to redesign the cooling circuits of three models of refrigerators among the "IDEAL" range of production.

Samples of the chosen models arrived in our premises on 22nd August 1996 and we started testing them to verify their behaviour and performances, using the old refrigerant R12, on 10th September 1996.

The test on the appliances filled with R12 were necessary to establish a parameter to which refer as comparison once modified the appliances to work with the new refrigerant gas R134A.

INTRODUCTION

Before achieving the final result we had several tests and trials to examine the behaviour and the performance level achieved by using the new gas and the relevant results have been already transmitted during the preparation of the Flash Report and Interim Report.

BODY

We are reporting here below the result achieved after the conclusion of the tests.

Refrigerator Model KSG 235 (2 stars)

The appliances tests have been made in the following configuration :

- ◆ charge : 180 g of R134A
- ◆ compressor type: GL 60AA
- ◆ capillary flow rate: 2.2 lt/min (capillary length as defined in the original drawing for the use of R12 i.e. 2760 mm. length, 0.6 mm. internal diameter)
- ◆ thermostat type: K60 L 2121 (-1-16/-8.5-28/+ 5.5)
- ◆ thermostat knob setting :
 - pos 1 (min) = 60°
 - pos 3/4 (med) = 150°
 - pos 6 (max.) = 315°
- ◆ drawer settings : close for ambient temperature lower or equal to 25°
- ◆ load plan : as per enclosed scheme

The tests have covered :

- ◆ continuous running test
- ◆ storage test
- ◆ energy consumption
- ◆ pull down test
- ◆ thermostat running
- ◆ final charge determination
- ◆ starting test
- ◆ winding temperature
- ◆ noise level

This appliances by using the compressor GL 60AA was performing properly as far as the cooling and storing values were concerned but was having problems in the starting voltage both in cold and warm start (see **Interim Report**)

During the meeting held in our laboratories with a delegate of "IDEAL" we proposed to mount a compressor model GL 60AN which is having substantially the same displacement and cooling capacity but a more powerful electric motor so to overcome the starting and overheating problem.

In that occasion we have also been requested to analyse the possibility to make use of a smaller compressor in the GL 50 series to verify the behaviour of the appliances with it. Not being available the version AN (more powerful electric motor) yet, has been agreed to make the test with the normal version GL 50AA.

We have therefore covered also the following additional test :

- ◆ final charge determination for both GL 50 AA and
GL 60 AN
- ◆ continuous running test for both GL 50 AA and
GL 60 AN
- ◆ starting test with GL 60 AN
- ◆ winding temperature with GL 60 AN

We are reporting here below the results of the various test made.



FIRST GROUP OF THE TEST WITH GL 60 AA COMPRESSOR

The 100% load less continuous running test performed both at 43°C and 38°C gave the following results:

AMB. TEMP	43 °C				38 °C			
	original	equipment			original	equipment		
Lab.Reg. Number	009	010	087	088	009	010	087	088
Compressor type	L 45 AW	L 45 AW	GL 60 AA	GL 60 AA	L 45 AW	L 45 AW	GL 60 AA	GL 60 AA
Refr.Avg.Temp.	3.1	3.4	-2.9	-1.6	-0.9	-3.2	-6.4	-4.9
T1	3.7	3.9	-2.6	-1	-0.5	-2.7	-6	-4.4
T2	2.9	3.4	-3	-1.4	-1	-3.1	-6.5	-4.7
T3	2.6	2.9	-3.1	-2.3	-1.2	-3.7	-6.8	-5.6
Th.bulb temp.	-22.7	-19.8	-26.2	-25.4	-26.6	-26.7	-29	-28.1
Evap.inlet temp.	-25	-25.5	-26.1	-25.7	-27.8	-27.9	-29	-28.4
Evap.outlet temp.	-19.1	-18.4	-25.7	-24.6	-22.8	-23.9	-28.1	-27.3
Frez.air temp.	-16.8	-17.2	-18.9	-18.4	-20	-21.3	-21.8	-21.3
Cond. temp.	55.5	52.8	56.7	57.3	48.1	45.6	51.3	51.6
Input Power (W)	101.5	98	120.5	116.5	95.5	94	111	108
Charge (g R134A)	N.A.	N.A.	180	180	N.A.	N.A.	180	180
Drawer settings	open	open	open	open	open	open	open	open

Storage test at 18- 25 - 38° C amb. temp.

Amb.Temp.	18 °C		25 °C		38 °C	
Lab.Reg. Number	087	088	087	088	087	088
Refr.Avg.Temp.	0.3	-0.6	1.3	1.7	1.5	1.9
Warmest Pack Temp.	-12	-12.3	-12.7	-12.2	-12.5	-12.4
Running in %	17	27.5	32	37.5	62	72
T3 min / max	0.6 / 0.9	-0.8 / 0	1.3 / 2.2	1.1 / 2.9	-0.6 / 2.9	-0.3 / 3.3
T1 max	0	-0.7	1	2	3.3	4.1
Thermost. settings	5	5	5 / 6	5 / 6	5	5
Drawer settings	close	close	close	close	open	open

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Energy consumption at 25°C amb. temp.

Amb.Temp.	25 °C	
Lab.Reg. Number	087	088
Refr.Avg.Temp.	2	2
Warmest Pack.Temp.	-12	-12
Running in %	30	36
Cycles / 24 h	34	21
Kwh / 24 h	1.05	1.1
Drawer setting.	close	close

Pull-dow test at 38°C amb. temp (220 V)

Amb.Temp.	38 °C	
Lab.Reg. Number	087	088
Refrigerator (min)	107	115
Freezer(min)	64	67

Thermostat running

See charts :

LOADLESS RUNNING

LAB.#: 087T0996

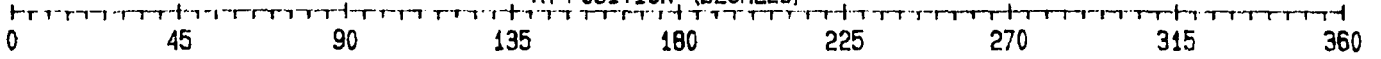
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REP.#: 96-387

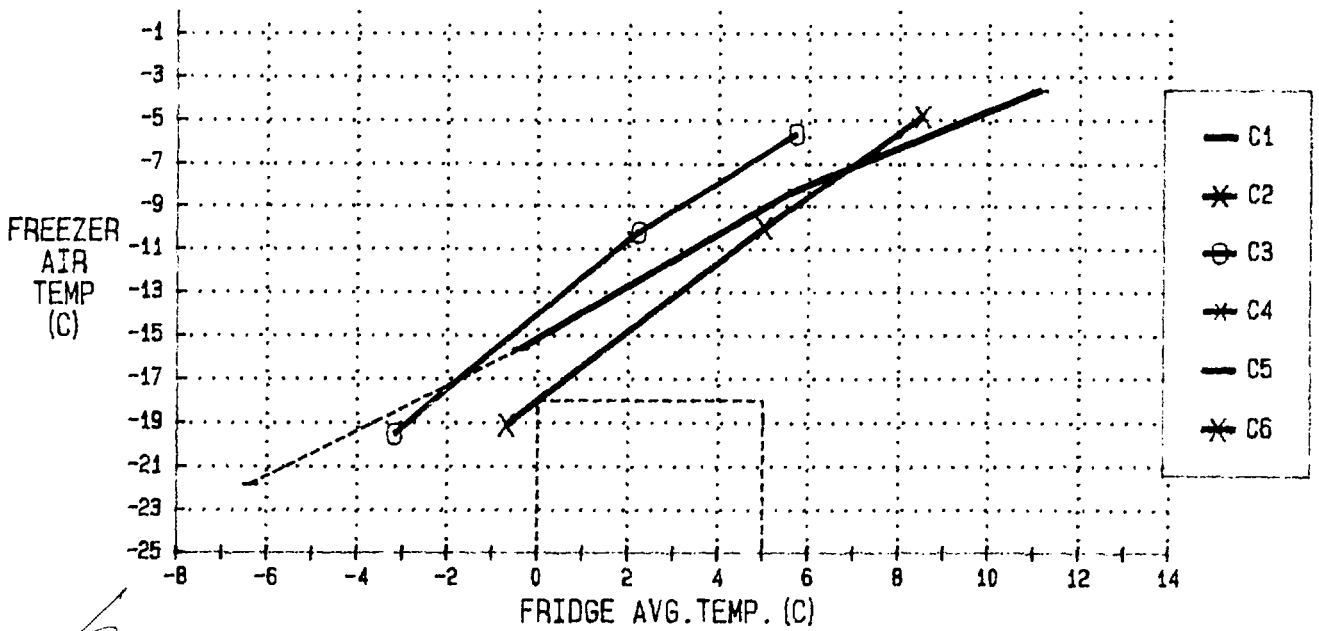
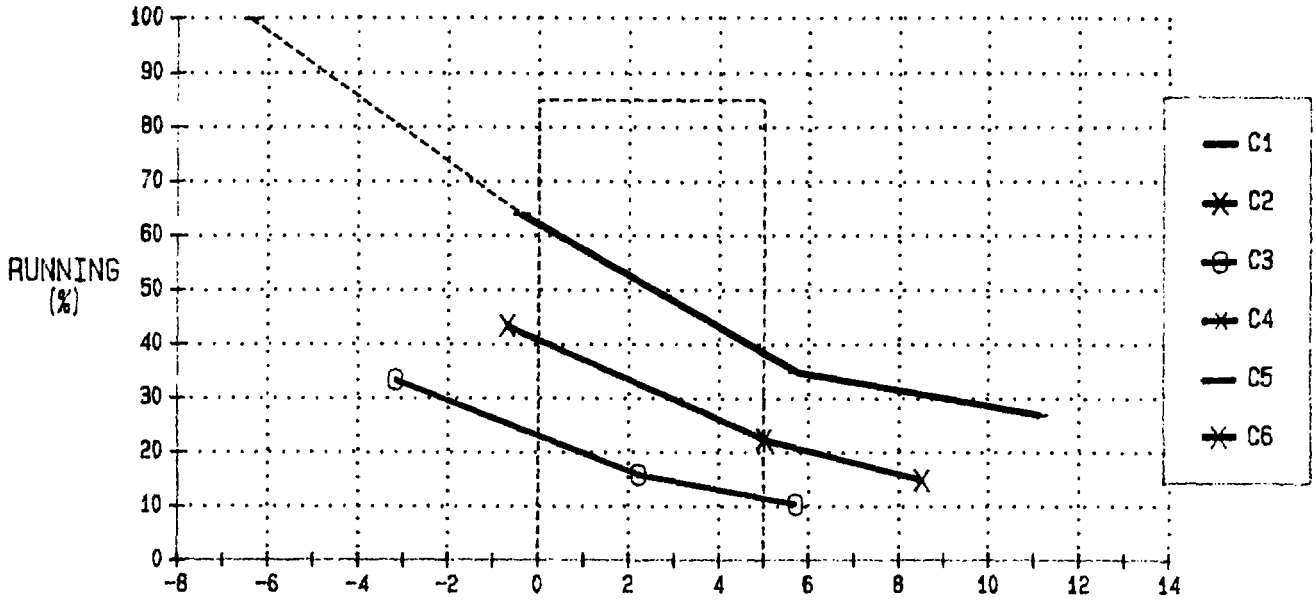
DATE: IDEAL

NOTES: K60L2121

TH POSITION (DEGREES)



GRAPH	AMB. T	100%	C	M	W
C1 :	38 (C)	-6.4 (C)	5.2	3.5	1.0
C2 :	25 (C)		6.0	3.5	1.0
C3 :	18 (C)		6.0	3.5	1.0



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LOADLESS RUNNING

LAB.#: 088T0996

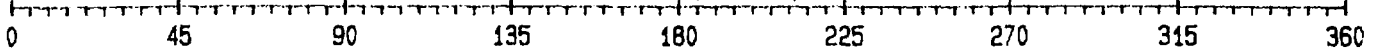
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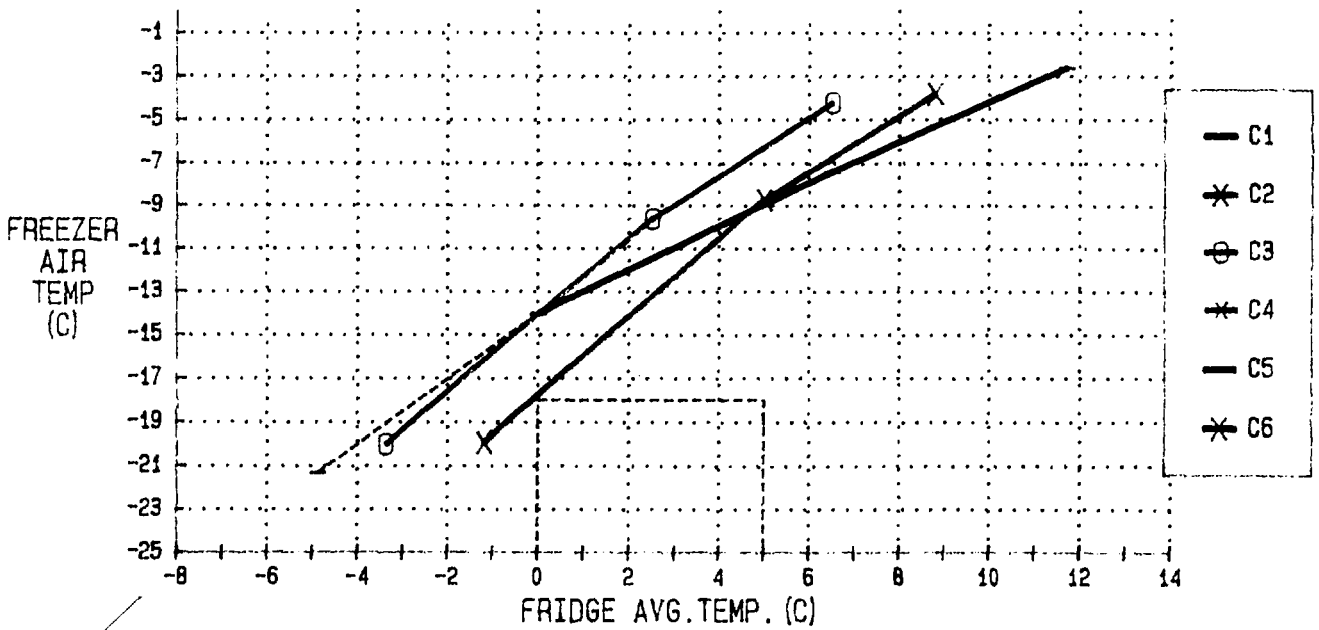
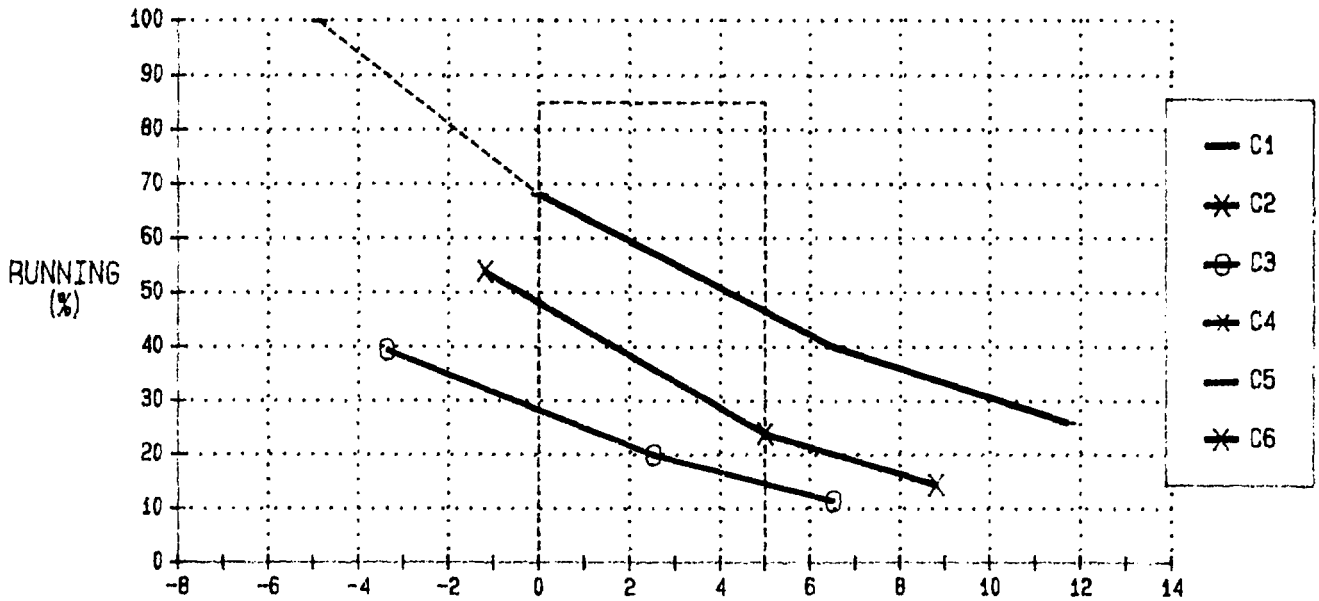
DATE: IDEAL

NOTES: K60L2121

TH POSITION (DEGREES)



GRAPH	AMB. T	100%	C	M	N
C1 :	38 (C)	-4.9 (C)	5.0	3.5	1.0
C2 :	25 (C)		6.0	3.5	1.0
C3 :	18 (C)		6.0	3.5	1.0



2ND GROUP OF TESTS

N.B. the GL 50AA, GL60AN had been tested according to the agreements made on data 25.11.96

Charge of R134A

The optimised charge amount is of 180g R134A

See charts :

2

RICERCA DI CARICA

LAB. #: 087T0996

AP. TYPE: KSG235

REP. #: 96-387

DATE: 2,2 L/MIN

NOTES: GL60AA

C1: Tmc (C)

C2: T. FZ (C)

C3: T. Ent.Ev. (C)

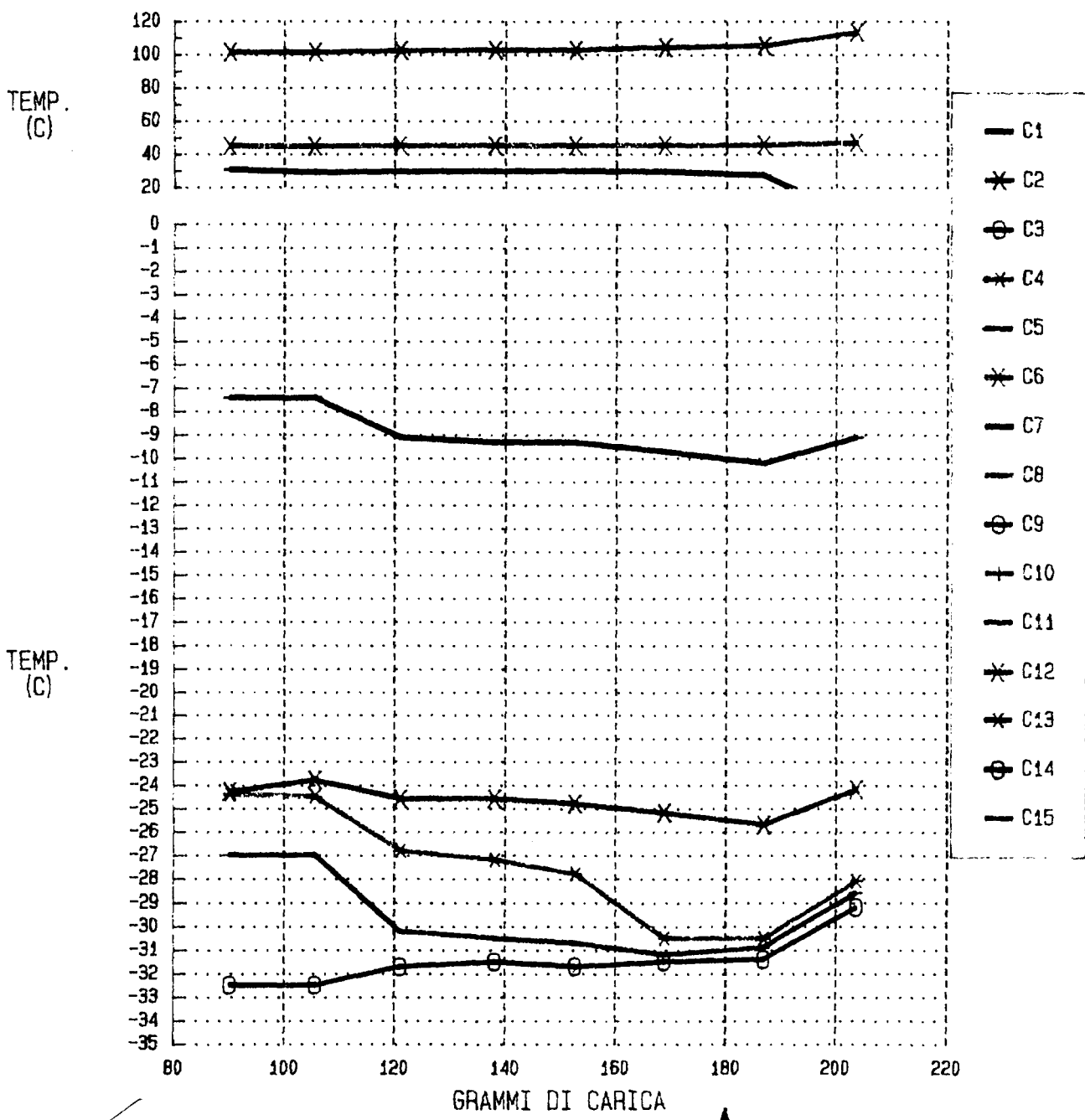
C4: T. Usc.Ev. (C)

C5: T. Bulbo (C)

C6: T. Filtro (C)

C7: T.Scamb. (C)

C8: Potenza (W)



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The continuous running at 32°C and 38 °C for the various type of compressor substantially shown a similar behaving

Continuous running test at 32°C amb. temp. and...

38°C amb. temp.

Amb.Temp.	32°C			38°C
Lab.Reg. Number	087	088	036	036
Compressor type	GL 60 AA	GL 50 AA	GL 60 AN	GL 60 AN
Refr.Avg.Temp.	-9.7	-8.9	-8.5	-5.7
T1	-9.4	-8.5	-8.1	-5.3
T2	-9.5	-9	-8.7	-5.8
T3	-10.1	-9.1	-8.7	-6
Th.bulb temp.	-31.2	-28.5	-30.2	-27.7
Evap.inlet temp.	-31.5	-28.7	-30.4	-28.5
Evap.outlet temp.	-30.5	-27.6	-29	-27
Frez.air temp.	-25.2	-22.3	-23	-20.5
Cond. temp.	45.7	45.7	45.3	52
Input Power (W)	104	89	105	113
Charge (g R134A)	180	180	180	180
Drawer settings	open	open	open	open

ELECTRICAL TESTS

Starting test at 38°C amb. temp. (187V) with GL60 AN (pull down)

The appliance started regularly (P.eq. = 6.2 bar)

P.d. Fr = 110 min

P.d. Fz = 70 min

Winding temperature at 43°C amb. temp. (254 V) with GL60AN

N.B. : This test had been made at the worst conditions assuming a class T appliance

036-----> Main W: = 73.7

Start W. = 72.1

Limit = 97

Comments

The appliances had been tested with GL 60AN to improve the starting performances and with GL 50AA to show that a scaling down of the compressor could be made only at the extent of a performance reduction especially concerning the starting test behaviour that can be solved only with a GL50AN compressor.

The noise level measured was of 38 dBA (see chart)

ZANUSSI ELETTRODOMESTICI S.p.A.

Divisione Refrigerazione - Smeqna

AB Electrolux
EPD - Cold

Rapporto prova Rumore

Check Point 1

ISO 913 (ISO 9960 / IEC 704-1)

AP.: KSG235

DATA: 18/11/1996

N.RAF.: 054BT96

COMP.FR.: E60AA

COMP.FZ.:

MATR.: 088T096

STAB.: ZS

LABEM.: PROG/LAB

TIPOP.: SV

INST. PROVA.: FS

T.AMB.(°C): 24.0

P(mbar): 1005

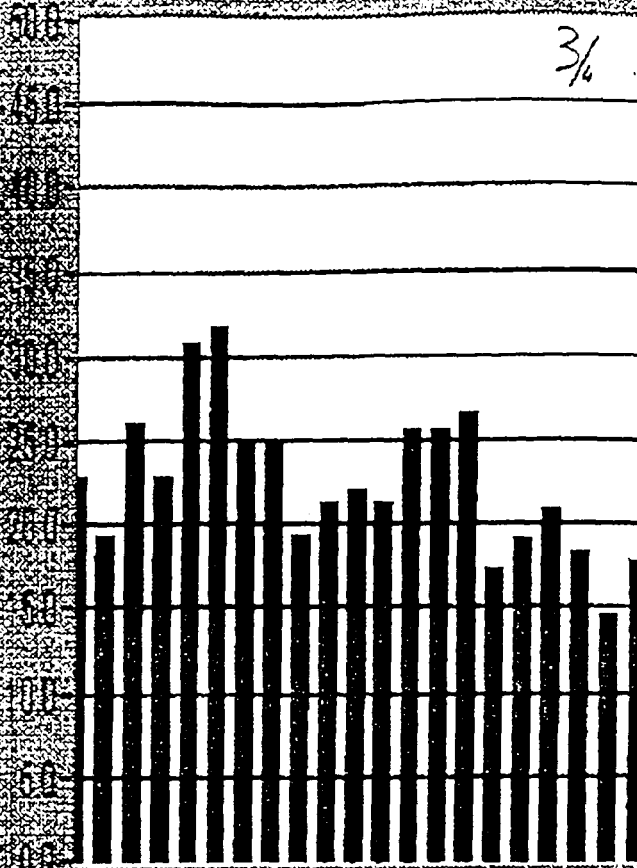
U.B.(%): 50

TOT.SPENTRO LWA: 38.0

COMMENTI

STEADY STATE

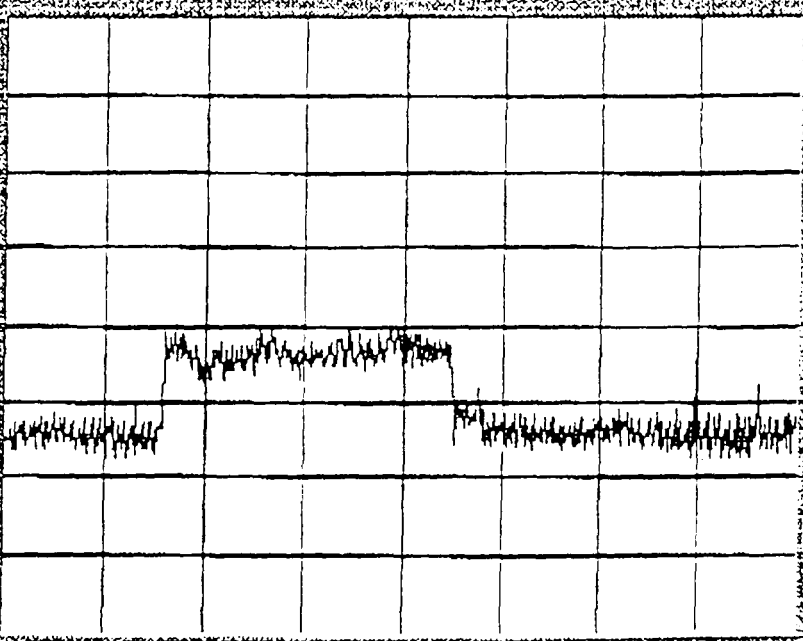
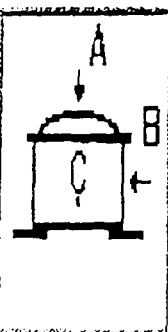
SENZA DAMPER



100 Hz = 22.8
125 Hz = 19.4
160 Hz = 25.9
200 Hz = 22.7
250 Hz = 30.6
315 Hz = 31.6
400 Hz = 24.7
500 Hz = 24.8
630 Hz = 19.2
800 Hz = 21.3
1 KHz = 22.0
125 KHz = 21.2
16 KHz = 25.4
2 KHz = 25.4
2.5 KHz = 26.5
3.15 KHz = 17.3
4 KHz = 19.0
5 KHz = 20.9
6.3 KHz = 18.4
8 KHz = 14.6
10 KHz = 17.8

COMPR. B = 19

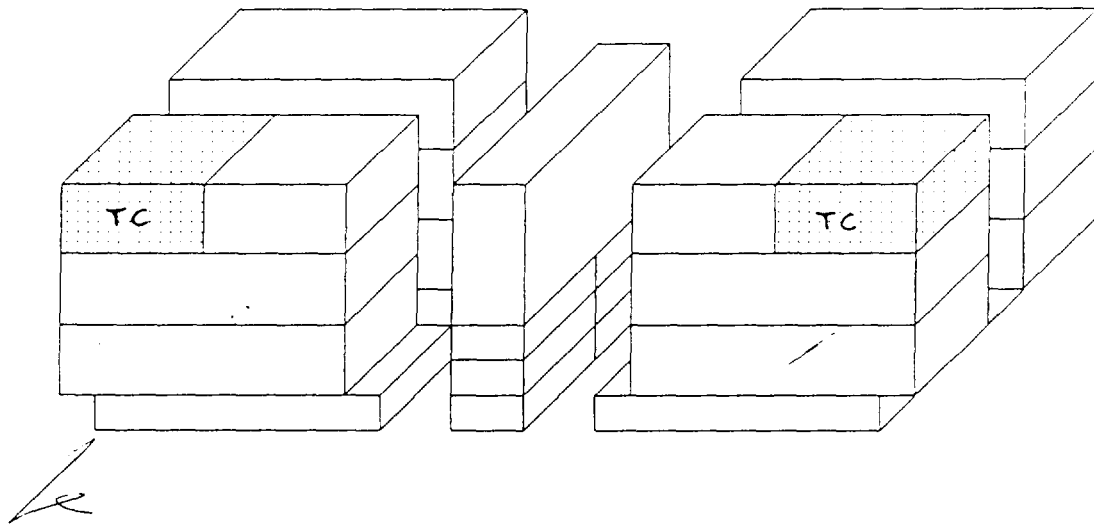
COMPRESSORE
0191863-9



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LOAD PLAN

KSG235 - IDEAL



Kg. 15,75

Refrigerator model KS 328 ZL (4 stars)

The appliances was fitted as follows to perform the test :

- ◆ charge: 120 g R134A (optimised during the storage test at 18°C ambient temperature)
- ◆ compressor type: GL 99AA
- ◆ capillary flow rate: 2.2 lt/min (capillary length 4 Mt. internal dia 0,65 mm)
- ◆ thermostat: K59L1900 (-9-27/+4)
- ◆ load plan: as per enclosed scheme

The tests have covered :

- ◆ continuous running test
- ◆ storage test
- ◆ energy consumption
- ◆ pull down test
- ◆ starting test
- ◆ thermostat running
- ◆ warn and cold start
- ◆ winding temperature
- ◆ freezing test
- ◆ noise level

With the related compressor GL 99AA the appliances was performing properly as far as the cooling and storing, but did not achieve to freeze the required quantity of food neither in "T" nor in "ST" condition, as per ISO standard.

During the meeting held in our laboratories in November last, we have been requested to test the appliances also with a smaller compressor : the GL90AN.

We have therefore made the additional test :

- ◆ charge determination
- ◆ continuous running
- ◆ starting voltage
- ◆ pull down
- ◆ winding temperature

We are reporting here below the result of the test made :

[Handwritten signature]

FIRST GROUP OF TEST WITH GL99AA COMPRESSOR

Continuous running test at 32 - 38° C amb. temp.

Amb. Temp.	32 °C		38 °C			
			original equipment			
Lab.Reg. Number	091	092	005	006	091	092
Compressor type	GL 99 AA	GL99 AA	E80-801	L 45 AW	GL 99 AA	GL99 AA
Refr.Avg.Temp.	-6.7	-6.7	-2.1	-1.3	-2.3	-2.5
T1	-4.5	-4.6	0	0.7	-0.1	-0.4
T2	-6.5	-6.3	-1.3	-0.4	-2.1	-2.1
T3	-9.2	-9.1	-5	-4.3	-4.8	-5
Therm.bulb temp.	-28.5	-27.4	-22.5	-23.3	-24.8	-24.2
Evap.inlet temp.	-31.1	-31.2	-27.5	-27.9	-28.8	-28.5
Evap.outlet temp.	-31.2	-31.9	-27.2	-27.3	-28.1	-29.1
Frez air temp.	-27.5	-27.1	-23.9	-24.3	-24.3	-24.3
Cond. temp.	46.9	46.9	52.7	51	53.2	52
Input Power (W)	129	123	N.A.	N.A.	140	133
Charge (g R134A)	120	120	N.A.	N.A.	120	120

Storage test at 18 - 25 - 38°C amb.temp.

Amb. Temp.	18 °C		25 °C		38 °C	
Lab.Reg. Number	091	092	091	092	091	092
Refr.Avg.Temp.	1.8	1.4	2.2	2.6	2.6	4.2
Warmest Pack.Temp.	-18.2	-19.4	-18.3	-18.9	-20	-18
Running in %	25	31	39	42	81.5	68.5
T3 min / max	-3 / 4.5	-3.7 / 4.1	-3.7 / 5.3	-2.7 / 5	-4 / 6	-1.4 / 6.3
T1 max	4.5	4.3	5.6	5.4	7.4	7.8
Thermost. settings	4	4 / 5	3 / 4	3 / 4	2 / 3	2

Energy consumption at 25° C amb. temp.

Amb. Temp.	25 °C	
Lab.Reg. Number	091	092
Refr.Avg.Temp.	2.3	3.5
Warmest Pack.Temp.	-18	-18
Running in %	37	37
Cycles / 24 h	17	21
Kwh / 24 h	1.42	1.38

Pull-down test at 38°C amb. temp (220 V)

Amb. Temp.	38 °C	
Lab.Reg. Number	091	092
Refrigerator (min)	131	143
Freezer(min)	86	86

Thermostat running

See charts



LOADLESS RUNNING

LAB.#: 091T0996

AP. TYPE: KS328ZL

REP.#: 96-387

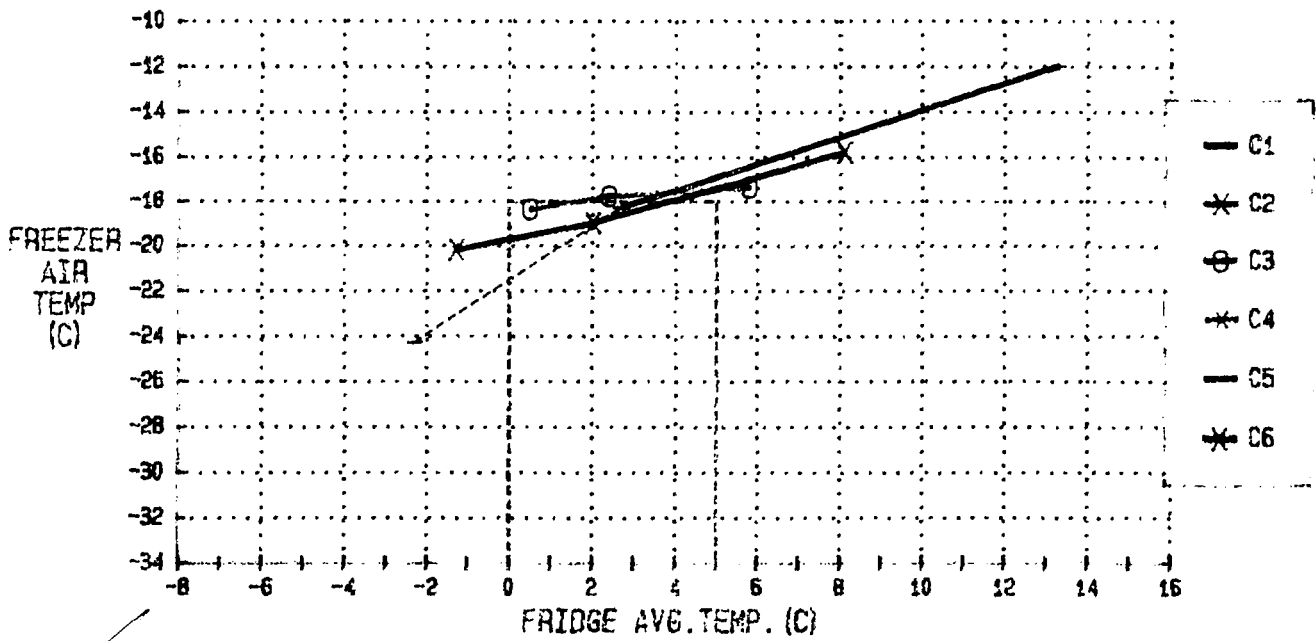
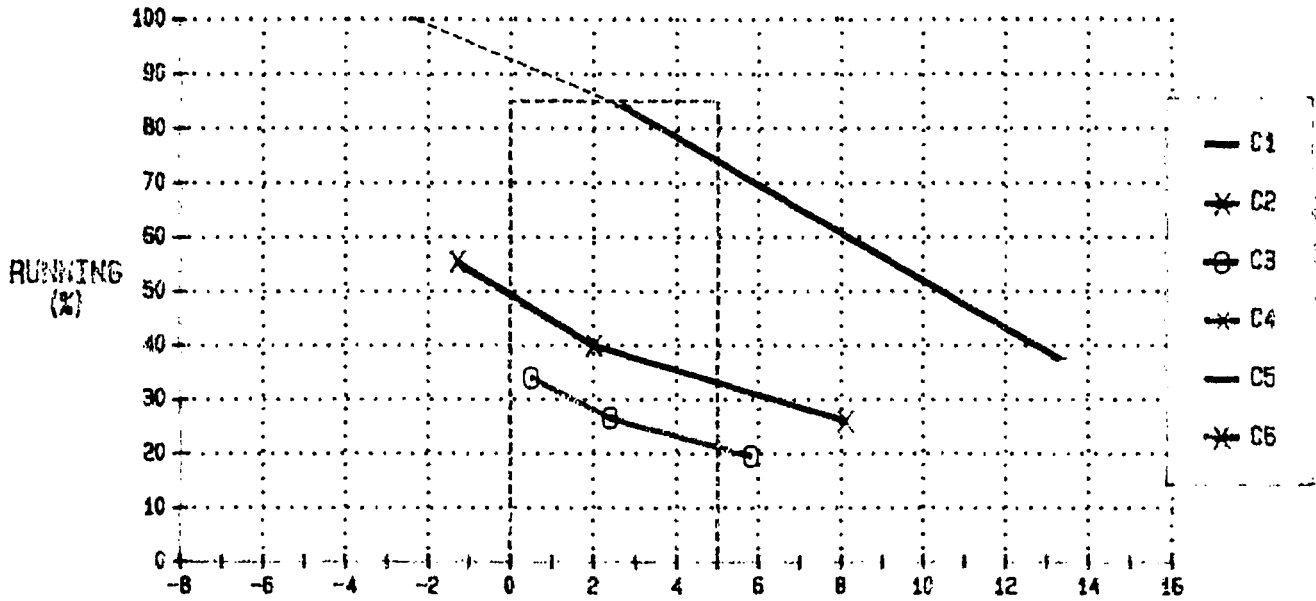
DATE: -9-27/+4

NOTES: GL99AA

TH POSITION (DEGREES)

0 45 90 135 180 225 270 315 360

GRAPH	AKB.T	100%	C	M	W
C1:	38 (C)	-2.3 (C)	2.5		1.0
C2:	25 (C)		5.0	3.0	1.0
C3:	18 (C)		5.0	3.0	1.0



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LOADLESS RUNNING

LAB.#: 092T0996

AP. TYPE: KS328ZL

REP.#: 96-387

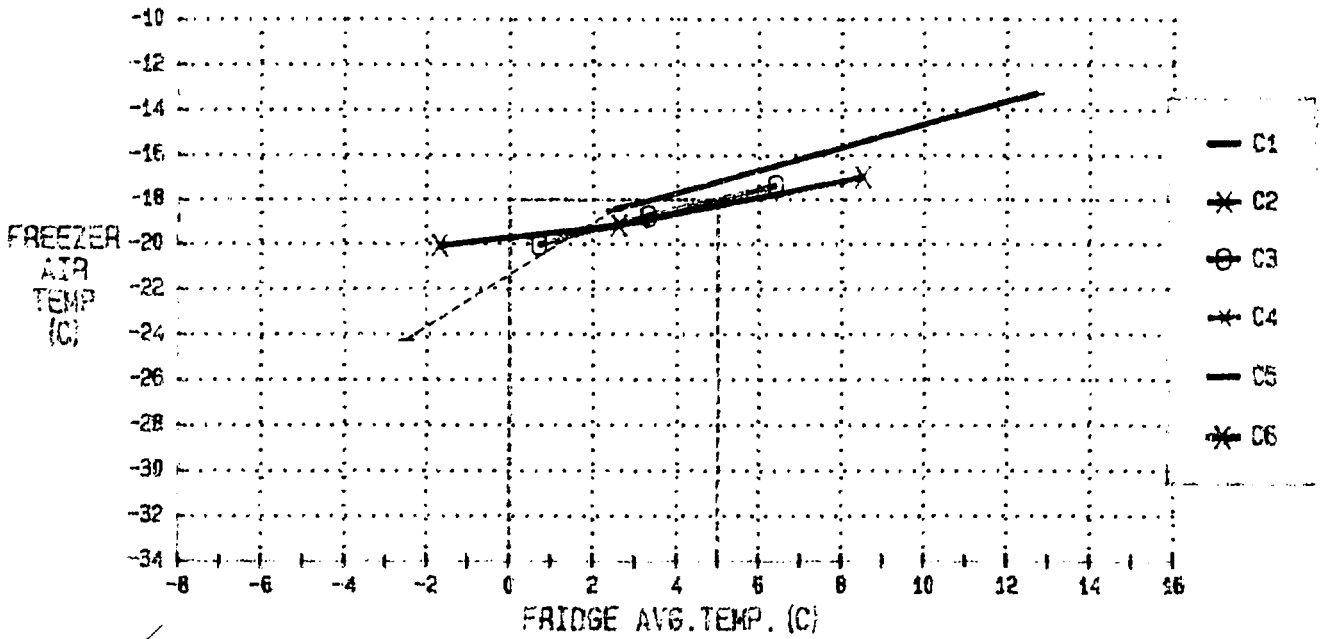
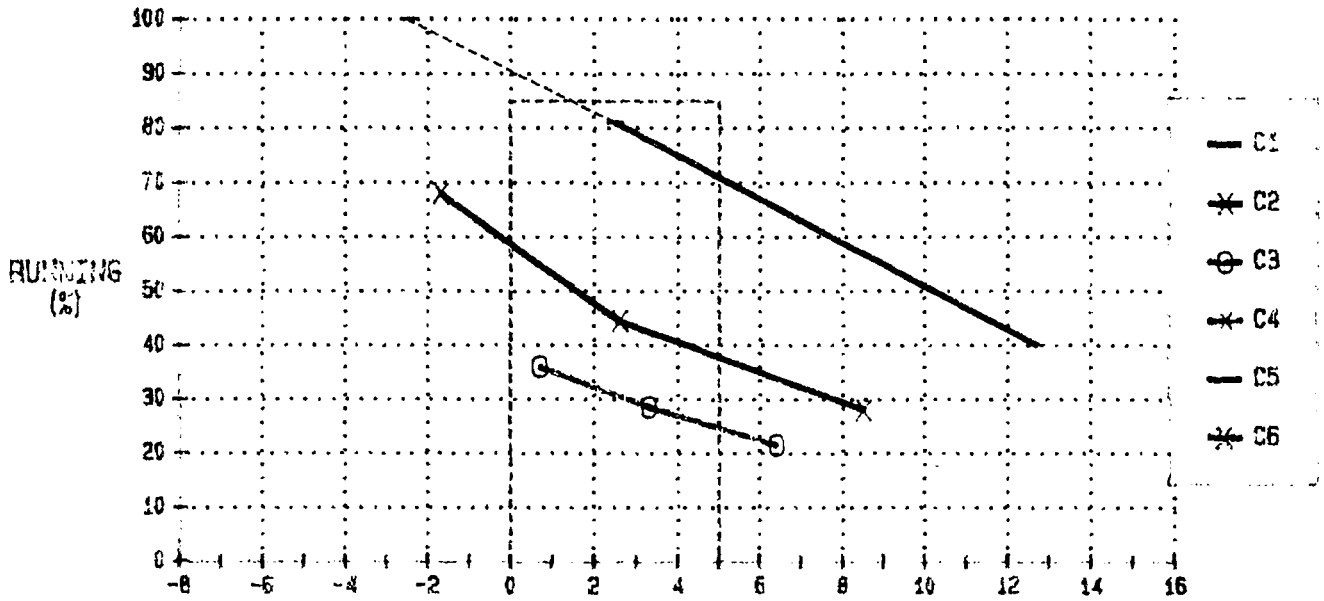
DATE: -9-27/44

NOTES: GL99AA

TH POSITION (DEGREES)

0 45 90 135 180 225 270 315 360

GRAPH	AMB. T	100%	C	M	W
C1 :	38 (C)	-2.5 (C)	2.5		1.0
C2 :	25 (C)		5.0	3.0	1.0
C3 :	18 (C)		5.0	3.0	1.0



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Starting test at 38°C amb. temp (187 V) (pull down)

The appliance started regularly (P.eq. = 4 bar)

	091	092
P.d. Fr.	131	143
P.d. Fz	86	86

Winding temperature at 38°C amb. temp. (254 V)

091.....> Main W. = 101.3 Start W. = 98.9 Limit = 102

092.....> Main W. = 99.7 Start W. = 95 Limit = 102

Cold and warm starts at 38°C amb. temp.

Cold starts 3 x 187V = O.K. 3 x254V = O.K.

Warm starts 3 x 187V = O.K. 3 x254V = O.K.

Freezing test at 25°C amb. temp. (2,5 Kg light load)

Amb.Temp.	25°C
Lab.Reg. Number	092
Refr.Avg.Temp. Init.	2.5
T3 min. Init.	1.6
Warmest Pack.Temp. Init.	-19.3
T3 min dur.	-1.2
Refr.Avg Temp Dur.	-14
Freezing O.K. (hours)	/

The freezing test had given a negative result.

To freeze 2,5 Kg. of light load does not comply with ISO standard because the ballast load reaches - 14°C (limit = 15°C).

2ND GROUP OF TESTS

N.B. : The GL 90AN had been tested according to the agreement made on date 25.11.96

Charge of R134A

The charge amount is of 120 g R134A

See charts

RICERCA DI CARICA 43°C

LAB. #: 091T0996

AP. TYPE: KS3287L

REP. #: 96-387

DATE: IDEAL

NOTES: 6L39AA

C1: Tm (C)

C2: T. F2 (C)

C3: T. Ent. Ev. (C)

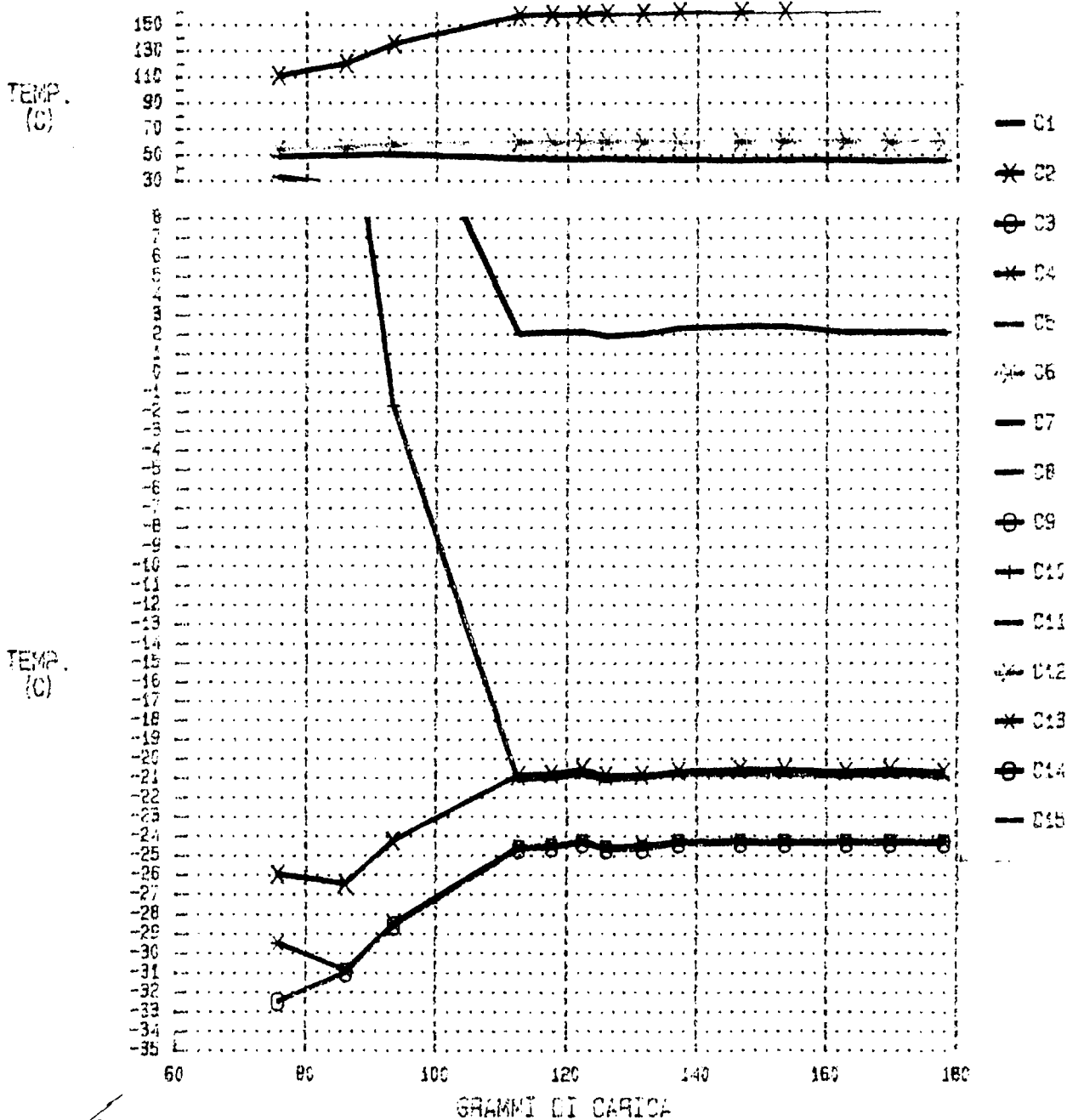
C4: T. Usc. Ev. (C)

C5: T. Bulbo (C)

C6: T. Filtra (C)

C7: T. Scamb. (C)

C8: Potenza (K)



↑
charge optimized during the storage test

RICERCA DI CARICA 43°C

LAB. #: 092T0996

AP. TYPE: KS328ZL

REP. #: 96-387

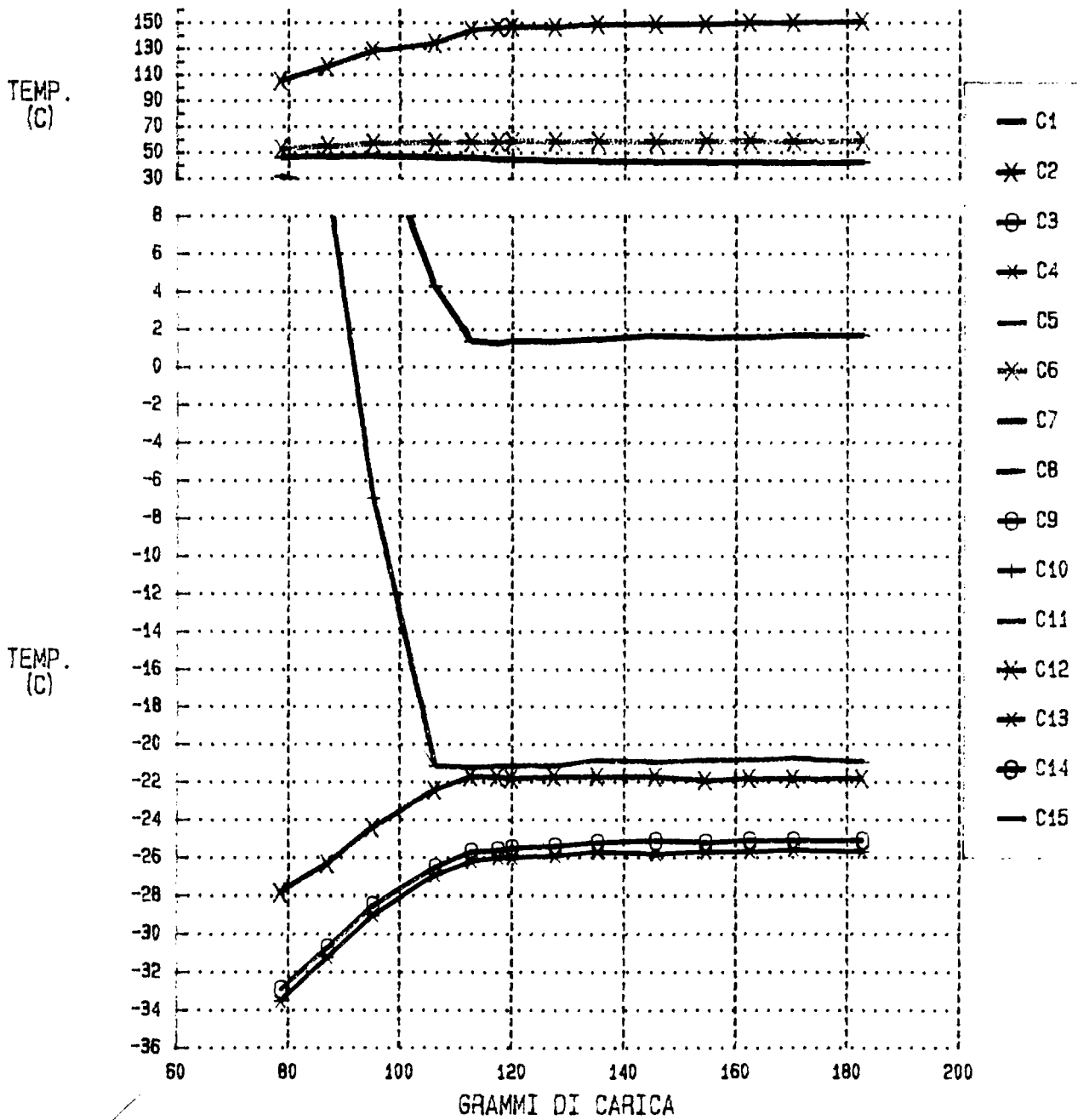
DATE: IDEAL

NOTES: GL99AA

C1: Tmc (C) .
 C4: T. Usc. Ev. (C) .
 C7: T. Scamb. (C) .

C2: T. FZ (C) .
 C5: T. Bulbo (C) .
 C8: Potenza (W) .

C3: T. Ent. Ev. (C) .
 C6: T. Filtro (C) .



↑
 charge optimized during the storage test

Continuous running test at 32°C and 38°C amb. temp.

Amb.Temp.	32 °C		38 °C	
Lab.Reg. Number	091	091bis	091	091bis
Compressor type	GL 99 AA	GL90 AN	GL 99 AA	GL90 AN
Refr.Avg.Temp.	-6.7	-6	-2.3	-1.8
T1	-4.5	-3.8	-0.1	0.5
T2	-6.5	-5.7	-2.1	-1.4
T3	-9.2	-8.6	-4.8	-4.6
Therm. bulb temp.	-28.5	-28.5	-24.8	-25
Evap.inlet temp	-31.1	-30.3	-28.8	-27
Evap.outlet temp.	-31.2	-29.9	-28.1	-26.8
Frez.air temp.	-27.5	-27.2	-24.3	-23.7
Cond. temp.	46.9	47.8	53.2	55
Input Power (W)	129	156	140	169

ELECTRICAL TESTS**Starting test at 43°C amb. temp (187V) with GL90 AN (pull down)**

The appliance started regularly (P.eq. = 4.4 bar)

P.d. Fr = 205 min

P.d. Fz = 140 min

Windings temperature (233 V) with GL 90 AN

Only at 38°C amb. temp. the over-heating of the compressor windings comply with the limit (140°C), this comply with the norm for an ST class appliance

Comments

The appliance doesn't reach the 4 stars rating according the ISO. It can be rated 3 stars only. The electrical tests show that the GL90AN compressor comply with the IEC 335-2-24 standard only at 38°C amb. temp.

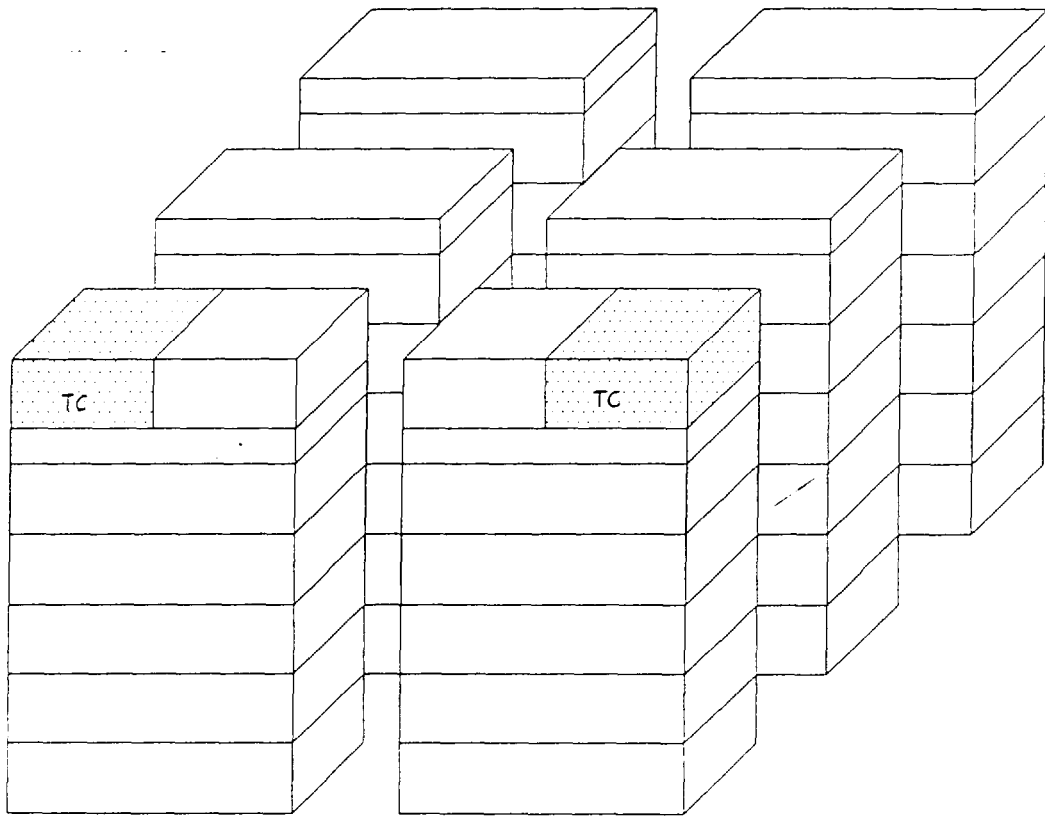
Good performances are reached in the continuous running test.

Our conclusion is that the GL 90 compressor model can be used both in the AA or AN version (AN is supposed to be hotter and more power consuming that the AA version).

GL99AA is of course the best choice having enough power to release at any demand.

PIANO DI CARICO

KS328ZL - Ideal



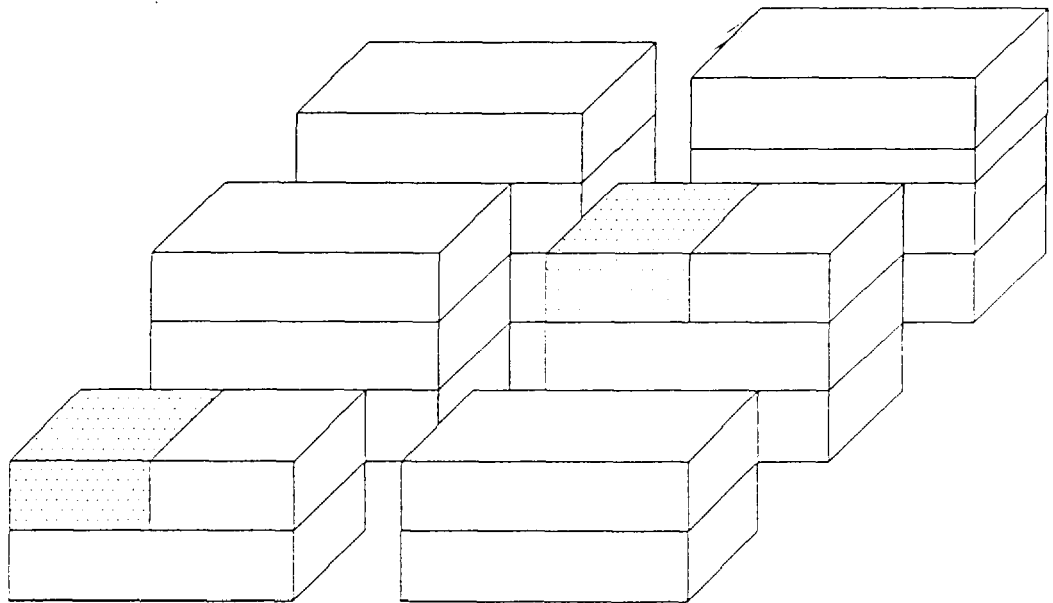
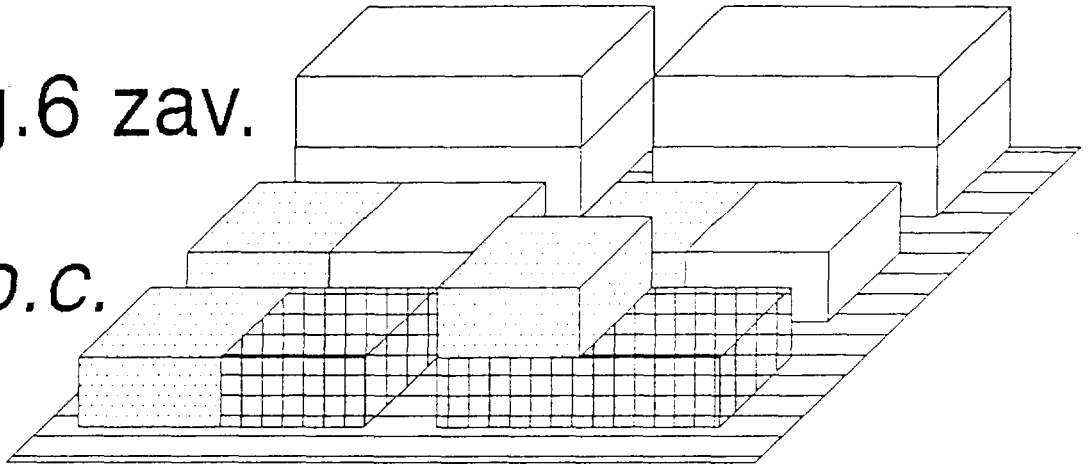
4 Kg. 39

PIANO DI CARICO CONGELAMENTO

KS328ZL - IDEAL

Kg.6 zav.

Kg.2,5 p.c.



Kg.16,5 zav.

Tot Kg.22,5 zav.

The noise level measured was of 39 dBA

(See chart)

A small, handwritten mark or signature, possibly initials, located below the text "(See chart)".

ZANUSSI ELETTRODOMESTICI Sp.A.

Divisione Refrigerazione - Sesto San Giovanni

AB Electrolux
EPD - Cold

Rapporto prova Rumore
Check Point 1

I.Std #13 (ISO 8960 / IEC 704-1)

AP.: DP280DT FS DATA: 05/12/1996 N.RAF.: 018B1296
*S 328 2 L
COMP.FR.: GL99AA COMP.FZ.: MATR.: 09T0996

STAB.: ZS LAB.EM.: PROG/LAB TIPO P.: SV

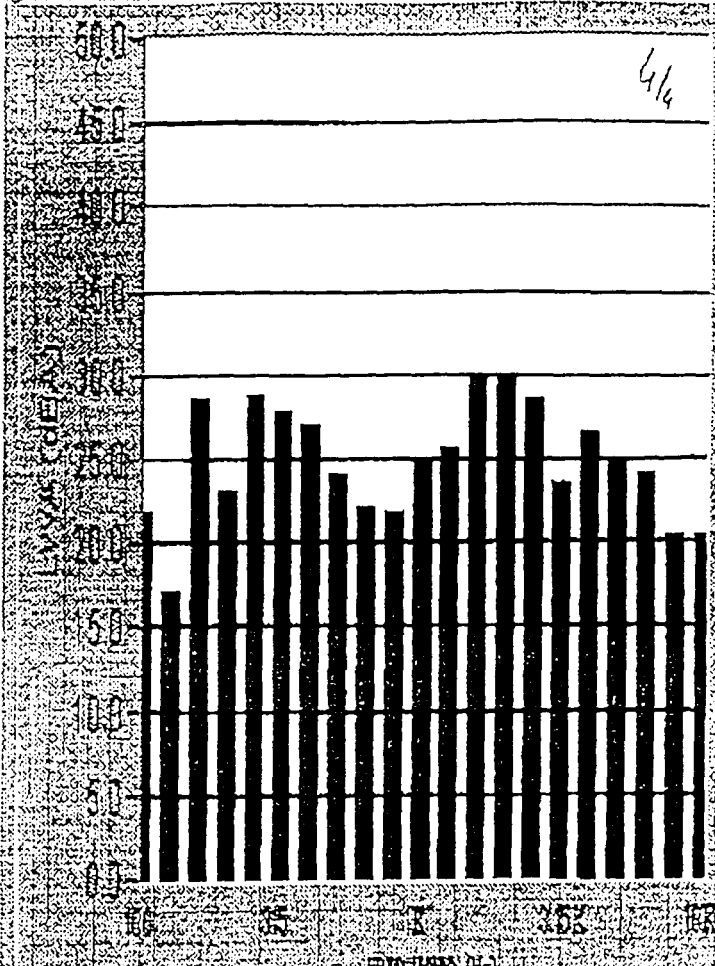
INST. PROVA: FS

T.AMB(C): 21.0 P(mbar): 1020 U.B(%): 36

TOT.SPETTROLWA = 39.0

COMMENTI

STEADY STATE
IDEAL EGITTO KSS28ZL - N.2 DAMPER MANDATA
N.1 DAMPER RTORNO



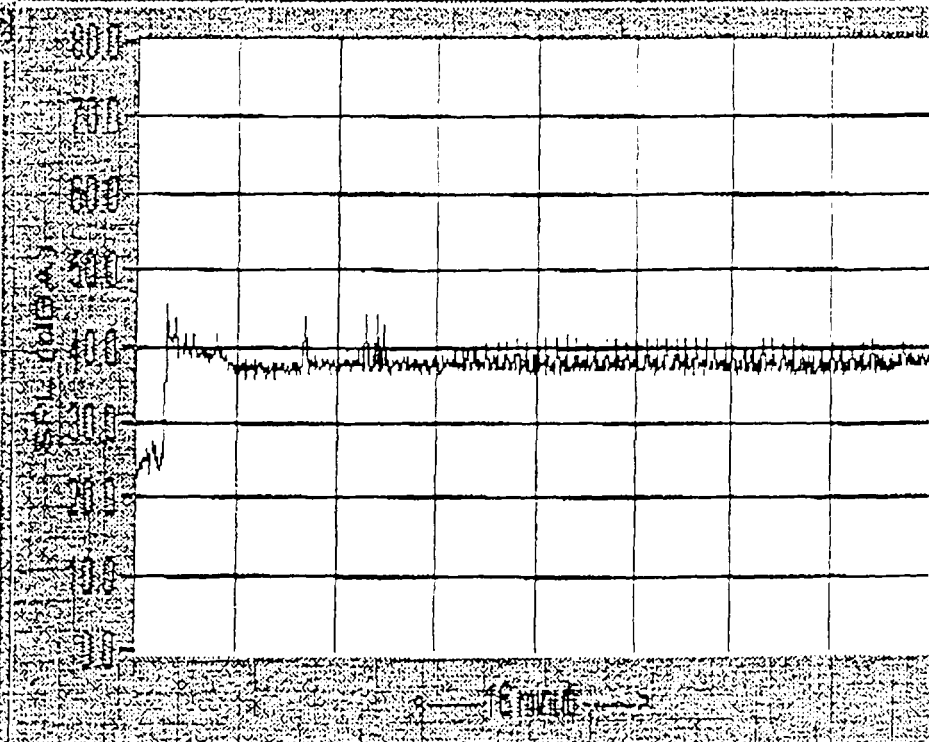
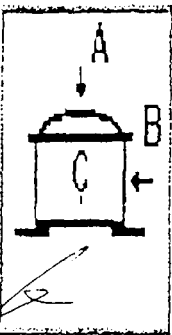
Valori spettrolwa (dB(A))

100 Hz = 21.7
125 Hz = 17.1
160 Hz = 28.5
200 Hz = 22.3
250 Hz = 29.7
315 Hz = 27.8
400 Hz = 27.0
500 Hz = 24.1
630 Hz = 22.1
800 Hz = 21.7
1KHz = 24.8
1.25 KHz = 25.4
1.6 KHz = 29.6
2 KHz = 29.7
2.5 KHz = 28.5
3.15 KHz = 23.5
4 KHz = 26.5
5 KHz = 25.0
6.3 KHz = 24.0
8 KHz = 20.4
10 KHz = 20.2

MIS. SOSTITUZIONE

COMPR. B - 2.7

COMPRESSORE
10143-9



Refrigerator Model RC 280 (2 stars)

The appliances tests had been made in the following configuration :

- ◆ charge: 120 g of R134A
- ◆ compressor type: GL 99AA
- ◆ capillary flow rate: 2.2 lt/min (capillary length 9650 mm 0,78 mm internal diameter)
- ◆ condenser: 1100x 450 mm
- ◆ thermostat type: K60 L 2121 (-1-16/-8.5-28/+ 5.5)
- ◆ thermostat knob setting :
 - pos 1 (min) = 60°
 - pos 3/4 (med) = 150°
 - pos 6 (max.) = 315°

The tests have covered :

- ◆ continuous running test
- ◆ pull down test
- ◆ thermostat running
- ◆ winding temperature test
- ◆ starting test
- ◆ intermittent test
- ◆ noise level

Despite rated at "Two stars" the refrigerators received was not attaining to this rating in the original configuration filled with R 12. The material used for the insulation of the cabinet probably is not allowing to achieve and/or maintain the "Two stars" characteristics: In agreement with IDEAL has therefore been decided to verify the behaviour of the refrigerator in "T" class as per ISO standard checking the attaining of the "ICE" performances. We are reporting here below the result of the various tests made

Continuous running test at 43°C amb. temp.

Amb.Temp.	43 °C			
	original	equipment	2 21 mm	cond. 1100x450
Lab.Reg. Number	011	012	089	090
Compressor type	L 55 AV	L 55 AV	GL 99 AA	GL99 AA
Refr.Avg.Temp.	6.3	5.5	2.2	2.2
T1	6.5	5.8	2.3	2
T2	6.2	5.3	2.3	2.8
T3	6.2	5.4	2	2
Th.bulb temp.	-16.8	-17.4	-24.2	-23.7
Evap.inlet temp.	-18.2	-18.7	-24.3	-24.7
Evap.outlet temp.	-18.7	-19.9	-25.3	-26
Frez.air temp.	-8.8	-10	-13.7	-13
Cond. temp.	64.4	62.6	61.8	58
Input Power (W)	143	139	161	163
Charge (g R134A)	N. A.	N. A.	120	120

Charge research : See chart

RICERCA DI CARICA

LAB. #: 089T0996

AP. TYPE: RC280LF

REP. #: 96-387

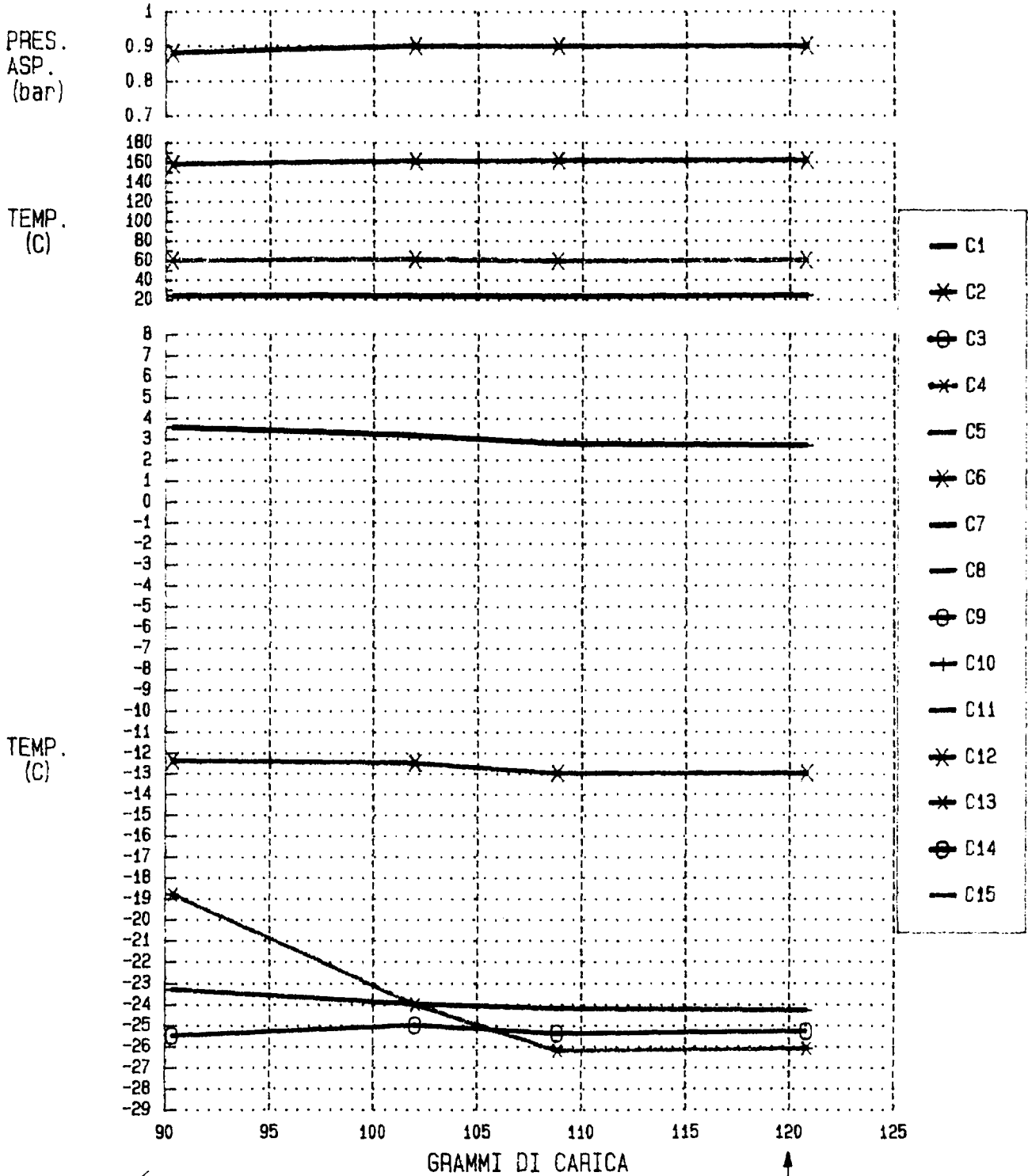
DATE: IDEAL

NOTES: GL99AA

C1: Tmc (C) .
 C4: T. Usc. Ev. (C) .
 C7: T. Scamb. (C) .

C2: T. FZ (C) .
 C5: T. Bulbo (C) .
 C8: Potenza (W) .

C3: T. Ent. Ev. (C) .
 C6: T. Filtro (C) .



Handwritten signature

ELECTRICAL TESTS

N.B. The electrical tests had been made according to IDEAL specifications PE 2100AA

Pull-down test at 43°C amb. temp. (220 V)

Amb. Temp.	43 °C	
Lab.Reg. Number	089	090
Refrigerator Avg. Temperature	7	7
Elapsed time (min)	155	130

Winding temperature

089.....> Main W. = 89.87 Start W. = 89.56 (220 V supply)

090.....> Main W. = 94.4 Start W. = 91.26 (254 V supply)

Starting test at 43° C amb. temp.

0 (242 V) -The compressor starts successfully
 1÷10 (187 V) -The compressor starts successfully
 11 (182 V) -The compressor doesn't start (lowest starting voltage test)

The appliances does comply with the IEC-335224 as regards overheating and starting tests.

Intermittent test at 43°C amb. temp.

Amb. Temp.	43 °C			
Lab.Reg. Number	0 89		0 90	
Thermost. settings	1	3 / 4	1	3 / 4
Refrigerator Avg. Temp.	12.3	7.7	11.2	5.7
Refrigerator Min. Temp.	12.1	7.4	10.9	5.2
Freezer Air Temp.	-1.8	-7.4	-0.5	-11
Running %	43	66	44.5	72
Cycles / 24 h	127	94	146	89
Therm. bulb temp. (min max)	-18 / -3	-22 / -8	-16 / -2	-21 / -7
Kwh/24h	2.36	3.1	2.4	3.32

Thermostatic running

See chart

LOADLESS RUNNING

LAB.#: 089T0996

AP.TYPE: RC280LF

REP.#: 96-387

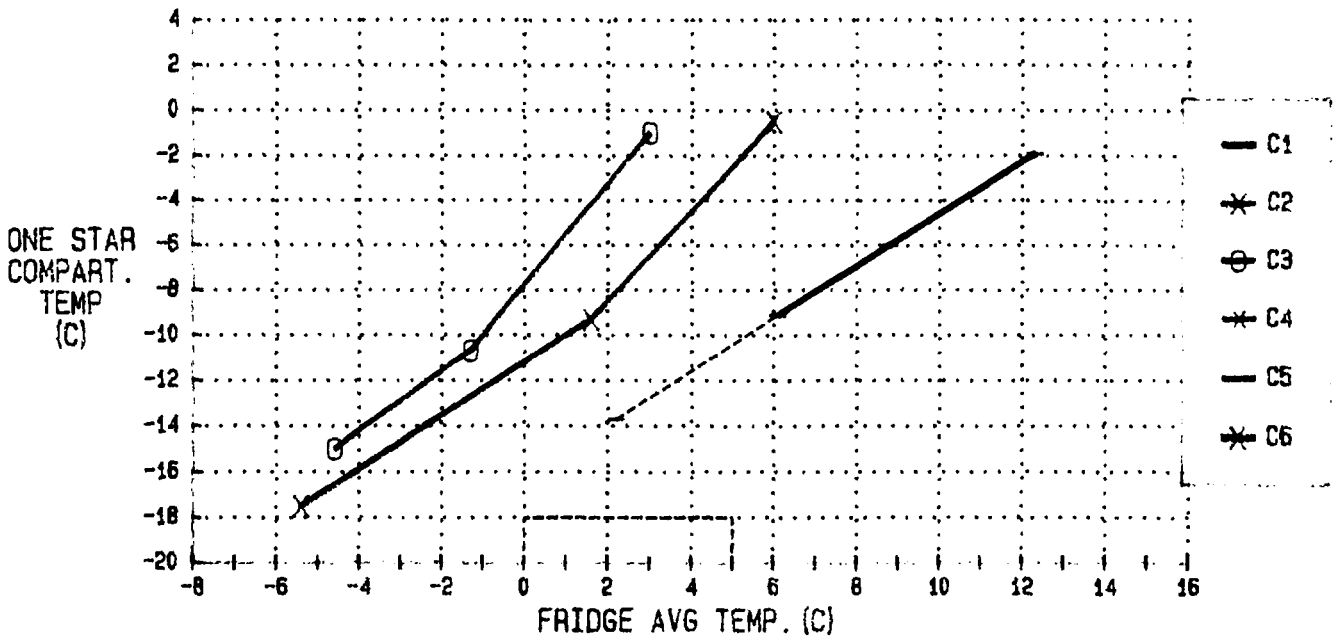
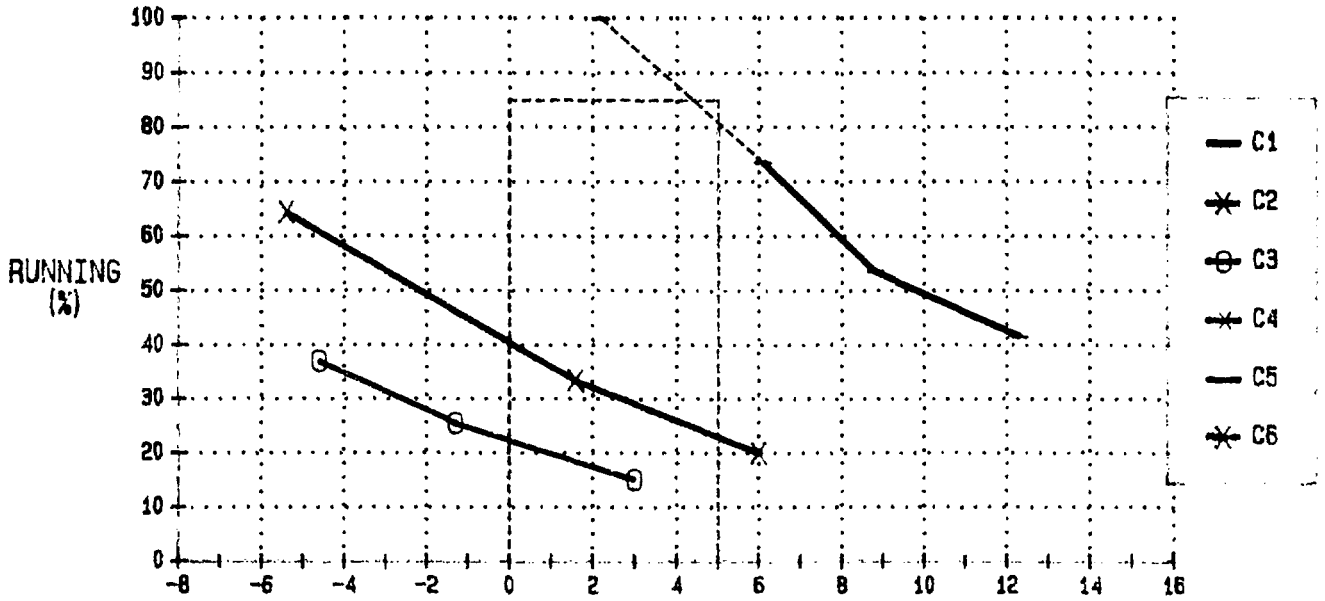
DATE: IDEAL

NOTES: K60L2121

TH POSITION (DEGREES)

0 45 90 135 180 225 270 315 360

GRAPH	AMB. T	100%	C	M	W
C1 :	43 (C)	2.2 (C)	4.0	3.5	1.0
C2 :	25 (C)		6.0	3.5	1.0
C3 :	18 (C)		6.0	3.5	1.0



Handwritten signature or mark

LOADLESS RUNNING

LAB.#: 090T0996

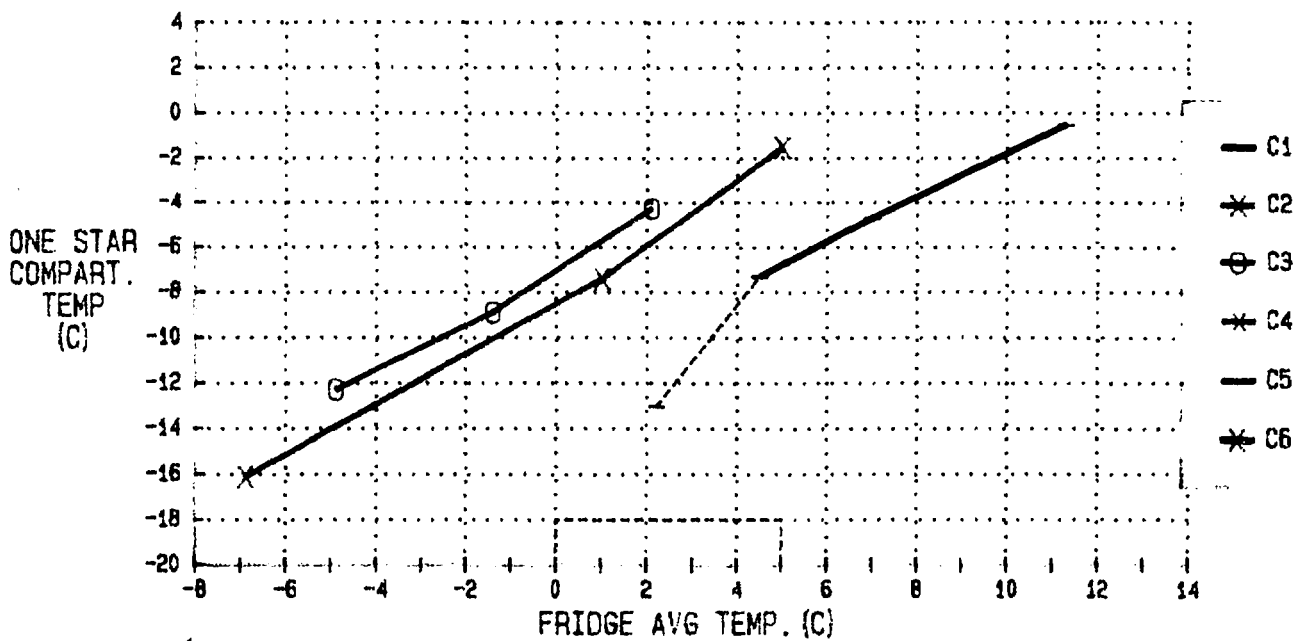
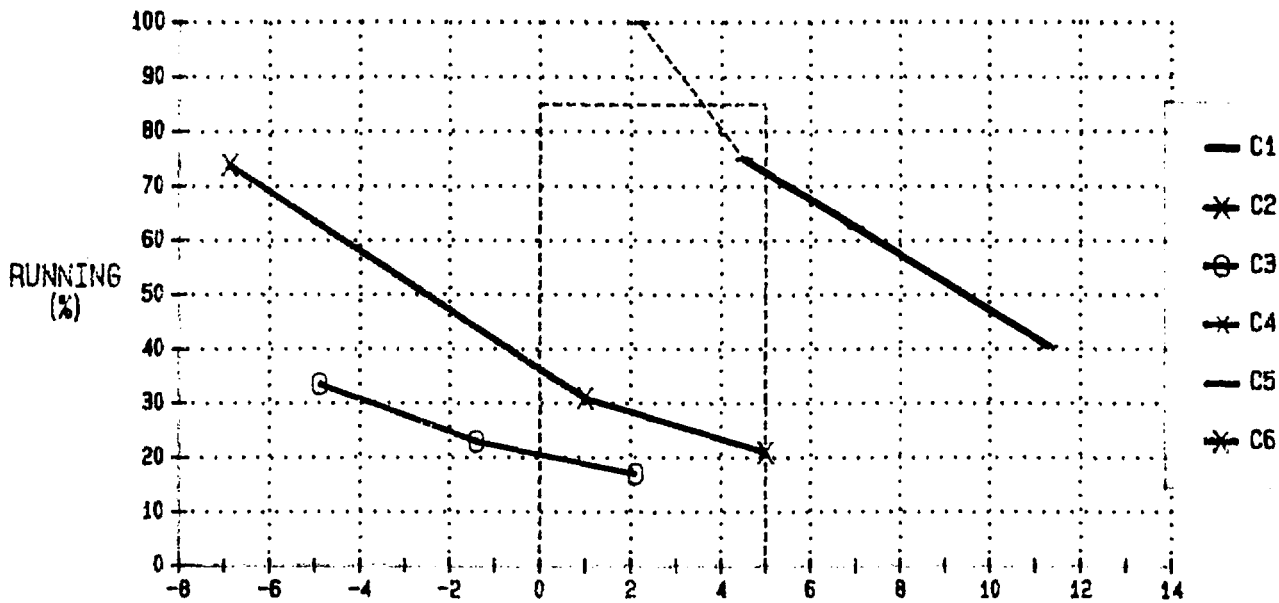
AP.TYPE: RC280LF

REP.#: 96-387

DATE: IDEAL

NOTES: K60L2121

TH POSITION (DEGREES)								
0	45	90	135	180	225	270	315	360
GRAPH		AMB. T	100%		C		M	W
C1 :		43 (C)	2.2 (C)		4.0		3.5	1.0
C2 :		25 (C)			6.0		3.5	1.0
C3 :		18 (C)			6.0		3.5	1.0



The noise level measured was of 41 dBA (See chart)

Comments

The appliance could be declared as one start ISO.

It could be underlined that the appliance has a poor performance at 43°C amb. temp.

The appliance could be marked as a quite good ST class instead.



ZANUSSI ELETTRODOMESTICI Sp.A.

Divisione Refrigerazione - Sussepea

AB Electrolux
EPD - Cold

Rapporto prova Rumore
Check Point 1

I.S.d #13 (ISO 8960 / IEC 704-1)

AP.: FA280DS FS DATA: 22/11/1996 N.RAP.: 071B1196

COMP.FR.: GL99AA COMP.FZ.: MATR.: 090T0996

STAB.: ZS LABEM.: PROGLAB TIPO P.: SV

DIST. PROVA.: FS

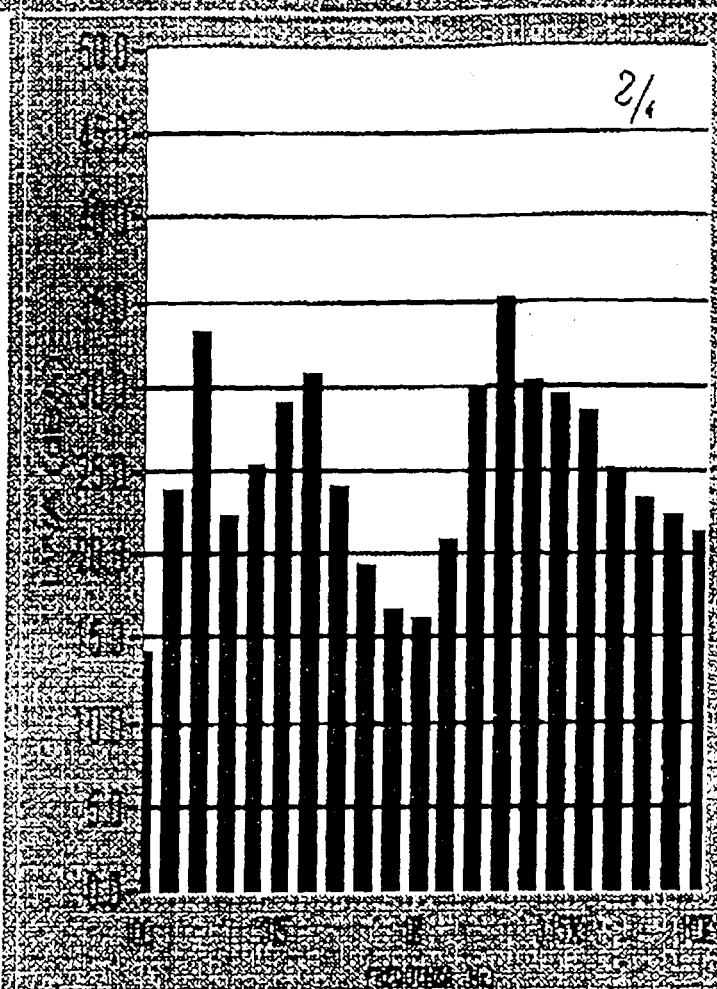
T.A.M.E.(C): 22.0 P.imbarj.: 1005 U.R.(%): 40

TOT.SPETTRO LWA = 41.0

COMMENTI

STEADY STATE

RC380LF IDEAL EGITTO - N.2 DAMPER IN MANDATA



- 100 Hz = 41.2
- 125 Hz = 23.8
- 160 Hz = 33.2
- 200 Hz = 22.2
- 250 Hz = 25.3
- 315 Hz = 28.9
- 400 Hz = 30.6
- 500 Hz = 24.0
- 630 Hz = 19.3
- 800 Hz = 16.7
- 1 KHz = 16.1
- 125 KHz = 20.7
- 16 KHz = 30.0
- 2 KHz = 35.1
- 2.5 KHz = 30.2
- 3.15 KHz = 29.4
- 4 KHz = 23.4
- 5 KHz = 24.9
- 6.3 KHz = 23.3
- 8 KHz = 22.3
- 10 KHz = 21.4

COMPR. B = IS

COMPRESSORE

