



UNIVERSITI KUALA LUMPUR
MALAYSIA FRANCE INSTITUTE

FINAL EXAMINATION
JANUARY 2014 SESSION

SUBJECT CODE : FRB 30603/FRB 40203
SUBJECT TITLE : COLD ROOM AND REFRIGERATED SHOWCASE
LEVEL : BACHELOR
TIME/DURATION : (3 HOURS) 9.00 am - 12.00 noon
DATE : 08 JUN 2014

INSTRUCTIONS TO CANDIDATES

1. All documents authorized (Open Book Examination)
 2. Please read the instructions given in the question paper CAREFULLY.
 3. This question paper is printed on both sides of the paper.
 4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
 5. This question paper consists only one section. Answer all questions.
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THERE ARE 3 PRINTED PAGES OF QUESTIONS, EXCLUDING THIS PAGE

INSTRUCTION: Answer ALL questions.

Please use the answer booklet provided.

Question 1

The freezer room having a dimension of 4.5m x 3m x 3.0 height and the wall thickness is 60mm with the inside design temperature -25°C .

Floor insulation has a total coefficient of transmission of $0.25 \text{ W/m}^2\text{K}$ while walls and roof made of insulation panels of $K = 0.25 \text{ W/m}^2\text{K}$.

Outside temperature for 4 walls is 28°C , ground temperature is 27°C and roof 35°C .

Storage capacity is 450 kg with daily loading/unloading rate =45 kg at -18°C and a specific heat of 1.8 kJ/kgK .

It handling by 2 motorized pallet truck of 2 kW each and daily net 3 hours are operating inside the cold room.

There is 1 automatic door for entry and exit each, have a dimension 2.0 m H x 1.5 m W equipped with air curtains.

External conditions is 28°C , RH 70 % enthalpy 64 kJ/kg density 1.15 kg/m^3 and internal conditions -20°C , RH 95 % enthalpy -25 kJ/kg density 1.43 kg/m^3 .

Time for opening of the door for the passing of power lifts: 50 kg: 45 s

Lighting is 6 x 200W operating for a duration of 8 hours net per day

2 occupants for a net duration of 2 hours net per day and release heat 250 W/ person

Calculate the hourly refrigerating power for a maximum running time 18 hours per day.

(4 marks)

In order to save energy, it is proposed that the incandescent lights be replaced by 3 high efficiency fluorescent tubes, each consuming 60W. If the lights are on for an average of 8 hr a day, every day, determine the amount of electrical energy and money this facility will save per year? Assume the refrigeration system has a COP of 2.5 and the cost of electricity is $\$0.28/\text{kWh}$.

(2 marks)

Question 2

Draw the complete refrigerating diagram of principle on the basis of four (4) screw compressor, individual oil separator, individual oil cooler, air cooled condenser, high pressure bottle, expansion valve and low pressure bottle with pump supplying the evaporator.

(4 marks)

Question 3

Explain clearly about control of microorganisms in food highlighting the following:

- i. four common kinds of microorganisms
- ii. Refrigeration process prevent or delay the spoilage of foods
- iii. four environmental factors that affects growth of microorganism
- iv. How can the microorganisms in foods be destroyed

(2Marks)

QUESTION 4

The chilling room of a meat plant is 15m x 18m x 5.5m in size and has a capacity of 350 beef carcasses. The power consumed by the fans and the lights of the chilling room are 22 and 2kW, respectively, and the room gains heat through its envelope at a rate of 11kW. The average mass of beef carcasses is 280kg. The carcasses enter the chilling room at 35 C, after they are washed to facilitate evaporative cooling, and are cooled to 16 C in 10hr. The water is expected to evaporate at a rate of 0.080 kg/s. The air enters the evaporator section of the refrigeration system at 0.5C and leaves at -2.2C. The air side of evaporator is heavily finned, and the overall heat transfer coefficient of the evaporator based on the air side is 22 W/m².C. Also, the average temperature difference between the air and the refrigerant in the evaporator is 5.5C. Determine:

- (i) The refrigeration load of the chilling room
- (ii) The volume flow rate of air
- (iii) The heat transfer surface area of the evaporator on the air side.

(4 marks)

QUESTION 5

{i} An R-134a commercial refrigerator has a design capacity of 4 tons and operates with a saturated suction temperature of 40° F and a saturated condensing temperature of 110°F. The copper suction line is 52 ft long and has 16 equivalent ft of fittings and valves. Select the proper size for the suction line.

(ii) An R-134a commercial refrigerator has a design capacity of four tons. It operates with a saturated suction temperature of 40°F and a saturated condensing temperature of 110°F. The

copper discharge line is 30 ft long and has 10 equivalent ft of fittings and valves. Select the proper diameter for the discharge line.

(iii) Sketch the location of hot gas de-frost line and explain its function.

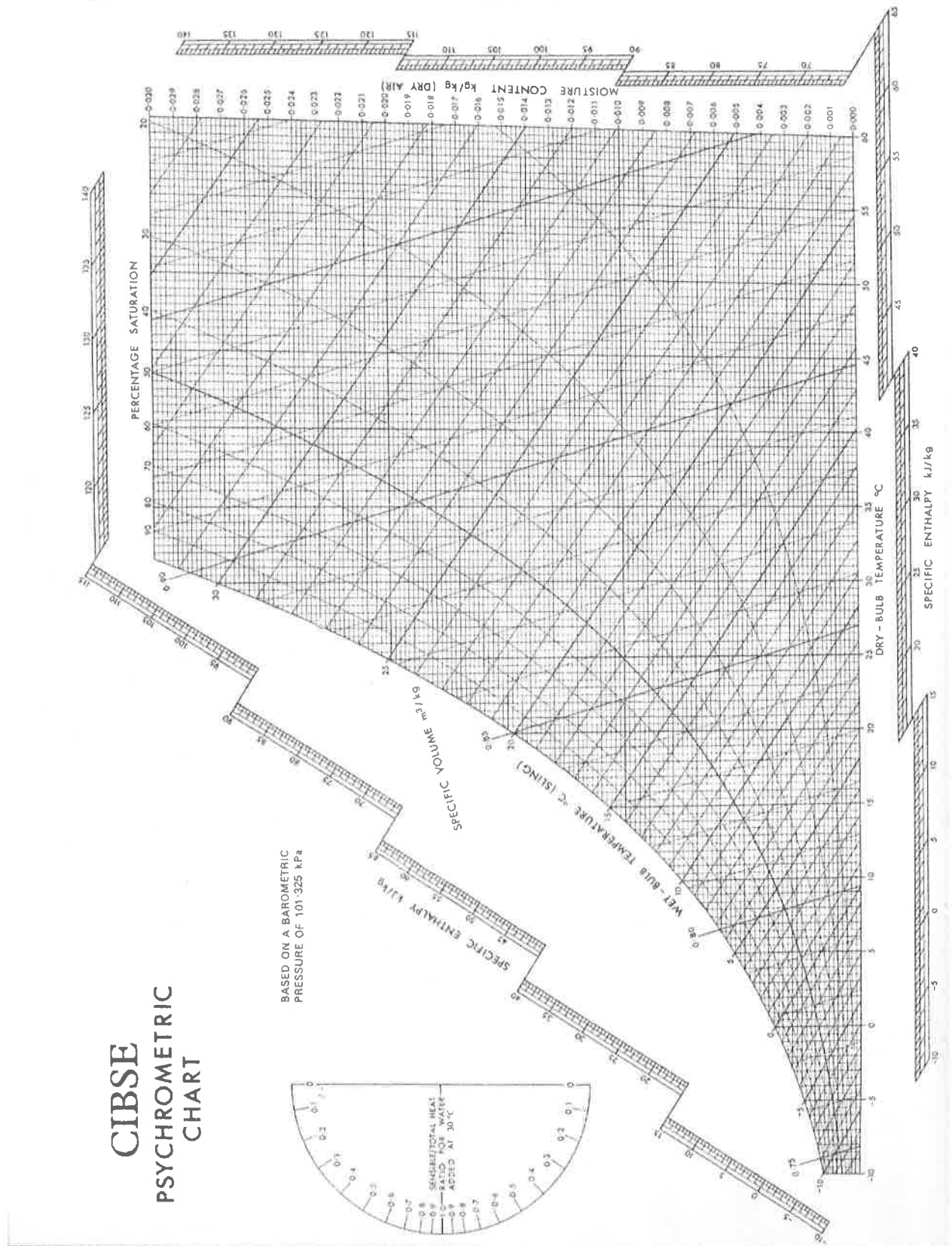
(4 marks)

END OF QUESTION

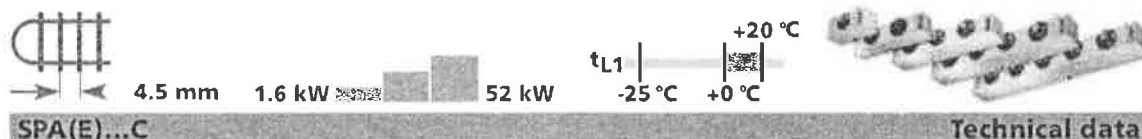
APPENDIX 1: (MUST BE RETURNED)

C1-4

CIBSE GUIDE



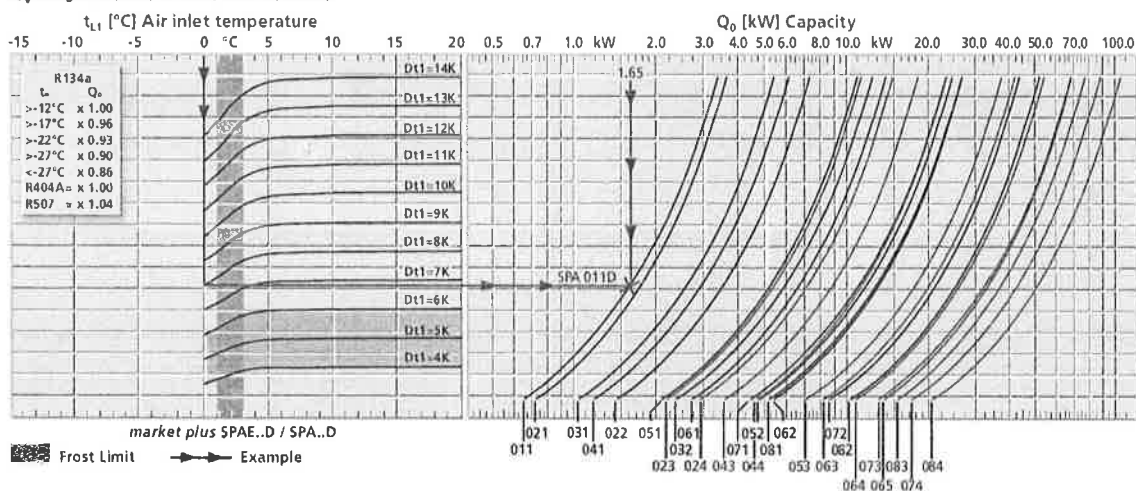
APPENDIX 2

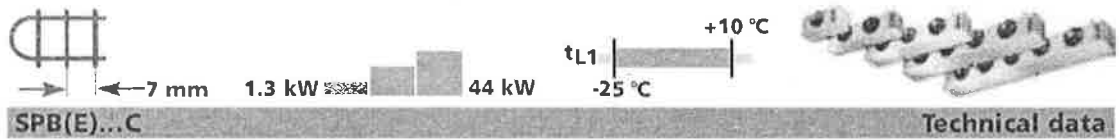


SPA(E)...C										Technical data								
Type		Power Q at 50 Hz DT1, R404A		Cooling area	Air flow	Air throw	Tube volume	Connections		Sound 	Fans  (operating values at 50 Hz)							
		t _{L1} ±0 °C DT1 = 8 K	t _{L1} +10 °C DT1 = 10 K					Inlet	Outlet		L _{WA} ***	Blades	Current type	Per fan				
		kW	kW	m ²	m ³ /h	m	dm ³	Ø mm	Ø mm	dB(A)	Pcs. x Ø mm	V ±10 %	rpm	W	A			
																		
SPA 011D		1.65	2.44	6.9	820	4	1.4	10	12	63	1 x 250	230V -1	1347	85	0.59			
SPA 021D		1.80	2.65	9.1	760	4	1.9	10	12	63	1 x 250	230V -1	1347	85	0.59			
SPA 031D		2.65	3.93	10.3	1380	6	2.1	10	18	70	1 x 300	230V -1	1340	80	0.36			
SPA 041D		3.00	4.44	13.6	1300	5	2.8	12*	22	70	1 x 300	230V -1	1340	80	0.36			
SPA 051D		6.05	8.98	20.5	3020	8	4.2	12*	28	77	1 x 400	230V -1	1420	188	0.83			
SPA 061D		6.83	10.1	30.6	2720	7	6.3	12*	28	77	1 x 400	230V -1	1420	188	0.83			
SPA 071D		11.3	16.8	36.3	5800	17	7.6	15*	35	83	1 x 500	400V -3	1362	560	1.01			
SPA 081D		13.1	19.3	54.2	5270	16	11.1	15*	35	83	1 x 500	400V -3	1362	560	1.01			
SPA 022D		3.62	5.34	18.2	1520	6	3.6	12*	22	66	2 x 250	230V -1	1347	85	0.59			
SPA 032D		5.33	7.90	20.6	2760	8	4.1	12*	28	73	2 x 300	230V -1	1340	80	0.36			
SPA 042D		6.02	8.92	27.3	2600	7	5.5	12*	28	73	2 x 300	230V -1	1340	80	0.36			
SPA 052D		11.9	17.7	40.9	6040	12	8.2	15*	35	80	2 x 400	230V -1	1420	188	0.83			
SPA 062D		13.4	19.7	60.9	5440	11	12.1	15*	35	80	2 x 400	230V -1	1420	188	0.83			
SPA 072D		21.7	31.9	72.7	11600	22	14.3	15*	42	86	2 x 500	400V -3	1362	560	1.01			
SPA 082D		25.7	37.9	108.3	10540	21	21.5	22*	42	86	2 x 500	400V -3	1362	560	1.01			
SPA 023D		5.51	8.16	27.3	2280	8	5.3	12*	28	68	3 x 250	230V -1	1347	85	0.59			
SPA 043D		8.96	13.3	40.9	3900	10	8.0	15*	35	75	3 x 300	230V -1	1340	80	0.36			
SPA 053D		18.2	27.0	61.4	9060	15	12.0	22*	42	82	3 x 400	230V -1	1420	188	0.83			
SPA 063D		20.6	30.4	91.5	8160	13	18.0	22*	42	82	3 x 400	230V -1	1420	188	0.83			
SPA 073D		33.4	49.5	109.2	17400	26	21.3	22*	54	88	3 x 500	400V -3	1362	560	1.01			
SPA 083D		38.3	56.3	162.7	15810	24	32.2	22*	54	88	3 x 500	400V -3	1362	560	1.01			
SPA 024D		7.26	10.7	36.3	3040	9	7.1	12*	28	69	4 x 250	230V -1	1347	85	0.59			
SPA 044D		11.7	17.2	54.5	5200	12	10.6	15*	35	76	4 x 300	230V -1	1340	80	0.36			
SPA 064D		26.9	39.6	122.0	10880	16	23.7	22*	42	83	4 x 400	230V -1	1420	188	0.83			
SPA 074D		43.5	64.1	145.5	23200	28	28.6	22*	54	89	4 x 500	400V -3	1362	560	1.01			
SPA 084D		51.6	76.1	216.9	21080	26	41.0	28*	54	89	4 x 500	400V -3	1362	560	1.01			
SPA 065D		34.1	50.4	152.4	13600	18	28.9	22**	54	84	5 x 400	230V -1	1420	188	0.83			

Multiple injection via * flow distributor, ** KÜBA-CAL® distributor

*** Modification of sound power level, see page 47

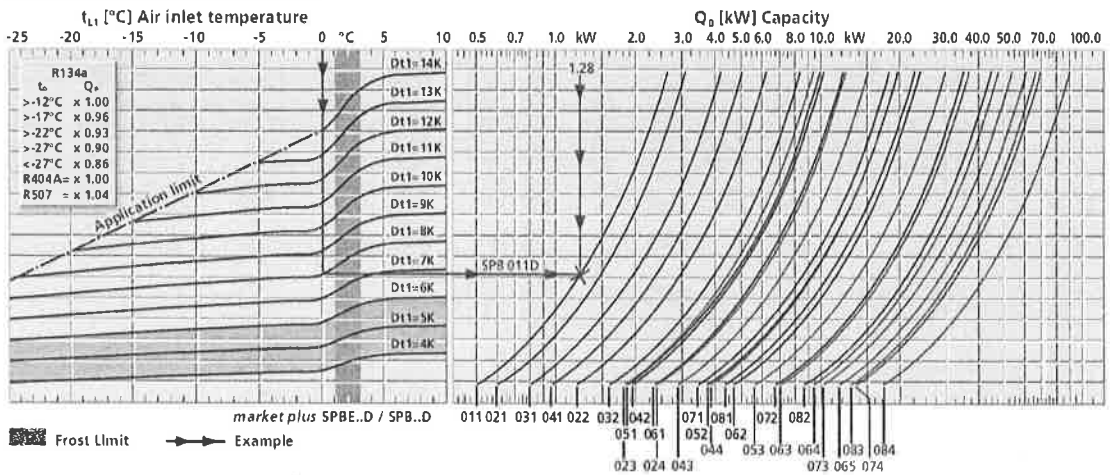
Q_V Diagram (R22, R134A, R404A, R507)See page 47 for information about Q_V diagram



Type	Power Q at 50 Hz DT1, R404A		Cooling area	Air flow	Air throw	Tube volume	Connections		Sound L _{WA} **	Fans (operating values at 50 Hz)		
	t _{L1} ±0 °C DT1 = 8 K	t _{L1} -18 °C DT1 = 7 K					Inlet	Outlet		Blades	Current type	Per fan
	kW	kW	m ²	m ³ /h	m	dm ³	Ø mm	Ø mm	dB(A)	Pcs. x Ø mm	V ±10 %	rpm W A
SPB 011D	1.28	1.01	4.6	880	4	1.4	10	12	63	1 x 250	230V-1	1347 85 0.59
SPB 021D	1.51	1.20	6.0	850	4	1.9	10	12	63	1 x 250	230V-1	1347 85 0.59
SPB 031D	2.03	1.61	6.9	1450	7	2.1	10	18	70	1 x 300	230V-1	1340 80 0.36
SPB 041D	2.45	1.94	9.1	1420	6	2.8	10*	22	70	1 x 300	230V-1	1340 80 0.36
SPB 051D	4.78	3.78	13.7	3320	9	4.2	12*	28	77	1 x 400	230V-1	1420 188 0.83
SPB 061D	5.93	4.70	20.4	3080	8	6.3	12*	35	77	1 x 400	230V-1	1420 188 0.83
SPB 071D	8.75	6.92	24.3	6250	18	7.6	15*	35	83	1 x 500	400V-3	1362 560 1.01
SPB 081D	11.1	8.76	36.3	5880	17	11.1	15*	35	83	1 x 500	400V-3	1362 560 1.01
SPB 022D	3.03	2.41	12.2	1700	6	3.6	10*	22	66	2 x 250	230V-1	1347 85 0.59
SPB 032D	4.05	3.21	13.7	2900	9	4.1	10*	28	73	2 x 300	230V-1	1340 80 0.36
SPB 042D	4.89	3.88	18.2	2840	8	5.5	12*	28	73	2 x 300	230V-1	1340 80 0.36
SPB 052D	9.49	7.52	27.3	6640	13	8.2	15*	35	80	2 x 400	230V-1	1420 188 0.83
SPB 062D	11.7	9.31	40.7	6160	12	12.1	15*	35	80	2 x 400	230V-1	1420 188 0.83
SPB 072D	17.1	13.5	48.6	12500	23	14.3	15*	42	86	2 x 500	400V-3	1362 560 1.01
SPB 082D	21.9	17.4	72.5	11760	22	21.5	22*	42	86	2 x 500	400V-3	1362 560 1.01
SPB 023D	4.59	3.63	18.2	2550	8	5.3	12*	28	68	3 x 250	230V-1	1347 85 0.59
SPB 043D	7.31	5.80	27.3	4260	11	8.0	15*	35	75	3 x 300	230V-1	1340 80 0.36
SPB 053D	14.4	11.4	41.0	9960	16	12.0	22*	42	82	3 x 400	230V-1	1420 188 0.83
SPB 063D	17.8	14.1	61.1	9240	14	18.0	22*	42	82	3 x 400	230V-1	1420 188 0.83
SPB 073D	26.0	20.6	73.0	18750	27	21.3	22*	54	88	3 x 500	400V-3	1362 560 1.01
SPB 083D	32.6	25.9	108.8	17640	25	32.2	22*	54	88	3 x 500	400V-3	1362 560 1.01
SPB 024D	6.08	4.82	24.3	3400	9	7.1	12*	28	69	4 x 250	230V-1	1347 85 0.59
SPB 044D	9.63	7.65	36.5	5680	13	10.6	15*	35	76	4 x 300	230V-1	1340 80 0.36
SPB 064D	23.5	18.7	81.6	12320	17	23.7	22*	42	83	4 x 400	230V-1	1420 188 0.83
SPB 074D	34.2	27.1	97.1	25000	30	28.6	22*	54	89	4 x 500	400V-3	1362 560 1.01
SPB 084D	43.8	34.7	144.8	23520	28	41.0	28*	54	89	4 x 500	400V-3	1362 560 1.01
SPB 065D	29.7	23.5	101.9	15400	19	28.9	22*	54	84	5 x 400	230V-1	1420 188 0.83

Multiple injection via * KUBA-CAL® distributor

** Modification of sound power level, see page 47

See page 47 for information about Q_y diagramQ_y Diagram (R22, R134A, R404A, R507)

APPENDIX 3

R134a



Leistungswerte
bezogen auf 20°C Sauggasatemperatur
mit Flüssigkeits-Unterkühlung, 50 Hz

Performance data
based on 20°C suction gas temperature
with liquid subcooling, 50 Hz

Données de puissance
se référant une température de gaz aspiré de
20°C avec sous-refroidissement, 50 Hz

Type	Umgeb.- Temp.		Kälteleistung Cooling capacity Puissance frigorifique			Leistungsaufnahme Power consumption Puissance absorbée		
Type	Ambient temp.		Q_o [Watt]			P_e [kW]		
Type	Temp. ambiante °C		Verdampfungstemperatur °C			Evaporation temperature °C		
			Température d'évaporation °C					
			10	5	0	-5	-10	-15
LH84/2CC-3.2Y	27	Q	11730	9950	8350	6910	5640	4520
		P	2.68	2.46	2.24	2.03	1.82	1.61
	32	Q	11040	9360	7840	6490	5270	4210
		P	2.85	2.61	2.38	2.15	1.92	1.70
	43	Q	9550	8090	6760	5560	4500	3660
		P	3.20	2.92	2.66	2.39	2.12	1.85
LH84/2CC-4.2Y	27	Q	12270	10360	8650	7130	5800	4630
		P	2.55	2.35	2.16	1.97	1.78	1.58
	32	Q	11560	9750	8120	6690	5420	4310
		P	2.72	2.51	2.30	2.09	1.88	1.66
	43	Q	10050	8450	7020	5740	4620	3650
		P	3.08	2.83	2.59	2.33	2.08	1.82
LH84/4FC-3.2Y	27	Q	12480	10570	8840	7290	5920	4710
		P	2.75	2.55	2.36	2.15	1.94	1.72
	32	Q	11750	9950	8310	6840	5530	4380
		P	2.91	2.68	2.47	2.25	2.03	1.80
	43	Q	10190	8610	7170	5870	4720	3700
		P	3.25	2.97	2.71	2.46	2.20	1.93
LH84/4FC-5.2Y	27	Q	13090	11020	9160	7520	6080	4820
		P	2.71	2.51	2.31	2.11	1.90	1.69
	32	Q	12330	10370	8610	7050	5670	4480
		P	2.89	2.68	2.46	2.24	2.01	1.78
	43	Q	10740	9010	7450	6070	4850	3780
		P	3.28	3.02	2.76	2.49	2.22	1.94
LH84/4EC-4.2Y	27	Q	15130	12930	10900	9070	7420	5970
		P	3.97	3.67	3.37	3.08	2.79	2.50
	32	Q	14190	12120	10210	8480	6920	5550
		P	4.21	3.87	3.55	3.22	2.89	2.57
	43	Q	12170	10390	8730	7210	5840	4630
		P	4.72	4.31	3.90	3.49	3.08	2.68
LH84/4EC-6.2Y	27	Q	16200	13730	11490	9500	7740	6200
		P	3.68	3.44	3.20	2.96	2.70	2.44
	32	Q	15220	12890	10780	8890	7220	5760
		P	3.95	3.68	3.40	3.11	2.82	2.52
	43	Q	13110	11080	9230	7580	6110	4810
		P	4.53	4.16	3.79	3.41	3.03	2.64
LH84/4DC-5.2Y	27	Q	18710	15940	13410	11130	9100	7300
		P	4.60	4.22	3.85	3.48	3.13	2.78
	32	Q	17600	14990	12590	10430	8500	6800
		P	4.87	4.46	4.07	3.68	3.29	2.91
	43	Q	15230	12940	10840	8940	7240	5740
		P	5.42	4.97	4.52	4.07	3.61	3.16
LH104/4DC-7.2Y	27	Q	19590	16590	13890	11470	9340	7470
		P	4.39	4.05	3.71	3.38	3.05	2.72
	32	Q	18470	15620	13050	10760	8730	6950
		P	4.67	4.30	3.94	3.58	3.22	2.85
	43	Q	16060	13550	11280	9250	7460	5880
		P	5.25	4.83	4.40	3.97	3.54	3.10
LH84/4CC-6.2Y	27	Q	21350	18340	15530	12970	10660	8610
		P	5.86	5.30	4.76	4.24	3.75	3.28
	32	Q	20100	17220	14580	12150	9970	8020
		P	6.17	5.58	5.01	4.46	3.94	3.43
	43	Q	17320	14850	12540	10420	8500	6780
		P	6.81	6.15	5.51	4.90	4.29	3.70
LH114/4CC-9.2Y	27	Q	23400	19840	16640	13770	11240	9010
		P	5.35	4.91	4.47	4.04	3.61	3.18
	32	Q	22000	18660	15630	12920	10510	8390
		P	5.71	5.22	4.75	4.27	3.80	3.34
	43	Q	19040	16120	13470	11080	8970	7100
		P	6.43	5.86	5.30	4.74	4.19	3.64

① Leistungsaufnahme des Verdichters.
Werte für Verflüssiger-Lüfter siehe
"Technische Daten" (Seite 18 und 19)

① Power consumption of compressor.
Values for condenser fans see
"Technical data" (page 18 and 19)

① Puissance absorbée du compresseur. Pour
les valeurs des condenseur-ventilateurs voir
"Caractéristiques techniques" (page 18 et 19)

Zusatzkühlung durch Verflüssiger-
Lüfter oder eingeschränkte Saug-
gasatemperatur.
Bei Regelung der Lüfter-Drehzahl
auf ausreichende Belüftung des
Verdichters achten!

Additional cooling by means of
condenser fan or limited suction
gas temperature.
With fan speed control mind sufficient
ventilation of the compressor!

Refroidissement additionnel par ventilateur
du condenseur ou température de gaz
aspiré limitée.
Avec régulation de la vitesse du ventilateur
tenir compte à ventilation suffisante du
compresseur!



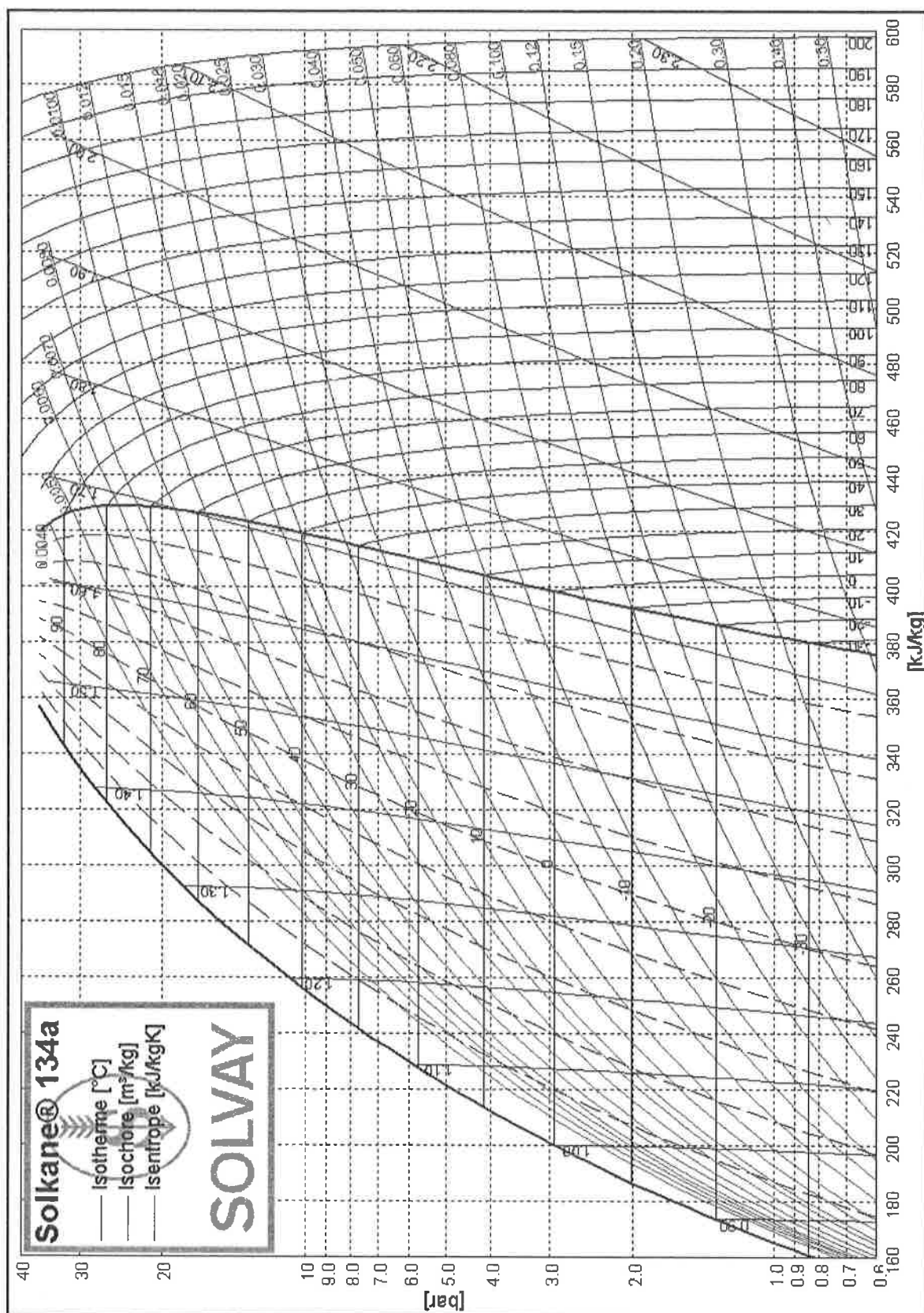
Technische Daten

Technical data

Caractéristiques techniques

Verflüssigungssatz Typ	Verdichter Compressor Compresseur		Lüfter Fan Ventilateur ②			Sammler Receiver Réservoir					
	Motor- Anschluss ①	max. Betr.-Strom	Strom- aufnahme	Leistungs- aufnahme	Luftdurch- satz Verflüssiger	Standard Typ	Maximale Kälte- mittel-Füllung ③			Option größerer Sammler	Gewicht (Stand.)
Condensing unit type	Motor connection ①	max. operating current	Current consumption	Power consumption	Air flow condenser	Standard type	Maximum refrigerant charge ③			Option larger receiver	Weight (Stand.)
Groupe de condensation type	Raccorde- ment de moteur ①	Courant de service max.	Consom. de courant	Puissance absorbée	Débit d'air condenseur	Type standard	Charge maximum de fluide frigorigène ③			Option réservoir plus grand	Poids (Stand.)
		A	A	Watt	m³/h		R134a kg	R404A R507A kg	R22 kg		kg
LH32/2KC-05.2(Y)	220 .. 240V Δ / 380 .. 420V Y / 3 / 50 Hz 265 .. 290V Δ / 440 .. 480V Y / 3 / 60 Hz	4,6/2,7	0,54	120	1750	FS36	3,3	2,9	3,3	FS56	70
LH32/2JC-07.2(Y)		6,0/3,5	0,54	120	1750	FS36	3,3	2,9	3,3	FS56	70
LH33/2HC-1.2(Y)		6,1/3,5	0,55	120	1710	FS36	3,3	2,9	3,3	FS56	71
LH33/2HC-2.2(Y)		7,4/4,3	0,55	120	1710	FS36	3,3	2,9	3,3	FS56	73
LH33/2GC-2.2(Y)		8,1/4,7	0,55	120	1710	FS36	3,3	2,9	3,3	FS56	73
LH44/2GC-2.2(Y)		8,1/4,7	0,56	125	1840	FS56	6,2	5,4	6,1	FS76	81
LH44/2FC-2.2(Y)		8,5/4,9	0,56	125	1840	FS56	6,2	5,4	6,1	FS76	80
LH44/2FC-3.2(Y)		10,0/5,8	0,56	125	1840	FS56	6,2	5,4	6,1	FS76	81
LH44/2EC-2.2(Y)		9,9/5,7	0,56	125	1840	FS56	6,2	5,4	6,1	FS76	98
LH64/2EC-3.2(Y)		12,0/6,9	1,41	301	3884	FS76	8,6	7,5	8,5	FS126	129
LH63/2DC-2.2(Y)		11,9/6,9	0,86	194	2528	FS56	6,2	5,4	6,1	FS76	114
LH64/2DC-3.2(Y)		13,5/7,8	1,41	301	3884	FS76	8,6	7,5	8,5	FS126	129
LH64/2CC-3.2(Y)		14,8/8,5	1,41	301	3884	FS76	8,6	7,5	8,5	FS126	128
LH84/2CC-4.2(Y)		16,4/9,4	3,08	485	4577	FS126	14,3	12,5	14,2	FS202	134
LH64/4FC-3.2(Y)		15,9/9,2	1,41	301	3884	FS76	8,6	7,5	8,5	FS126	140
LH84/4FC-5.2(Y)		18,7/10,8	3,08	485	4577	FS126	14,3	12,5	14,2	FS202	151
LH64/4EC-4.2(Y)		18,5/10,7	1,41	301	3884	FS76	8,6	7,5	8,5	FS126	142
LH84/4EC-6.2(Y)		22,9/13,2	3,08	485	4577	FS126	14,3	12,5	14,2	FS202	151
LH84/4DC-5.2(Y)		23,4/13,5	3,08	485	4577	FS126	14,3	12,5	14,2	FS202	153
LH104/4DC-7.2(Y)		27,5/15,9	2 x 1,47	2 x 316	7248	F152H	16,6	14,4	16,3	F302H	200
LH84/4CC-6.2(Y)		27,5/15,9	3,08	485	4577	FS126	14,3	12,5	14,2	FS202	157
LH114/4CC-9.2(Y)		34,5/20,0	2 x 1,41	2 x 301	7804	F152H	16,6	14,4	16,3	F302H	217

APPENDIX 4



Thermophysical Properties of Refrigerants

20.17

Refrigerant 134a (1,1,1,2-Tetrafluoroethane) Properties of Saturated Liquid and Saturated Vapor

Temp., °C	Pres- sure, MPa	Density, kg/m ³ Liquid	Volume, m ³ /kg Vapor	Enthalpy, kJ/kg		Entropy, kJ/(kg·K)		Specific Heat c _p , kJ/(kg·K)		c _p /c _v	Velocity of Sound, m/s		Viscosity, μPa·s		Thermal Cond., mW/(m·K)		Surface Tension, Temp., mN/m °C
				Liquid	Vapor	Liquid	Vapor	Liquid	Vapor		Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	
-103.30*	0.00039	1591.1	35.4960	71.46	334.94	0.4126	1.9639	1.184	0.585	1.164	1120	126.8	2175.0	6.46	145.2	3.08	28.07 -103.30
-100.00	0.00056	1582.4	25.1930	75.36	336.85	0.4354	1.9456	1.184	0.593	1.162	1103	127.9	1893.0	6.60	143.2	3.34	27.50 -100.00
-90.00	0.00152	1555.8	9.7698	87.23	342.76	0.5020	1.8972	1.189	0.617	1.156	1052	131.0	1339.0	7.03	137.3	4.15	25.79 -90.00
-80.00	0.00367	1529.0	4.2682	99.16	348.83	0.5654	1.8580	1.198	0.642	1.151	1002	134.0	1018.0	7.46	131.5	4.95	24.10 -80.00
-70.00	0.00798	1501.9	2.0590	111.20	355.02	0.6262	1.8264	1.210	0.667	1.148	952	136.8	809.2	7.89	126.0	5.75	22.44 -70.00
-60.00	0.01591	1474.3	1.0790	123.36	361.31	0.6846	1.8010	1.223	0.692	1.146	903	139.4	663.1	8.30	120.7	6.56	20.80 -60.00
-50.00	0.02945	1446.3	0.60620	135.67	367.65	0.7410	1.7806	1.236	0.720	1.146	855	141.7	555.1	8.72	115.6	7.36	19.18 -50.00
-40.00	0.05121	1417.7	0.36108	148.14	374.00	0.7956	1.7643	1.255	0.749	1.148	807	143.6	472.2	9.12	110.6	8.17	17.60 -40.00
-30.00	0.08438	1388.4	0.22594	160.79	380.32	0.8486	1.7515	1.273	0.781	1.152	760	145.2	406.4	9.52	105.8	8.99	16.04 -30.00
-28.00	0.09270	1382.4	0.20680	163.34	381.57	0.8591	1.7492	1.277	0.788	1.153	751	145.4	394.9	9.60	104.8	9.15	15.73 -28.00
-26.07b	0.10133	1376.7	0.19018	165.81	382.78	0.8690	1.7472	1.281	0.794	1.154	742	145.7	384.2	9.68	103.9	9.31	15.44 -26.07
-26.00	0.10167	1376.5	0.18958	165.90	382.82	0.8694	1.7471	1.281	0.794	1.154	742	145.7	383.8	9.68	103.9	9.32	15.43 -26.00
-24.00	0.11130	1370.4	0.17407	168.47	384.07	0.8796	1.7451	1.285	0.801	1.155	732	145.9	373.1	9.77	102.9	9.48	15.12 -24.00
-22.00	0.12165	1364.4	0.16006	171.05	385.32	0.8900	1.7432	1.289	0.809	1.156	723	146.1	362.9	9.85	102.0	9.65	14.82 -22.00
-20.00	0.13273	1358.3	0.14739	173.64	386.55	0.9002	1.7413	1.293	0.816	1.158	714	146.3	353.0	9.92	101.1	9.82	14.51 -20.00
-18.00	0.14460	1352.1	0.13592	176.23	387.79	0.9104	1.7396	1.297	0.823	1.159	705	146.4	343.5	10.01	100.1	9.98	14.21 -18.00
-16.00	0.15728	1345.9	0.12551	178.83	389.02	0.9205	1.7379	1.302	0.831	1.161	695	146.6	334.3	10.09	99.2	10.15	13.91 -16.00
-14.00	0.17082	1339.7	0.11605	181.44	390.24	0.9306	1.7363	1.306	0.838	1.163	686	146.7	325.4	10.17	98.3	10.32	13.61 -14.00
-12.00	0.18524	1333.4	0.10744	184.07	391.46	0.9407	1.7348	1.311	0.846	1.165	677	146.8	316.9	10.25	97.4	10.49	13.32 -12.00
-10.00	0.20060	1327.1	0.09959	186.70	392.66	0.9506	1.7334	1.316	0.854	1.167	668	146.9	308.6	10.33	96.5	10.66	13.02 -10.00
-8.00	0.21693	1320.8	0.09242	189.34	393.87	0.9606	1.7320	1.320	0.863	1.169	658	146.9	300.6	10.41	95.6	10.83	12.72 -8.00
-6.00	0.23428	1314.3	0.08587	191.99	395.06	0.9705	1.7307	1.325	0.871	1.171	649	147.0	292.9	10.49	94.7	11.00	12.43 -6.00
-4.00	0.25268	1307.9	0.07987	194.65	396.25	0.9804	1.7294	1.330	0.880	1.174	640	147.0	285.4	10.57	93.8	11.17	12.14 -4.00
-2.00	0.27217	1301.4	0.07436	197.32	397.43	0.9902	1.7282	1.336	0.888	1.176	631	147.0	278.1	10.65	92.9	11.34	11.85 -2.00
0.00	0.29280	1294.8	0.06931	200.00	398.60	1.0000	1.7271	1.341	0.897	1.179	622	146.9	271.1	10.73	92.0	11.51	11.56 0.00
2.00	0.31462	1288.1	0.06466	202.69	399.77	1.0098	1.7260	1.347	0.906	1.182	612	146.9	264.3	10.81	91.1	11.69	11.27 2.00
4.00	0.33766	1281.4	0.06039	205.40	400.92	1.0195	1.7250	1.352	0.916	1.185	603	146.8	257.6	10.90	90.2	11.86	10.99 4.00
6.00	0.36198	1274.7	0.05644	208.11	402.06	1.0292	1.7240	1.358	0.925	1.189	594	146.7	251.2	10.98	89.4	12.04	10.70 6.00
8.00	0.38761	1267.9	0.05280	210.84	403.20	1.0388	1.7230	1.364	0.935	1.192	585	146.5	244.9	11.06	88.5	12.22	10.42 8.00
10.00	0.41461	1261.0	0.04944	213.58	404.32	1.0485	1.7221	1.370	0.945	1.196	576	146.4	238.8	11.15	87.6	12.40	10.14 10.00
12.00	0.44301	1254.0	0.04633	216.33	405.43	1.0581	1.7212	1.377	0.956	1.200	566	146.2	232.9	11.23	86.7	12.58	9.86 12.00
14.00	0.47288	1246.9	0.04345	219.09	406.53	1.0677	1.7204	1.383	0.967	1.204	557	146.0	227.1	11.32	85.9	12.77	9.58 14.00
16.00	0.50425	1239.8	0.04078	221.87	407.61	1.0772	1.7196	1.390	0.978	1.209	548	145.7	221.5	11.40	85.0	12.95	9.30 16.00
18.00	0.53718	1232.6	0.03830	224.66	408.69	1.0867	1.7188	1.397	0.989	1.214	539	145.5	216.0	11.49	84.1	13.14	9.03 18.00
20.00	0.57171	1225.3	0.03600	227.47	409.75	1.0962	1.7180	1.405	1.001	1.219	530	145.1	210.7	11.58	83.3	13.33	8.76 20.00
22.00	0.60789	1218.0	0.03385	230.29	410.79	1.1057	1.7173	1.413	1.013	1.224	520	144.8	205.5	11.67	82.4	13.53	8.48 22.00
24.00	0.64578	1210.5	0.03186	233.12	411.82	1.1152	1.7166	1.421	1.025	1.230	511	144.5	200.4	11.76	81.6	13.72	8.21 24.00
26.00	0.68543	1202.9	0.03000	235.97	412.84	1.1246	1.7159	1.429	1.038	1.236	502	144.1	195.4	11.85	80.7	13.92	7.95 26.00
28.00	0.72688	1195.2	0.02826	238.84	413.84	1.1341	1.7152	1.437	1.052	1.243	493	143.6	190.5	11.95	79.8	14.13	7.68 28.00
30.00	0.77020	1187.5	0.02664	241.72	414.82	1.1435	1.7145	1.446	1.065	1.249	483	143.2	185.8	12.04	79.0	14.33	7.42 30.00
32.00	0.81543	1179.6	0.02513	244.62	415.78	1.1529	1.7138	1.456	1.080	1.257	474	142.7	181.1	12.14	78.1	14.54	7.15 32.00
34.00	0.86263	1171.6	0.02371	247.54	416.72	1.1623	1.7131	1.466	1.095	1.265	465	142.1	176.6	12.24	77.3	14.76	6.89 34.00
36.00	0.91185	1163.4	0.02238	250.48	417.65	1.1717	1.7124	1.476	1.111	1.273	455	141.6	172.1	12.34	76.4	14.98	6.64 36.00
38.00	0.96315	1155.1	0.02113	253.43	418.55	1.1811	1.7118	1.487	1.127	1.282	446	141.0	167.7	12.44	75.6	15.21	6.38 38.00
40.00	1.0166	1146.7	0.01997	256.41	419.43	1.1905	1.7111	1.498	1.145	1.292	436	140.3	163.4	12.55	74.7	15.44	6.13 40.00
42.00	1.0722	1138.2	0.01887	259.41	420.28	1.1999	1.7103	1.510	1.163	1.303	427	139.7	159.2	12.65	73.9	15.68	5.88 42.00
44.00	1.1301	1129.5	0.01784	262.43	421.11	1.2092	1.7096	1.523	1.182	1.314	418	138.9	155.1	12.76	73.0	15.93	5.63 44.00
46.00	1.1903	1120.6	0.01687	265.47	421.92	1.2186	1.7089	1.537	1.202	1.326	408	138.2	151.0	12.88	72.1	16.18	5.38 46.00
48.00	1.2529	1111.5	0.01595	268.53	422.69	1.2280	1.7081	1.551	1.223	1.339	399	137.4	147.0	13.00	71.3	16.45	5.13 48.00
50.00	1.3179	1102.3	0.01509	271.62	423.44	1.2375	1.7072	1.566	1.246	1.354	389	136.6	143.1	13.12	70.4	16.72	4.89 50.00
52.00	1.3854	1092.9	0.01428	274.74	424.15	1.2469	1.7064	1.582	1.270	1.369	379	135.7	139.2	13.24	69.6	17.01	4.65 52.00
54.00	1.4555	1083.2	0.01351	277.89	424.83	1.2563	1.7055	1.600	1.296	1.386	370	134.7	135.4	13.37	68.7	17.31	4.41 54.00
56.00	1.5282	1073.4	0.01278	281.06	425.47	1.2658	1.7045	1.618	1.324	1.405	360	133.8	131.6	13.51	67.8	17.63	4.18 56.00
58.00	1.6036	1063.2	0.01209	284.27	426.07	1.2753	1.7035	1.638	1.354	1.425	350	132.7	127.9	13.65	67.0	17.96	3.95 58.00
60.00	1.6818	1052.9	0.01144	287.50	426.63	1.2848	1.										