Sabroe

Refrigeration Plant Computation

Version 19.52A

SINGLE STAGE COMPRESSOR

compressor type	SMC 106 S		refrigerant	R 717	
number of compressors	1.00		evaporating temperature	-3.6	deg.C
compressor load	100.0	%	condensing temperature	44.8	deg.C
drive shaft speed	1460.0	RPM (list)	total suction superheat	0.0	K
no. of working cylinders:	6/ 6		suction line superheat	0.0	K
drive type	direct		total liquid subcooling	0.7	K
suction line loss	0.2	K			
discharge line loss	0.0	K			
total cooling capacity	226.3	kW	total shaft power req.	62.8	kW
total heating capacity	280.	kW	cooling cap./shaft power ratio	3.60	
			cooling cap./line power ratio	3.35	
equipment for head cooling	thermo pump or water				
equipment for oil cooling	included				
motor:	Leroy/75kW/400V/50Hz/IP23/250SP/In=143A		power line	50 Hz - 400 V	
start-up:	star/delta				
motor eff.	0.930		motor line power cons.	67.5 kW	
operating conditions:					
suction pressure	3.73	bar_a	discharge pressure	17.71	bar_a
suction temperature	-3.73	deg.C	discharge temperature	118.71	deg.C
suction specific volume	0.3306	m3/kg	disch. temp. at min. load	139.42	deg.C
enthalpy difference (ref.)	1051.06	kJ/kg	discharge specific volume	0.1009	m3/kg
suction side mass flow	0.2153	kg/s	subcooled liquid density	572.9	kg/m3
swept volume	330.2	m3/h	pressure ratio (p2/p1)	4.75	
cover cooling water flow	0.3	m3/h			
cover cooling pressure loss	0.76	m.b.g.			

errors and warnings:
NB: at current conditions the min. load is 50 % (10 K superheat)
NB: motor efficiency is approximate only
NB: design limits check OK

Full load performance data for chillers and other refrigeration systems are according to ISO-R916.
Measurement tolerances according to ISO-917.
Data subject to change without notice.

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Noise data - one compressor unit

Sound Power: 97.3 +/- 3 dB(A) re 10E-12 Watt
Mean Sound Pressure: 79.5 +/- 3 dB(A) re 2E-5 N/m2
Free field over reflecting plane, dist. = 1 m
Ref. surface: L= 2.8 W= 0.9 H= 2.0 m

Frequency . Hz	Sound Power Compr. dB	Sound Power Motor dB	Sound Power Total dB	Mean Sound Press. Total dB
63	86.9	78.6	87.5	69.7
125	91.9	85.6	92.8	75.0
250	92.2	83.6	92.7	74.9
500	91.5	79.6	91.7	73.9
1k	93.5	85.6	94.1	76.3
2k	88.9	76.6	89.1	71.3
4k	86.3	79.6	87.2	69.4
8k	78.3	65.6	78.6	60.8
dB(L)	99.3	91.0	99.9	82.1
dB(A)	96.8	88.0	97.3	79.5

Motor: 75.0 kW - IP23 - pole: 4 - 50 Hz - Leroy-P-250S

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EVAPORATOR

evaporator type	ESRD 700501		number of evaporators	1.00	
primary side:					
primary refrigerant	R-717		total capacity	226.3	kW
evaporating temperature	-3.6	deg.C	mean temperature diff.	5.34	K
			fouling factor	0.000035	m2.K/W
inlet velocity - prim. side	2.66	m/s	outlet velocity - prim. side	5.17	m/s
secondary side:					
secondary refrigerant (202) ETHYLENE_GLYCOL			percentage by weight	30.0	%
inlet temperature	4.0	deg.C	freezing temperature	-14.9	deg.C
outlet temperature	0.0	deg.C	total flow	52.6	m3/h
pressure loss	5.84	m.b.g.			
velocity	1.54	m/s			
density	1043.5	kg/m3	specific heat capacity	3.713	kJ/kg.K
dynamic viscosity	3.789	Cpoise	thermal conductivity	0.490	W/m.K
inlet velocity - sec. side	1.62	m/s	outlet velocity - sec. side	1.62	m/s
min. wall temperature	-1.8	deg.C			
			secondary side pass number	1	
built-in liquid separator performance:			separator speed	0.36	m/s
separator pressure loss	0.0	K	velocity ratio (cmax/cgas)	1.07	
special PHE output:					
no. of cassettes and type	1*50 MG		service transfer coefficient	2181.7	W/m2K
design/rating mode	rating		clean transfer coefficient	2481.0	W/m2K
plate material	AISI-316		refrigerant pressure loss	0.21	mbg
plate thickness	0.6	mm	margin	5.00	%
max. pressure loss sec. side	10.00	mbg	available liquid head	0.40	mbg
primary side connection - in/out	1/1		quality of vapour	0.85	
secondary side connection - in/out	1/1		excessive area	0.00	%
hot side channel pressure loss	5.70	mbg			
cold side channel pressure loss	0.25	mbg			

errors and warnings:

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CONDENSER

condenser type	CRRD 800501		number of condensers	1.00	
primary side:					
primary refrigerant	R-717		total capacity	280.4	kW
condensing temperature	44.8	deg.C	mean temperature diff.	4.66	K
condenser liquid subcooling	0.7	K			
			fouling factor	0.000020	m2.K/W
secondary side:					
secondary refrigerant (202) ETHYLENE_GLYCOL			percentage by weight	25.0	%
inlet temperature	37.0	deg.C	freezing temperature	-11.5	deg.C
outlet temperature	42.0	deg.C	total flow	50.9	m3/h
pressure loss	4.72	m.b.g.			
velocity	1.49	m/s			
density	1022.0	kg/m3	specific heat capacity	3.883	kJ/kg.K
dynamic viscosity	1.104	Cpoise	thermal conductivity	0.523	W/m.K
inlet velocity - sec. side	1.57	m/s	outlet velocity - sec. side	1.57	m/s
special PHE output:					
no. of cassettes and type	1*50 MG		service transfer coefficient	3093.9	W/m2K
design/rating mode	rating		clean transfer coefficient	3466.3	W/m2K
plate material	AISI-316		refrigerant pressure loss	0.02	mbg
plate thickness	0.6	mm	margin	5.00	%
max. pressure loss sec. side	10.00	mbg			
primary side connection - in/out	1/1		superheated vapour temp.	118.70	deg.C
secondary side connection - in/out	1/1		excessive area	0.00	%
hot side channel pressure loss	0.02	mbg			
cold side channel pressure loss	4.55	mbg			

errors and warnings:

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ChillPAC UNIT DATA - ChillPAC106S-C

plant load percentage	100.0	%
plant cooling capacity	226.3	kW
plant heating capacity	280.4	kW
totalt shaft power consumption	62.8	kW
total line power consumption	67.5	kW
capacity/shaft power ratio	3.60	
capacity/line power ratio	3.35	

chiller unit approx. length	3.08	m
chiller unit exact width	1.00	m
chiller unit approx. height	2.00	m
unit approx. operating weight	3535.	kg
unit approx. refrigerant charge	14.	kg
unit approx. brine/water charge	20.	kg
unit approx. condensing water charge	20.	kg
number of vibration dampers	4	
chiller unit expansion valve	HFI-040FD	
unit expansion valve load	51.2	%

errors and warnings: