SHANGHAI FAIVELEY RAILWAY TECHNOLOGY CO.

Amsterdam(Alstom)

2 TECHNICAL DATA

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Release History

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Revision Table

Revision	Date	Revised Sections, Description, Reason for changes
01	15.10.2010	First issue
02	16.04.2012	Power input of cab supply air fan updated to 170VAC. Refrigerant filling of Cab added.

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2 TECHNICAL DATA

2.1 BASIC DATA

2.1.1 General

Max. storage temperature	-20 °C to	+70 ℃
Working temperature(cooling mode)	+10 °C to	+47 ℃
Working temperature(heating mode)	-20 °C to	+20 ℃
Working temperature(controller)	-25 °C to	+70 ℃

2.1.2 Basis of cooling saloon

coach length	20.7	m	
coach width (mean)	2.73	m	
coach height	2.5	m	
k- value (standstill)	0.8	W/m^2 K	For roof
	0.7	W/m^2 K	For side wall, front 1 and front 2
	1.2	W/m^2 K	For floor
	5.3	W/m^2 K	For windows
outside	35	℃	
temperature(surface)			
outside humidity (surface)	45%		
passenger load(AW2)	180		
height above sea level	0	m	
solar load(15:30h)	600	W/m^2	

fresh air volume	1340	m^3/h
supply air volume	3000	m^3/h
vehicle velocity	10	km/h
Heat load inside car	5	KW
interior temperature	33	℃
interior humidity	55%	

2.1.3 Roof-mounted compact HVAC SALOON unit

Unit output

Cooling:	31	kW	at outdoor temperature of 35 °C/45%
Supply air max.:	3000	m3/h	
of this outside air:	1340	m3/h	normal operation

Operating voltage

Compressor motor:	400	V AC	3~/50Hz
Condenser fan:	400	V AC	3~/50Hz
Supply air fan:	400	V AC	3~/50Hz

Auxiliary energy

Control voltage:	110	V DC

Emergency operation

Outside air volume:	1250	m3/h	
Supply air fan:	250	V AC	3~/35Hz

Dimensions

Length:	4729	mm
Width without brackets:	1852	mm

Height:	325	mm
Weight	720	Kg
Refrigerant:	R407C	
Filling volume:	4.8± 0.1 kg	

2.1.4 Technical data of Refrigeration Components and Mechanical Components of Saloon HVAC unit

2.1.4.1 Compressor

Type	G600DL-90DTP	Scroll compressor
Drawing	See reference	
Pieces	2	

Operating and storage conditions

Storage condition	-20℃～+50℃,RH≤ 99%	
Working condition	-20℃～+50℃,RH≤ 99%	（in the position of the compressor,）
Max. altitude	<2000 m	

Technical data

Applied refrigerant	R407C		
Cooling capacity	16.5 kW		for R407c, evaporating 7.2℃, condensing 54.4℃
Displace volume	15.6	m^3/h	@50Hz
evaporating temperature:	7.2	°C	
condensing temperature:	54.4	°C	
Oil charge	1.5	L	
Type of oil	FVC68D		

Noise level Lwa	78	dB(A)	Sound power level
Life time	>50000	h	Working hours without overhaul
Weight	35	kg	

Electrical data

Power supply	400 ±5% (static)	V AC	3～/ 50 ±2%Hz,
Winding resistance	2.90	Ω	
Locked rotor APMS	108	A	
Max operation current	13	A	
IP grade	IP65		
Dielectric Test	2500	V	For 1 minute, without electric break-through
Motor protection devices	Internal Break Protector		

Interface data

Discharge line connection	Φ12.7	mm	ODF solder ODF
Suction line connection	Φ19	mm	ODF solder ODF
Gas equalization	Φ19	mm	ODF solder ODF
Oil equalization	Φ9.52	mm	ODF solder ODF

Note: use for tandem

2.1.4.2 Condenser

Type	Aluminium fin – copper tube
Drawing	See reference
Pieces	2

Operating and storage conditions

Storage condition	-40℃～70℃,RH≤ 99%
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.

Technical Data

Air flow rate	6500	m^3/h	
Eexternal surface	58.69	m^2	
Max. working pressure	29	bar	
Weight	Approx. 24kg	kg	

Construction data

Copper tube	Φ9.52×0.35	mm	TP2 inner thread
Tube pitch in air flow	21.6	mm	
Tube pitch above another	25	mm	
Array of tube	Staggered		
Fluid flow pattern	Counter		
No. of tube rows in deep	6		
No. of tube rows in height	14		
No. Of distribution	6		

Fin data

Fin material	Aluminium		Lacquer fin with azury crylic acid resin
Fin thickness	0.15	mm	
Fin pitch	2.2	mm	
Flow pattern	Counter		

Mechanical interface

Gas inlet	Φ12.7×1.5	mm	T2，ODF solder
Liquid outlet	Φ12×1	mm	T2，ODF solder

2.1.4.3 Solenoid valve

Type	EVR 6NC
Drawing	See the reference
Code no.	032F1213_TRD
Pieces	2

Operating and storage conditions

Storage condition	-40℃～80℃,RH≤ 99%
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.

Technical data

Refrigerant	R407C			
Medium temperature	-40℃~+105℃			
Max working pressure difference	35	bar		
MOPD	21 bar	10 a.c.	W	
	25 bar	12 a.c.	W	
	18 bar	20 a.c.	W	
kv value	0.8 m3/h			The kv value is the water flow in m3/h at a pressure drop across valve of 1 bar, ρ = 1000 kg/m3.
Nominal capacity	12.3kW			Evaporating temp. Te=-10℃, liquid temp. tl=25 ℃ ,superheat=0k, pressure drop in valve Δp=0.1bar, R407c

2.1.4.4 Filter dryer

Type:	DML 084S
Drawing	See the reference
Code no.	023Z5060
Pieces	2

Operating and storage conditions

Storage condition	-40℃～70℃,RH≤ 99%
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.

Technical data

Refrigerant	R407C		
Drying capacity	12.5	kg	For R407C in 52℃
Liquid capacity	29	kW	
Volume	0.17	L	
Max working pressure	42	bar	
Solid core	100% molecular sieve (especially for POE oil)		

2.1.4.5 Sight glass

Type	SGN 12S
Drawing	See the reference
Code no.	014-0183
Pieces	2

Operating and storage conditions

Storage condition	-40℃～70℃,RH≤ 99%
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.

Technical data

Refrigerant	R407C	
Ambient temperature	-50～+80℃	
Ambient humidity	Maximum 95%	
Max working pressure	46	bar
Max. working temperature of valve	110 ºC	
Nominal capacity	23.9kW	Evaporating temp. Te=+5℃, pressure drop in valve Δp=12bar, ASERCOM (TGE): Tc=38, TL=37,

2.1.4.6 Expansion valve

Type	TDEZ5-K
Drawing	See the reference
Code no.	068N4043_TRD
Pieces	2

Operating and storage conditions

Storage condition	-40℃～80℃,RH≤ 99%
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.

Technical data

Refrigerant	R407C		
Temperature of medium	AC: -40℃~+10℃OS=4 K		
Static superheat	4	K	
Open superheat	4	K	
Rated cooling capacity	5.7	kW	Evaporating temp. Te=+10℃, pressure drop in valve Δp=12bar, ASERCOM (TGE): Tc=38, TL=37,
Max working pressure	34	bar	
Max valve temperature	120	℃	

2.1.4.7 Evaporator

Type	Aluminium fin – copper tube
Drawing	See the reference
Pieces	1

Operating and storage conditions

Storage condition	-40℃～70℃,RH≤ 99%
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.

Technical Data

Air flow rate	3000	m^3/h	
Evaporation capacity	31	kW	
Eexternal surface	24.59	m^2	
Max. working pressure	18	bar	
Weight	Approx 15	kg	

Construction data

Copper tube	Φ9.52×0.35	mm	TP2
Tube pitch in air flow	12.5	mm	
Tube pitch above another	25	mm	
Array of tube	Staggered		
Fluid flow pattern	Counter		
No. of tube rows in deep	6		
No. of tube rows in height	14		
No. Of refrigerant distribution	14		

2.1.4.8 Supply air fan

Drawing	KS97A100.000-01A.Z3 KS97A100.000-22A.Z3		
Pieces	2		

Operating and storage conditions

Storage condition	-40℃～70℃,RH≤ 95%		
Working condition	-30℃～50℃,RH≤ 95%		
Max. altitude	2000	m	
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.		

Technical data

Air flow rate	2X1500(high speed) 2X1000(low speed)	m^3/h	
Static pressure	380	pa	
Noise	≤ 66	dB(A)	Pressure level (1m from the inlet)
Weight	17	kg	

Motor characteristics

Power supply	400V	AC	3～/ 50Hz±2%
Voltage range static	±5%		
Voltage range dynamic	±20%		
Insulation class	F		
Dielectric Test	2500	V	For 1 minute, without electric break-through
Protection grade	IP54		

Interface data

Wiring interface	With 6m cable (cable standard: Smoke & Flame BS6853; Insulation NFF 63-808, NFF 63-826)

Earthing	With earthing point

Other requirements

Anti-corrosion	shell is made of stainless steel and passivation is necessary.
Life time	For motor >50000 h, for bearing, >25000h .Working hours without overhaul;
Standard	GB/T 13275-91，GB755
Report	The supplier shall provide type test report and quality certificate according to GB 2888-91, ISO 5801 standard

2.1.4.9 Filter

Drawing	See KS97A100.000-05A.Z3 and KS97A100.000-09A.Z3
Pieces	2 for fresh air, 3 for mixed air
Working temp.	-20~70 ℃
Filter glass	EU3
Material	For fresh air filter ,stainless steel 304 ;for mixed air filter ,Al.
outline dimension	Refer to the drawing

2.1.4.10 Damper actuator

Type	TRD		
Pieces	2 for fresh air,1 for return air		
Working environment			
Ambient temperature range	-35～70	℃	
EMC standard	Comply with EN 50121-3-1 and EN 50121-3-2		
Technical data			
Nominal voltage	DC48～110V	V DC	
Power consumption	In operation		3.0W @ nominal torque
	At rest		2W
	For wire sizing		3VA
Torque	Min 5	Nm	Under rated voltage
Running time	35	S	0~5Nm
Sound power level	Max.45	dB(A)	
Degree of protection	IP54		
Angle of rotation	Max.95°		Adjustable by mechanical stops
Weight	700	g	
Other Instruction			
Connection cable	1 m long, 3 x 0.75 mm^2		
Direction of rotation			Selected with L/R switch
Position indication			Mechanical with pointer, 0~95°
Vibration and shock:	Meet with EN 61373 standard		
Fire safety	EN 45545		
Reliability	The analysis on reliability shall be provided.		
Auxiliary switch	S1A		

EMC standard	Comply with EN 50121-3-1 and EN 50121-3-2 符合 EN 50121-3-1 和 EN 50121-3-2
Weight	130g

2.1.4.11 High pressure switch

Type	HS200-835-0019_TRD
Drawing	See the reference
Pieces	2

Operating and storage conditions

Storage condition	-40℃～80℃,RH≤ 99%		
Max. altitude	2000	m	
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.		

Technical data

Medium compatibility	R407C		
Medium temperature	-54℃～+135℃		
Pressure setting	29±1 (off)	bar	When the pressure is higher than 29bar, the contact will be open.
	24±1（reset ）	bar	When the pressure reduce to 24bar, the contact will reset (close).
Max. working pressure	42bar ;		
Burst pressure	352 bar		
Protection class	IP65		

Electrical data

Supply voltage	110	DC	
Full load current	3	A	
Contact resistance	≤ 50	mΩ	
Insulation resistance	≥ 100	MΩ	DC500V

Dielectric strength	Withstand AC1500V for 1 min. 1500V
Contact life	100,000 Cycle

Interface data

Pressure connection	2.4mm^2 capillary
Cable	2×0.75mm^2 (2.0m) (cable standard: Smoke & Flame BS6853; Insulation NFF 63-808, NFF 63-826)

2.1.4.12 Low pressure switch

Type	HS200-835-0020_TRD
Drawing	See the reference
Pieces	2

Operating and storage conditions

Storage condition	-40℃～80℃,RH≤ 99%
Max. altitude	2000 m
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.

Technical data

Medium compatibility	R407C		
operating temperature	-54℃～+135℃		
Pressure range	0～30	bar	
Pressure setting	1.8±1 (off)	bar	When the pressure is lower than 29bar, the contact will be open.
	3.2±1（reset ）	bar	When the pressure rise to 3.2 bar, the contact will reset (close).
Max. working pressure	18bar ;		
Burst pressure	352 bar		
Protection class	IP65		

Interface data

Pressure connection	1/4” SAE Female
Electrical connection	Hirchman (Din 43650)

2.1.4.13 Condenser fan

Drawing	KS97A100.000-02A.Z3
Pieces	2

Operating and storage conditions

Storage condition	-40℃～70℃,RH≤ 99%
Working condition	-30℃～70℃,RH≤ 99%
Max. altitude	2000 m
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.
Other	Installed outside and bearing sun , rain, snow , sand and lightning strike

Technical data

Air flow rate	6500	m^3/h	
Static pressure	150	Pa	
Noise	≤ 70	dB(A)	Pressure level (1m from the inlet)
Rotating speed	TBD	rpm	
Impeller Diameter	560	mm	

Motor

Motor type	TBD		
Power supply	400V±5%	AC	3～/ 50Hz±5%
Nominal power	⩾ 0.8	kW	output
Nominal current	TBD	A	
Insulation class	F		
Dielectric Test	≥ 2000	V	For 1 minute, without electric break-through
Protection grate	IP55		
Winding type	Y		
Internal protection	PTC resistor		

Interface data

Wiring interface	With 5.5m cable (cable standard: Smoke & Flame BS6853; Insulation NFF 63-808, NFF 63-826)
Earthing	Outside earthing pole

Other requirements

Anti-corrosion	shell is made of stainless steel and passivation is necessary.
Life time	For motor, >50000 h; for bearing , >25000 h ,Working hours without overhaul;
Standard	GB/T 13275-91，GB755
Report	The supplier shall provide type test report and quality certificate according to GB 2888-91, ISO 5801 standard

2.1.4.14 Electrical heater

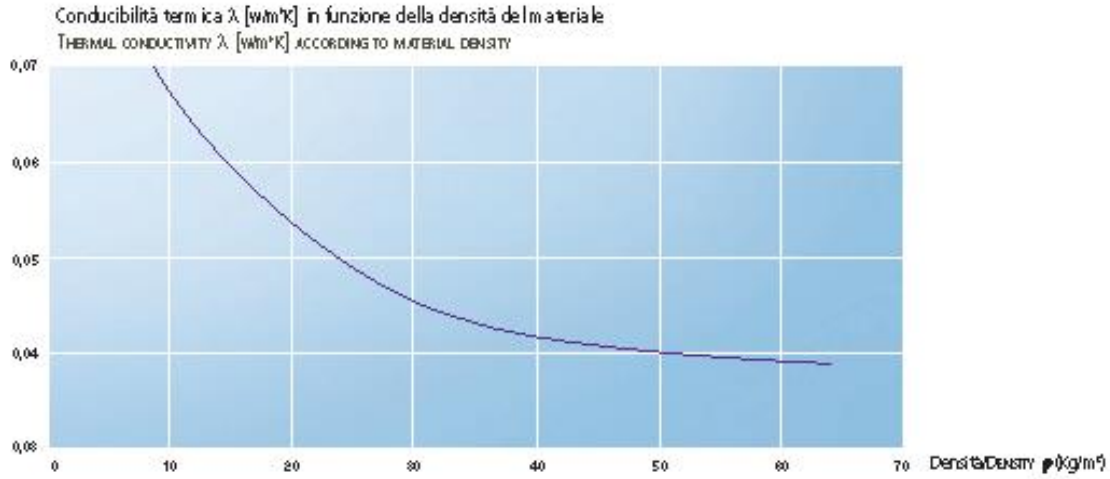
Heating capacity	2X15KW	
Tolerance	0~+5%	Under rated power supply
Air velocity	3.6m/s	Air volume: 3000m3/h
Pressure loss (air)	Max.45Pa	
Load without fins	Provided by supplier	Max.2.5 W/cm2 under rated power supply
IP degree IP	IP55	water-proof design
Thermostat	70±5°C Off 50±5°C On	Automatic reset
Thermal breaker	139±5°C off	Manual reset

2.1.4.15 Fiberform

Acoustic performance

Product	Thickness mm	Sound Absorption Coefficient (to BS EN20354:1993)					
		125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Unfaced **FiberForm**	25	0.16	0.26	0.43	0.60	0.70	0.77
	50	0.27	0.53	0.76	0.88	0.91	0.90
Faced with:							
Black non-woven	25	0.16	0.27	0.45	0.59	0.73	0.79
polyester fabric	50	0.27	0.54	0.83	0.87	0.94	0.92

Thermal conductivity can see the following figure:



CHEMICAL COMPOSITION	100% POLYESTER
MINIMUM AND MAXIMUM DIAMETRE OF FIBRES	17.9 μm – 47.8 μm
PERCENTAGE OF FIBRES WITH A DIAMETRE BETWEEN 40 AND 50 μm	Min.34.8%
HEATING VALUE	21600 KJ/Kg
SPECIFIC HEAT	0.24 KJ/Kg° K
PERMEABILITY TO STEAM	μ = 3.11

2.1.5 Technical data of Control Components

2.1.5.1 Fresh air, return air and supply air temperature sensor

Operating and storage conditions

Storage condition	-40℃～70℃,RH≤ 99%
Working condition	-40℃～70℃,RH≤ 99%
Max. working altitude	2000 m
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.

Technical data

Internal protection IP	IP65
Relationship between temperature and resistance	See reference

Interface data

Cable entry	PG 9
Cable requirement	2 x 0.75 mm^2 shield

Resistance Vs temperature

℃	0	1	2	3	4	5	6	7	8	9	10
-30	88 500	43 200	99 300	105 200	113 400	120 300	128 000	136 400	146 400	156 800	167 000
-20	48 535	51 450	54 550	57 850	61 400	65 200	69 520	73 600	78 200	83 150	88 500
-10	27 665	29 215	30 865	32 620	34 490	36 475	38 590	40 845	43 245	45 805	48 535
- 0	16 325	17 185	18 095	19 055	20 080	21 165	22 310	23 530	24 825	26 200	27 665
0	16 325	15 515	14 750	14 025	13 345	12 695	12 085	11 505	10 960	10 440	9 950
10	9 950	9 485	9 045	8 625	8 230	7 855	7 500	7 160	6 840	6 535	6 245

20	6 245	5 970	5 710	5 460	5 225	**5 000**	4 786,5	4 583,5	4 388,5	4 203,5	4 028,5
30	4 028,5	3 861,5	3 701,5	3 548,5	3 403,5	3 265,0	3 133,5	3 008,5	2 888,5	2 773,5	2 663,3
40	2 663,3	2 558,5	2 458,5	2 363,5	2 271,5	2 185,0	2 100,5	2 020,0	1 945,0	1 871,5	1 801,5
50	1 801,5	1 733,5	1 670,0	1 608,0	1 549,5	1 493,0	1 439,0	1 387,0	1 337,5	1 289,5	1 244,0
60	1 244,0	1 200,0	1 158,0	1 117,5	1 078,5	1 041,5	1 005,5	971,0	938,0	906,5	876,0
70	876,0	846,5	818,0	791,0	765,0	739,5	715,5	692,0	670,0	648,5	627,5
80	627,50	607,50	588,50	570,00	552,00	535,00	518,00	502,00	486,85	472,00	457,65
90	457,65	443,85	430,50	417,65	405,15	393,35	381,65	370,50	359,65	349,35	339,15
100	339,15	329,50	320,15	311,00	302,15	293,65	285,50	277,50	269,85	262,50	255,15
110	255,15	248,35	241,50	235,00	228,65	222,50	216,65	210,85	205,35	200,00	194,65
120	194,65	189,65	184,85	180,00	175,30	170,85	166,55	162,35	158,25	154,30	150,47

Temperature range -40℃～+125℃

Stability ≤±0.05℃/y

Precision 0.3℃ (-40～70℃)

Temperature Response Time 3s

2.1.5.2 Controller

Operating and storage conditions

Storage condition -40℃～70℃,RH≤ 99%

Working condition -40℃～50℃,RH≤ 99%

Max. working altitude 2000 m

Shock and vibration withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.

Technical data

Operating voltage 110 V DC Range: 77V DC to 137.5 V

Power consumption	<25	W
Train network interfaces	CAN bus	
Internal protection IP	IP20	
Weight(approx.)	Max. 3.5	kg

Other 其它

EMC standard	Comply with EN 50121-3-1 and EN 50121-3-2
Other standard	EN 50155

2.1.6 Basis of cooling cab

Side windows	0.3	m^2
Side windows k- value	5.7	$W/m^2 K$
Front windows	3	m^2
Front windows k- value	5.7	$W/m^2 K$
k-value cab	2.4	$W/m^2 K$
Front window glass solar factor	0.5	
Side window glass solar factor	0.5	
temperature(surface)	35	°C
outside humidity (surface)	45%	
max. no. of passenger	2	
height above sea level	0	m
load and humidity per passenger	to UIC 553	
fresh air volume	60	m^3/h
supply air volume	650	m^3/h
vehicle velocity	10	km/h
interior temperature	28	℃
interior humidity	45%	

2.1.7 Roof-mounted compact HVAC cab unit

Unit output

Cooling:	4.5 kW	at outdoor temperature of 44°C/33%

Supply air max.:	650 m^3/h		
of this outside air:	60 m^3/h		normal operation
Operating voltage			
Compressor motor:	400 V AC	3~/50Hz	
Condenser fan:	400 V AC	3~/50Hz	
Supply air fan:	170 V AC	1~/50Hz	
Auxiliary energy			
Control voltage:	110 V DC		
Dimensions			
Length: (not including flexible bellows)	1310 mm		
Width without brackets:	720 mm		
Height:	502 mm		
Weight	200 Kg		
Refrigerant:	R407C		
Filling volume:	2.2 kg		

2.1.8 Technical data of Refrigeration Components and Mechanical Components of Cab HVAC unit

2.1.8.1 Compressor

Type	ZR24KTE-TFD-522	Scroll compressor, Copeland
Drawing	See reference	
Pieces	1	

Operating and storage conditions

Storage condition	-40℃～70℃,RH≤ 99%
Working condition	-30℃～70℃,RH≤ 99% （in the position of the compressor）
Max. altitude	2000 m
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.

Technical data

Applied refrigerant	R407C		
Displace volume	5.92	m^3/h	@50hz
Range of evaporating temperature:	-23.3 ~12.8	°C	
Range of condensing temperature:	26.7 ~65.6	°C	
Oil charge	1.124initial	L	1.01L refill oil charge
Type of oil	MMMAPOE		
Noise level Lwa	65	dB(A)	Sound power level
Life time	> 50000	h	Working hours without overhaul
Weight	24.95	kg	

Electrical data

Power supply	400	V AC	3～/ 50 ±2%Hz,

Cooling capacity	5.5	kW		
Locked rotor APMS	26	A		
Rated load APMS	4.3	A		
Dielectric Test	≥ 2500	V	For 1 minute, without electric break-through	
Motor protection devices	Internal Line Break Protector			
Interface data				
Discharge line connection	Φ12	mm	ODF solder	ODF
Suction line connection	Φ19	mm	ODF solder	ODF

2.1.8.2 Condenser

Type	Aluminium fin – copper tube
Pieces	1

Operating and storage conditions

Storage condition	-40℃～70℃,RH≤ 99%
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.

Technical Data

Air flow rate	2000	m^3/h	
Pressure loss	< 60	Pa	
Eexternal surface	10.25	m^2	
Max. working pressure	29	bar	
Weight	Approx 9	kg	

Construction data

Copper tube	φ9.52×0.35	mm	TP2 inner thread
Tube pitch in air flow	12.5	mm	
Tube pitch above another	25	mm	
Array of tube	Staggered		
Fluid flow pattern	Counter		
No. of tube rows in deep	5		
No. of tube rows in height	16		
No. Of refrigerant distribution	2		

Fin data

Fin material	Aluminium		Lacquer fin with azury crylic acid resin
Fin thickness	0.3	mm	
Fin pitch	2.5	mm	

Flow pattern	Counter		
Mechanical interface			
Gas inlet	Φ12×1	mm	T2，ODF solder
Liquid outlet	φ12×1	mm	T2，ODF solder

2.1.8.3 Solenoid valve

Type	EVR 6NC
Manufacturer	Danfoss
Drawing	See the reference
Code no.	032F1213_TRD
Pieces	1

Operating and storage conditions

Operating condition	-40℃～80℃,RH≤ 99%
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.

Technical data

Refrigerant	R407c		
The maximum work differential pressure	21	bar	10 W a.c.
	25	bar	12 W a.c.
	18	bar	20 W a.c.
Rated cooling capacity	12.3	kW	
Max working pressure	35	bar	
Medium temperature	-40～105	°C	
Max valve temperature	130	°C	

Mechanical interface

Connection size	3/8”×3/8”	ODF×ODF solder

2.1.8.4 Filter dryer

Type	DML 033S
Drawing	See the reference
Code No.	023Z5050
Pieces	1

Operating and storage conditions

Operating condition	-40℃～70℃,RH≤ 99%
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.

Technical data

Refrigerant	R407C		
Drying capacity	4	kg	For R407C in 52℃
Liquid capacity	7	kW	
Max working pressure	42	bar	
Core area	65	cm^2	
Filtration cubage	41	cm^2	
Volume	0.08	L	
Weight	0.1	kg	
Solid core	100% molecular sieve (especially for POE oil)		

Mechanical interface

Connection size	3/8 inch	ODF×ODF solder

2.1.8.5 Sight glass

Type	SGN 10S
Manufacturer	Danfoss
Drawing	See the reference
Code No.	014-0182
Pieces	1

Operating and storage conditions

Storage condition	-20℃～70℃,RH≤ 95%
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.

Technical data

Refrigerant	R407C		
Ambient temperature	-50～+80℃		
Ambient humidity	95%		
Max working pressure	35	bar	
Connection size	12×12		ODF×ODF solder

2.1.8.6 Expansion valve

Type	TUBE6-N
Drawing	See the reference
Code No.	068U1916_TRD
Pieces	1

Operating and storage conditions

Storage condition	-40℃～80℃,RH≤ 99%
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.

Technical data

Refrigerant	R407C		
Temperature range	N: -40℃~+80℃		
Static superheat	4	K	
Open superheat	4	K	
Rated cooling capacity	5.7	kW	
Max working pressure	34	bar	
Max valve temperature	120	℃	

Mechanical interface

Connection size	6x12	mm	ODF×ODF solder

2.1.8.7 Evaporator

Type	Aluminium fin – copper tube
Drawing	See the reference
Pieces	1

Operating and storage conditions

Storage condition	-40℃～70℃,RH≤ 99%
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.

Technical Data

Air flow rate	650	m^3/h	
Pressure loss	< 23	Pa	In the wet condition
Eexternal surface	6.73	m^2	
Max. working pressure	18	bar	
Weight	Approx6	kg	

Construction data

Copper tube	φ9.52×0.35	mm	TP2
Tube pitch in air flow	12.5	mm	
Tube pitch above another	25	mm	
Array of tube	Staggered		
Fluid flow pattern	Counter		
No. of tube rows in deep			
No. of tube rows in height			
No. Of refrigerant distribution	6		

2.1.8.8 Supply air fan

Type	D2E146-AP43-C9
Drawing	See reference
Pieces	1

Operating and storage conditions

Storage condition	-20℃～70℃,RH≤ 99%
Working condition	-20℃～50℃,RH≤ 99%
Max. altitude	2000 m
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.

Technical data

Air flow rate	650/TBD	m^3/h	high/low speed
Static pressure	300/TBD	pa	high/low speed
Noise	≤60	dB(A)	Pressure level (1m from the inlet)

Motor characteristics

Power supply	170V±10%	AC	1～/ 50Hz±2%
Insulation class	F		
Dielectric Test	≥2000	V	For 1 minute, without electric break-through
Protection grade	IP56		
winding type	Y/Δ		
Internal protection	PTC resistor		

Interface data

Wiring interface	With 2 m cable (cable standard: Smoke & Flame BS6853; Insulation NFF 63-808, NFF 63-826)
Earthing	With earthing point

Other requirements

Anti-corrosion	shell is made of stainless steel and passivation is necessary.

Life time	> 25000 h, Working hours without overhaul
Standard	GB/T 13275-91，GB755
Report	The supplier shall provide type test report and quality certificate according to GB 2888-91, ISO 5801 standard

2.1.8.9 Filter

Type	N.A.
Drawing	KS97C100.000-03A.Z3 for Mixed air filter KS97C100.000-06A.Z4 for fresh air filter
Pieces	1 for mixed air filter,1 for fresh air filter
Working temp.	-40~70 ℃
Filter glass	EU3
Material	
outline dimension	Refer to the drawing

2.1.8.10 High pressure switch

The technical data of the High pressure sensor please see chapter 2.1.4.11.

Number of pieces: 1

2.1.8.11 Low pressure switch

The technical data of the Low pressure sensor please see chapter 2.1.4.12.

Number of pieces: 1

2.1.8.12 Condenser fan

Drawing	KS97C100.000-02A.Z3
Pieces	1

Operating and storage conditions

Storage condition	-40℃~70℃,RH≤ 99%

Working condition	-30℃～70℃,RH≤ 95%		
Max. altitude	2000	m	
Shock and vibration	withstand at least shocks corresponding to an acceleration of 1g in lateral and vertical directions and 3g in longitudinal.		
Other	Installed outside and bearing sun , rain, snow , sand and lightning strike		

Technical data

Air flow rate	2000	m^3/h	
Static pressure	170	Pa	
Noise	≤ 68	dB(A)	Pressure level (1m from the inlet)
Rotating speed	TBD	rpm	
Impeller Diameter:	TBD	mm	
Color	B04		

Motor

Motor type	TBD		
Power supply	400V±10%	AC	1～/ 50Hz±5%
Nominal power	TBD	kW	output
Nominal current	TBD	A	
Insulation class	F		
Dielectric Test	≥ 2000	V	For 1 minute, without electric break-through
Protection grate	IP56		
Winding type	Y		
Internal protection	PTC resistor		

Interface data

Wiring interface	With 5.5m cable (cable standard: Smoke & Flame BS6853; Insulation NFF 63-808, NFF 63-826)
Earthing	Outside earthing pole

Other requirements

Anti-corrosion	shell is made of stainless steel and passivation is necessary.

Life time	For motor,>50000 h ; for bearing >25000 h ,Working hours without overhaul;
Standard	GB/T 13275-91，GB755
Report	The supplier shall provide type test report and quality certificate according to GB 2888-91, ISO 5801 standard

2.1.8.13 Fiberform

Refer to 2.1.4.1.

2.1.9 Cab aerotherm unit

2.1.9.1 Temperature sensor

Refer to 2.1.5.1.

2.1.9.2 Supply air fan

Type	double inlet forward curved fan
Air volume	400 m3/h per fan high speed, tbd. m3/h low speed
Static pressure	240 Pa, 80 Pa for duct system+ internal pressure (high speed)
Requirement of sound pressure level	59 dB(A)

2.1.9.3 Electrical heater

Heating capacity	2.5KW	
Tolerance	0~+5%	Under rated power supply
Air velocity	m/s	Air volume: 400m3/h
Pressure loss (air)	Max.45Pa	
Load without fins	Provided by supplier	Max.2.5 W/cm^2 under rated power supply
Thermostat	70±5°C Off 50±5°C On	Automatic reset
Thermal breaker	139±5°C off	Manual reset

2.1.9.4 Fiberform

Refer to 2.1.4.1.

2.2 POWER CONSUMPTION

2.2.1 Power Consumption of Saloon HVAC Unit

Table 1: Power Consumption of the HVAC System (cooling @35°C 45% 31kw)

	QYT PER / UNIT	POWER CONSUMED PER MOTOR [kW]	TOTAL POWER CONSUMED/unit [kW]	POWER FACTOR	TOTAL POWER Consumed/car [kVA]	COP
COMPRESSOR MOTOR	2	5.7	11.4	.80	14.3	
CONDENSER FAN MOTOR	2	0.85	1.7	.62	2.7	
SUPPLY AIR FAN MOTOR	2	0.7	1.4	.56	2.5	
TOTAL			14.5	0.66	19.5	2.05

Table 2: Power Consumption of the HVAC System (cooling @external tempertaure:15°C)

	QYT PER / UNIT	POWER CONSUMED PER MOTOR [kW]	TOTAL POWER CONSUMED/unit [kW]	POWER FACTOR	TOTAL POWER Consumed/car [kVA]
COMPRESSOR MOTOR	2	3.2	6.4	.67	9.6
CONDENSER FAN MOTOR	2	0.85	1.7	.62	2.7
SUPPLY AIR FAN MOTOR	2	0.7	1.4	.56	2.5
TOTAL			9.5	0.62	14.8

Table 3: Power Consumption of the HVAC System (cooling @external tempertaure:20°C)

	QYT PER / UNIT	POWER CONSUMED PER MOTOR [kW]	TOTAL POWER CONSUMED/unit [kW]	POWER FACTOR	TOTAL POWER Consumed/car [kVA]
COMPRESSOR MOTOR	2	3.8	7.6	.7	10.9
CONDENSER FAN MOTOR	2	0.85	1.7	.62	2.7
SUPPLY AIR FAN MOTOR	2	0.7	1.4	.56	2.5
TOTAL			10.7	0.63	16.1

Table 4: Power Consumption of the HVAC System (cooling @external tempertaure:25°C)

	QYT PER / UNIT	POWER CONSUMED PER MOTOR [kW]	TOTAL POWER CONSUMED/unit [kW]	POWER FACTOR	TOTAL POWER Consumed/car [kVA]
COMPRESSOR MOTOR	2	4.4	8.8	.73	12
CONDENSER FAN MOTOR	2	0.85	1.7	.62	2.7
SUPPLY AIR FAN MOTOR	2	0.7	1.4	.56	2.5
TOTAL			11.9	0.64	17.2

Table 5: Power Consumption of the HVAC System (cooling @external tempertaure:30°C)

	QYT PER / UNIT	POWER CONSUMED PER MOTOR [kW]	TOTAL POWER CONSUMED/unit [kW]	POWER FACTOR	TOTAL POWER Consumed/car [kVA]
COMPRESSOR MOTOR	2	5	10	.77	13
CONDENSER FAN MOTOR	2	0.85	1.7	.62	2.7
SUPPLY AIR FAN MOTOR	2	0.7	1.4	.56	2.5
TOTAL			13.1	0.65	18.2

Table 6: Power Consumption of the HVAC System (cooling @external tempertaure:40°C)

	QYT PER / UNIT	POWER CONSUMED PER MOTOR [kW]	TOTAL POWER CONSUMED/unit [kW]	POWER FACTOR	TOTAL POWER Consumed/car [kVA]
COMPRESSOR MOTOR	2	6.5	13	.82	15.9
CONDENSER FAN MOTOR	2	0.85	1.7	.62	2.7
SUPPLY AIR FAN MOTOR	2	0.7	1.4	.56	2.5
TOTAL			16.1	0.73	21.1

Table 7: Power Consumption of the HVAC System (cooling @external tempertaure:45°C)

	QYT PER / UNIT	POWER CONSUMED PER MOTOR [kW]	TOTAL POWER CONSUMED/unit [kW]	POWER FACTOR	TOTAL POWER Consumed/car [kVA]
COMPRESSOR MOTOR	2	7.5	15	.85	17.6
CONDENSER FAN MOTOR	2	0.85	1.7	.62	2.7
SUPPLY AIR FAN MOTOR	2	0.7	1.4	.56	2.5
TOTAL			18.1	0.68	22.8

Table 8: Power Consumption of the HVAC System (cooling @external tempertaure:47°C supply air fan running low speed)

	QYT PER / UNIT	POWER CONSUMED PER MOTOR [kW]	TOTAL POWER CONSUMED/unit [kW]	POWER FACTOR	TOTAL POWER Consumed/car [kVA]
COMPRESSOR MOTOR	2	7.5	15	.85	17.6
CONDENSER FAN MOTOR	2	0.85	1.7	.62	2.7
SUPPLY AIR FAN MOTOR	2	0.4	0.8	.75	1.1
TOTAL			17.5	0.74	21.4

2.2.2 Power Consumption of Cab HVAC Unit

Table 9: Power Consumption of the Cab HVAC System (cooling @design point)

	QYT PER car	POWER CONSUMED PER MOTOR [kW]	TOTAL POWER CONSUMED [kW]	POWER FACTOR	TOTAL POWER Consumed[kVA]	START CURRENT [A]
COMPRESSOR MOTOR	1	2.2	2.2	.8	2.8	32
CONDENSER FAN MOTOR	1	0.54	0.54	.65	0.83	13
SUPPLY AIR FAN MOTOR	1	0.26	0.26	.65	0.4	10
TOTAL			3	0.77	4.03	

Table 10: Power Consumption of the HVAC System (Heating)

	QYT PER car	POWER CONSUMED PER MOTOR [kW]	TOTAL POWER CONSUMED [kW]	POWER FACTOR	TOTAL POWER Consumed[kVA]	START CURRENT [A]
Electrical heater	1	2.5	2.5	1	2.5	
SUPPLY AIR FAN MOTOR	1	0.26	0.26	.65	0.4	10
TOTAL			2.8	0.83	2.9	

Table 11: Power Consumption of the Aerotherm System (Heating)

	QYT PER car	POWER CONSUMED PER MOTOR [kW]	TOTAL POWER CONSUMED [kW]	POWER FACTOR	TOTAL POWER Consumed[kVA]	START CURRENT [A]
Electrical heater	1	2.5	2.5	1	2.5	
SUPPLY AIR FAN MOTOR	1	0.20	0.20	.65	0.3	6
TOTAL			2.7	0.83	2.8	