

Choosing a purpose-built vaccine refrigerator

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TABLE OF CONTENTS

Introduction	2
Purpose-built vaccine refrigerator manufacturers	2
1. Refrigerator features	3
2. Storage features.....	11
3. Temperature, monitoring and alarm features	13
4. Purchasing and installation	20
5. Service and warranty.....	22

Introduction

This document is a collation of questions and answers from manufacturers to provide practices/clinics with a starting point in the purchase of a purpose-built vaccine refrigerator. **Practices/clinics are actively encouraged to contact the manufacturer for additional information about the company and product to assist in the decision-making process.**

Practice/clinics may also wish to refer to **page 20** of the [National Vaccine Storage Guidelines: Strive for Five](#) which provides questions to consider when choosing a purpose-built vaccine refrigerator.

Although it is recommended that the entire document be reviewed, the following areas may be considered most critical when choosing a purpose-built vaccine refrigerator:

1. The new refrigerator must be large enough to easily store one month's supply of vaccine, including the supply of influenza vaccine in autumn. It should also have room enough to store additional vaccines which may be added to the National Immunisation Program Schedule in the near future.
2. Even with a purpose-built vaccine refrigerator the temperatures need to be monitored and recorded at least daily. The process for temperature monitoring varies between manufacturers, and some are more time-consuming than others.
3. Alarm systems vary between manufacturers. A purpose-built refrigerator which would clearly alert staff to the fact that the temperature is, or has been, outside the 2°C to 8°C would be preferable.

STRIVE 5 See pages 17, 19-21

Purpose-built vaccine refrigerator manufacturers

It should be noted that neither Queensland Health nor General Practice Queensland (GPQ) endorse any particular model of vaccine refrigerator – practices/clinics need to consider their practice environment, staffing arrangements and other relevant details to ensure the most appropriate refrigerator is chosen.

The following purpose-built vaccine refrigerator companies have been listed in alphabetical order:

Arcus Australia

Phone: 08 9381 3888
Fax: 08 9388 1311
Email: enquire@arcus.biz
Web: www.arcus.biz

Quirks Australia

Phone: 1800 804 627
Fax: 07 3808 8725
Email: qldsales@quirksrefrigeration.com.au
Web: www.quirksaustralia.com.au

Ebos Group (supply ICS PACIFIC)

Phone: 1800 269 534
Fax: 1800 810 257
Email: ebos@ebosgroup.com.au
Web: www.ebosgroup.com.au

Rollex Group Australia

Phone: 1300 880 441
Fax: 02 9457 6516
Email: digby@bentleybrokerage.com.au
Web: www.rollex.com.au

ICS PACIFIC

Phone: 1800 664 664
Fax: 03 9706 6556
Email: info@icspacific.com.au
Web: www.icspacific.com.au

SKOPE Australia

Phone: 1800 121 535
Fax: 1800 121 533
Web: www.skope.com.au

Quantum Scientific (supply Sanyo)

Phone: 1800 777 168
Fax: 1800 625 547
Email: sales@quantum-scientific.com.au
Web: www.quantum-scientific.com.au

Thermoline Scientific

Phone: 07 3260 5243
Fax: 07 3266 3978
Email: garyguest@thermoline.com
Web: www.thermoline.com.au

GPQ would like to thank the above purpose-built vaccine refrigerator companies for contributing to the development of this document.

1. REFRIGERATOR FEATURES

1.1. Please detail your refrigerator model(s) and their respective specifications.

Arcus range

Model	AUD1PV	AUD1SV	AUD1V	AUD2V
Solid door	Optional	Optional	Optional	Optional
Glass door	Standard	Standard	Standard	Standard
External measurements				
Height (mm)	1540 mm	1820 mm	2070 mm	2045 mm
Width (mm)	565 mm	700 mm	740 mm	1175 mm
Depth (mm)	570 mm	625 mm	810 mm	810 mm
Internal measurements	220 L	400 L	560 L	980 L
Height (mm)	-	-	-	-
Width (mm)	-	-	-	-
Depth (mm)	-	-	-	-
Ventilation requirements (mm)	-	-	-	-
Shelves (number)	5	5	5	5
Sound level	-	-	-	-
Energy (power) consumption	-	-	-	-
Keyed door lock	Optional	Optional	Optional	Optional
Refrigerator lifespan (years)	10 + years	10 + years	10 + years	10 + years

ICS PACIFIC

Model	G135L Medical	G375L Medical	G400L Medical
Solid door	-	-	-
Glass door	Yes, self closing double glazed non-condensing safety glass	Yes, self closing double glazed non-condensing safety glass	Yes, self closing double glazed non-condensing safety glass
External measurements			
Height (mm)	850 mm	1870 mm	1780 mm
Width (mm)	595 mm	595 mm	600 mm
Depth (mm)	610 mm	600 mm	620 mm
Internal measurements			
Height (mm)	640 mm	1530 mm	1530 mm
Width (mm)	520 mm	500 mm	500 mm
Depth (mm)	420 mm (Base 250 mm)	420 mm (Base 250 mm)	420 mm (Base 250 mm)
Ventilation requirements (mm)	100 mm	100 mm	100 mm
Shelves (number)	4 + Base, all usable	7 + Base, all usable	7 + Base, all usable

Model	G135L Medical	G375L Medical	G400L Medical
Sound level	42dB	42dB	42dB
Energy (power) consumption	3.3 kW/24 hours	3.75 kW/24 hours	3.75 kW/24 hours
Keyed door lock	Yes	Yes	Yes
Refrigerator lifespan (years)	10 + years	10 + years	10 + years

Quantum Scientific (supply Sanyo)

Model	Sanyo MPR-161	Sanyo MPR-311	Sanyo MPR-514	Sanyo MPR-1014
Solid door	No	No	No	No
Glass door	Yes	Yes	Yes	Yes
External measurements				
Height (mm)	1090 mm	1800 mm	1790 mm	1790 mm
Width (mm)	800 mm	800 mm	900 mm	1800 mm
Depth (mm)	450 mm	450 mm	600 mm	600 mm
Internal measurements				
Height (mm)	725 mm	1435 mm	1300 mm	1300 mm
Width (mm)	720 mm	720 mm	800 mm	1700 mm
Depth (mm)	300 mm	350 mm	465 mm	465 mm
Ventilation requirements (mm)	50 mm at rear of unit	50 mm at rear of unit	50 mm at rear of unit	50 mm at rear of unit
Shelves (number)	2	5	5	10
Sound level	Minimal (37 dB)	Minimal (43 dB)	Minimal (45 dB)	Minimal (45 dB)
Energy (power) consumption	121 nW	193W	240W	350W
Keyed door lock	Yes	Yes	Yes	Yes
Refrigerator lifespan (years)	Approx. +8 Years	Approx. +8 Years	Approx. +8 Years	Approx. +8 Years

Quirks

Model	FKG311	FKG371	HB80	Super 5
Solid door	No	Yes	No	No
Glass door	Yes	Yes	Yes	Yes
External measurements				
Height (mm)	1630 mm	1930 mm	770 mm	955 mm
Width (mm)	595 mm	595 mm	560 mm	500 mm
Depth (mm)	595 mm	595 mm	500 mm	540 mm
Internal measurements	306 L	381 L	80 L	136 L
Height (mm)	-	-	-	-
Width (mm)	-	-	-	-

Model	FKG311	FKG371	HB80	Super 5
Depth (mm)	-	-	-	-
Ventilation requirements (mm)	50 mm	50 mm	50 mm	50 mm
Shelves (number)	5	6	3	2
Sound level	Under testing	Under testing	Under Testing	Under testing
Energy (power) consumption	Under testing	Under testing	Under Testing	Under testing
Keyed door lock	Yes	Yes	No	Non-standard but available
Refrigerator lifespan (years)	10 years	10 years	10 years	10 years

Rollex

Model	202 82ltr	502 142ltr	902 277ltr	1202 350ltr	1602 441ltr
Solid door	PE = Solid	PE = Solid	PE = Solid	PE = Solid	PE = Solid
Glass door	PG = Glass	PG = Glass	PG = Glass	PG = Glass	PG = Glass
External measurements					
Height (mm)	660 mm	860 mm	1508 mm	1880 mm	1688 mm
Width (mm)	502 mm	502 mm	533 mm	600 mm	685 mm
Depth (mm)	508 mm	584 mm	610 mm	610 mm	910 mm
Internal measurements					
Height (mm)	541 mm	749 mm	1343 mm	1663 mm	1175 mm
Width (mm)	448 mm	448 mm	421 mm	472 mm	553 mm
Depth (mm)	373 mm	446 mm	470 mm	470 mm	697 mm
Ventilation requirements (mm)	50 mm	50 mm	50 mm	50 mm	50 mm
Shelves (number)	2	3	5	7	5
Sound level	Quiet	Quiet	Quiet	Quiet	Quiet
Energy (power) consumption	149 W	170 W	176 W	180 W (approx)	240 W
Keyed door lock	Yes	Yes	Yes	Yes	Yes
Refrigerator lifespan (years)	If all systems are maintained/serviced annually, indefinite. ATO depreciates medical systems @ 17% per annum.				

Thermoline Scientific

Model	TPR-530	TPR-800	TPR-900	TPR-1275
Solid door	Choice	Choice	Choice	Choice
Glass door	Choice	Choice	Choice	Choice
External measurements				
Height (mm)	2000 mm	2000 mm	2000 mm	2000 mm
Width (mm)	730 mm	1000 mm	1220 mm	1470 mm

Model	TPR-530	TPR-800	TPR-900	TPR-1275
Depth (mm)	710 mm	710 mm	710 mm	710 mm
Internal measurements				
Height (mm)	1460 mm	1460 mm	1460 mm	1460 mm
Width (mm)	580 mm	850 mm	1120 mm	1310 mm
Depth (mm)	560 mm	560 mm	560 mm	560 mm
Ventilation requirements (mm)	100 mm	100 mm	100 mm	100 mm
Shelves (number)	4	4	4	4
Sound level	-	-	-	-
Energy (power) consumption	-	-	-	-
Keyed door lock	Optional	Optional	Optional	Optional
Refrigerator lifespan (years)	Anticipated 10 years	Anticipated 10 years	Anticipated 10 years	Anticipated 10 years

1.2. Are there any special requirements that the practice/clinic needs for the purpose-built vaccine refrigerator?

Arcus	A 10amp G.P.O power supply is required to run the vaccine refrigerator.
ICS PACIFIC	No.
Quantum Scientific	Not generally. It is recommended however to ensure it is in as low traffic area as possible to minimise dust, out of direct sunlight where possible, and not too close to external doors that are opened frequently.
Quirks	Only if auto dialler is required – dedicated phone line.
Rollex	Yes, a reasonable space to fit the fridge so it is reasonably ventilated. A dedicated power point and a surge protector fitted.
Thermoline Scientific	No, our refrigerators are built for clinical and laboratory use.

1.3. Is the refrigerator suitable for use in a busy office-based practice environment?

Arcus	The Arcus vaccine refrigerator range can be used in all areas where vaccines are being stored, whether it is in a pharmacy, hospital or a laboratory.
ICS PACIFIC	Yes.
Quantum Scientific	Yes.
Quirks	Yes.
Rollex	Yes, we have them installed in all types of environments from Retail Pharmacies, RFDS hangars, hospital wards and pharmacies, laboratories, clinical trial locations and military medical locations including the sick bays on the new ANZAC frigates. They can be powered by approved generators.
Thermoline Scientific	Yes, all Thermoline Scientific vaccine refrigerators are designed for high use areas.

1.4. Does the vaccine refrigerator provide temperature readings up to at least 26°C?

(Note: This information is important for Queensland Health when managing a cold chain breach.)

Arcus	<i>No answer.</i>
ICS PACIFIC	Yes.
Quantum Scientific	Yes, digital controller will display from -45°C to +45°C.
Quirks	Yes.
Rollex	Yes.
Thermoline Scientific	Yes.

1.5. Can you describe quantitatively the temperature spatial differentials from side to side, front to back and top to bottom in your refrigerator?

Arcus	<i>No answer.</i>
ICS PACIFIC	1°C temperature difference throughout the entire cabinet.
Quantum Scientific	Minimal, but generally not more than $\pm 1^\circ\text{C}$ throughout the chamber.
Quirks	5°C.
Rollex	Spatial differential is established normally in a factory environment when the fridges are randomly line tested in a controlled environment. Most manufacturers target a 1°C differential. However in a practical sense that has no bearing on the internal performance when the fridges are loaded. As an example our suppliers testing laboratory use 16 different probes placed inside the fridge to test the consistency of temperature. The intention is to determine an average cabin temperature throughout the system and any well manufactured unit will or should establish a 1°C differential. However commonsense tells us that variations within all fridges will vary markedly once they are in the field depending on the amount of product stored within the units and how the units are managed. Generally the temperatures will range between 2°C and 8°C throughout the fridge given a reasonable stocking level. There is absolutely no way you can guarantee spatial differential as all fridge stocking levels vary in each and every practice. That obviously is why the 2°C to 8°C range has been established for vaccine storage.
Thermoline Scientific	Throughout the entire cabinet, there is a maximum temperature spatial difference of +1°C.

1.6. Does the refrigerator have automatic defrost capabilities?

Arcus	The refrigerator has cyclic defrost.
ICS PACIFIC	Yes, fully programmable automatic defrost function, which can be set to suit individual locations.
Quantum Scientific	Yes.
Quirks	Yes.
Rollex	Yes.
Thermoline Scientific	Yes, all Thermoline vaccine refrigerators are classed as cyclic defrost refrigerators. This means the refrigeration unit cycles on and off periodically and, during the off phase, any water condensation on the internal refrigeration coil surface will drip into drain tray. The drain tray then leads the water into a heated pan where the water is evaporated to the atmosphere.

1.7. Does the refrigerator door(s) close automatically?

Arcus	Yes.
ICS PACIFIC	Yes.
Quantum Scientific	No, but magnetic pull when close to end.
Quirks	Yes.
Rollex	Yes, some models by using the adjustable feet on the front of some systems and incorporating magnetic door seals, other models offer fully automatic closers.
Thermoline Scientific	Yes, all our purpose-built vaccine refrigerators are manufactured with hinged or spring doors that have the capability to close automatically.

1.8. If the doors are glass, are they constructed of double-glaze, non-condensing clear safety glass?

Arcus	The doors on all Arcus Australia refrigerators are made of double glazing.
ICS PACIFIC	Double glazed non-condensing safety glass.
Quantum Scientific	Yes.
Quirks	Yes.
Rollex	Yes, double glazing and in some models triple glazing but depending on dew point some glass door units will get condensation on the external face, especially if air conditioning is turned off. Beyond an ambient room temperature of 32°C, all glass door systems may experience condensation especially in high humidity locations.
Thermoline Scientific	Yes, our glass doors are double glazed to assist in the insulation of the cabinet and effectively reduce condensation on the door.

1.9. Even though double-glazed, do the glass doors allow light into the refrigerator?

Arcus	Yes.
ICS PACIFIC	Yes.
Quantum Scientific	Yes.
Quirks	Yes.
Rollex	Yes.
Thermoline Scientific	Yes, for some models however there is an option to install argon and gas been glazes to block majority of UV.

1.10. Does the refrigerator have an external light switch suitably identified and fitted in an accessible location so products can be identified before opening the door?

Arcus	Yes, the light switch is at the top of the unit and is easily accessible. The light can be turned off if not required by the light switch at the top of the unit.
ICS PACIFIC	Yes, incorporated into the digital temperature controller.
Quantum Scientific	Yes, external light switch.

Quirks	Yes, all models except Super 5.
Rollex	Some of the models have external light switches and some have internal light switches which can be switched on/off as the user chooses.
Thermoline Scientific	The refrigerator has a light switch that is accessible inside the storage cabinet.

1.11. Can the light be turned off if it is not wanted?

Arcus	The light can be turned off if not required by the light switch at the top of the unit.
ICS PACIFIC	Yes, by way of an external light switch.
Quantum Scientific	Yes.
Quirks	Yes.
Rollex	Yes.
Thermoline Scientific	Yes.

1.12. Are the shelves able to be removed easily and resist hypochlorite and other recommended cleaning solutions?

Arcus	Shelves are easily removable and can be cleaned by warm soapy water.
ICS PACIFIC	Yes.
Quantum Scientific	Yes, cost and support clips required per shelf will vary depending on model selected. Please contact Quantum Scientific by phoning toll free 1800 777 168 for details.
Quirks	Yes, plastic coated.
Rollex	Yes.
Thermoline Scientific	Yes, the shelving is easily removed and the polyester coating on the shelves adds resistance to basic cleaning solutions.

1.13. Can extra shelves be purchased? If so what is the approximate cost?

Arcus	The cost for additional shelves would be \$85.00 plus \$8.50 GST each with 4 shelf clips.
ICS PACIFIC	Yes, \$24.80 each + GST + freight.
Quantum Scientific	Yes, contact Quantum Scientific for pricing on FREECALL 1800 777 168.
Quirks	Yes, \$45.00 per shelf.
Rollex	Extra shelves can be purchased from approximately \$95.00 to \$245.00 depending upon models and time of purchase. It is best to negotiate before delivery as postage/courier costs can increase overall costs.
Thermoline Scientific	Yes, \$80.00 + GST per door.

1.14. Are the surfaces smooth and durable, with minimal projections and easy to clean grooves?

Arcus	Yes, white colourbond sides with slots for the shelf clips.
ICS PACIFIC	Yes.
Quantum Scientific	Yes.
Quirks	Yes.
Rollex	Yes.
Thermoline Scientific	Our economy range has moulded plastic interior with curved corners and the standard range has minimal projections to allow simplistic cleaning maintenance.

1.15. Does the purpose-built vaccine refrigerator have a built-in power filter?

(Note: A power filter protects against power surges.)

Arcus	We call them an under/over voltage protection relay and these are available as an optional extra at a cost \$222.00 plus \$22.20 GST. The relay protects the refrigerator from power surges and fluctuating power.
ICS PACIFIC	No, but a surge protector can easily be installed.
Quantum Scientific	Yes, Varistor protection on mains input.
Quirks	No.
Rollex	While these systems are built to WHO standards and durable filters are installed at manufacture, we recommend a Belkin [dedicated] surge protector be installed with all fridges. They are available from Rollex at a nominal figure.
Thermoline Scientific	The power filter can be purchased as an additional item to protect the fridge against power surges and fluctuations.

1.16. Does the refrigerator provide voltage free contacts to allow the alarm conditions to be monitored?

(Note: Voltage free contacts allow the refrigerator to be easily and safely wired into the security or alarm system. Drilling new holes presents a risk of damaging insulation, electrical wiring or refrigeration pipes.)

Arcus	Yes, they are situated at the back of the unit and can be setup as either a closed or open circuit.
ICS PACIFIC	Yes, already fitted – just connect to alarm system.
Quantum Scientific	Yes, only when using the QS1000 Chart Recorder system.
Quirks	No, but can be arranged.
Rollex	Yes.
Thermoline Scientific	Yes, there are voltage free contacts at the back of the refrigerator that would allow personnel to connect the fridge to security or a central monitoring facility.

1.17. Does the refrigerator have an access port or contacts to accommodate external monitoring of the refrigerator cabinet temperature to be continually monitored via a remote system/data logger?

(Note: An access port is a sealed small hole that will enable a probe to be installed without drilling. This also avoids having cables running under door seals which increase the wear on the seals. The contacts enable connection to electrical devices such as loggers without drilling new holes. This may be important if the practice is planning to use auto diallers.)

Arcus	No, there are no portholes in the units although they can be added at an additional charge prior to delivery if requested.
ICS PACIFIC	No, but could do so if required.
Quantum Scientific	Yes.
Quirks	Not needed as ports already in unit.
Rollex	Yes.
Thermoline Scientific	Yes. All our cabinets have an external point of entry to allow access of independent monitoring devices for logging the temperature inside the cabinet.

1.18. Are there adjustable swivel castors to allow mobility and lock the unit into a secure operating position?

Arcus	Yes, and the front two castors are lockable.
ICS PACIFIC	Height adjustable feet fitted.
Quantum Scientific	Rear castors to allow easy moving with front rubber feet to lock in position.
Quirks	No, twin roller system with adjustable legs.
Rollex	On some models.
Thermoline Scientific	Yes, all our purpose-built vaccine refrigerators have lockable swivel castors to reduce work place health and safety risks involved with mobility of the cabinet.

2. STORAGE FEATURES

2.1. If there is a small quantity of vaccine being stored, do water bottles or ice packs/gel packs need to be added to empty space to add thermal mass?

Arcus	No, all refrigerators have fan forced air circulation for quick temperature recovery.
ICS PACIFIC	No, as cooling is fan forced.
Quantum Scientific	No, the pharmacy fridges have air circulation and high temperature stability on both light and heavy loads.
Quirks	No.
Rollex	No, the fan forced air circulation system makes this old method redundant but users should look at defrost cycles to determine whether having too little stock affects maximum temperature levels during defrost [especially when using glass door systems].
Thermoline Scientific	Adding thermal mass is not required, but the refrigeration will run more often without the bottles of water to assist in cabinet stabilisation.

2.2. Can you store vaccines in their packaging in enclosed containers?

For example Tupperware, polystyrene containers, solid plastic open container or trays with air flow.

Arcus	The vaccines can be stored in their normal packaging.
ICS PACIFIC	Containers that allow airflow are recommended.
Quantum Scientific	Most combinations are possible from a general storage perspective, however the type of container the product is stored in will determine its temperature variation and recovery characteristics from door openings, etc. The specific effect is too varied to be discussed in this note without further specific user information.
Quirks	Trays with air flow.
Rollex	The Pharmacy Guild of Australia do not recommend this in their QCPP standards. The thermal mass of the containers can distort the temperatures both internally and externally. Product is best stored in trays that allow full air circulation in any purpose built vaccine fridge.
Thermoline Scientific	We believe containers that allow some air flow to the product would be the best. Closed containers will slow cooling of the vaccines held inside.

2.3. Can vaccines be stored on the floor of the refrigerator?

Arcus	Yes, vaccines can be stored on the floor of the refrigerator.
ICS PACIFIC	Yes, there is a grid on the floor which allows air circulation.
Quantum Scientific	Yes.
Quirks	No.
Rollex	Yes, in the baskets or containers provided so that airflow can pass underneath but again not recommended as this limits air circulation.
Thermoline Scientific	Storing supplies on the floor of the fridge would inhibit airflow of the cabinet, and thus possibly degrading the products at the bottom of the fridge.

2.4. Can vaccines be stored next to the sides and back of the refrigerator?

Arcus	It is not advisable as it restricts the air flow through the cabinet.
ICS PACIFIC	Each shelf is fitted with a white plastic coated back rail to prevent vaccines touching the refrigeration plate at the back. Vaccines can be stored against the side walls without any problems. Vaccines placed within each shelf, including the front, will allow good airflow through out the cabinet.
Quantum Scientific	Yes, preferably not so crowded as to impede air flow.
Quirks	Yes, sides but must keep 50 mm from back wall for air flow.
Rollex	Not recommended as temperatures in any refrigeration system will cool lower at the back where the condenser plate is placed. Our fridges have cover plates to prevent this and the shelves have up stands to prevent product touching the back section. Side walls do not pose a problem but good fridge management requires a small space away from the walls to be standard practice unless baskets are used then these may touch the walls.
Thermoline Scientific	We believe to promote good air flow, space between the sides and back should be left.

3. TEMPERATURE, MONITORING AND ALARM FEATURES

3.1. Under normal conditions, can you guarantee that the refrigerator temperature will not go outside the 2°C to 8°C range?

Arcus	Yes.
ICS PACIFIC	Yes.
Quantum Scientific	Yes.
Quirks	Yes.
Rollex	<p>The question is what is “normal conditions”?</p> <p>The management of the stock and how people handle the fridge is critical and has a huge bearing on what happens within the fridge.</p> <p>However, if the fridge is placed in a position that allows for adequate [correct] air ventilation, product is stored as required, the door is only opened for short periods with staff checking that the doors are closed firmly after use, if staff check that the power plug is firmly in place, [if the cleaners do not remove the plug to do the vacuuming at night], if the practice don't use multi plugs extension leads etc, if the unit has a power surge protector and if the local power authority guarantees good consistent power flow and we were somehow able to stop electrical storms occurring then temperatures should be maintained at correct levels!</p> <p>We are not trying to be flippant, this is the reality of the situation, our purpose built fridges will definitely do the job as specified so long as all the outside influences are in order.</p>
Thermoline Scientific	Yes, Thermoline has a third controller which is fitted and is set at 1-5°C. This is to stop product from ever freezing should the main controller fail.

3.2. How long will the refrigerator temperature be maintained in the event of a power blackout at an ambient temperature of +25°C?

Arcus	This would depend on the internal thermal mass.
ICS PACIFIC	30 minutes approximately providing the door is kept closed.
Quantum Scientific	In the event of a power blackout, the temperature will rise approximately 10°C per hour.
Quirks	<p>It's hard to say because it depends on a number of points.</p> <ol style="list-style-type: none"> 1. How much stock is in the cabinet (the more stock the longer it will hold temperature). 2. The ambient temperature in the area the unit is being kept (the higher the temperature the shorter the time it will hold temperature). 3. If the unit temperature was at 7°C when the power failed it would not take long for it to go over 8°C but if temperature was 3°C it would hold within range for a lot longer.

Rollex	Again many factors have a bearing on the time line – amount of product inside the fridge – temperature before the outage etc, however we have recorded at least 2 hours at 25°C a solid door system will out perform a glass door system every time. Glass door systems are rated at 32 degrees ART while solid door systems are rated at 43 degrees. Also, these systems defrost between 3 to 6 times in a 24 hour period depending upon loading styles. Rollex can provide evidence of a system 60% loaded and defrosts denied for 24 hours lasting through an electrical servicing period of over three hours and the system [under monitored conditions] not exceeding 8°C.
Thermoline Scientific	Depends on the amount of supplies in the fridge. The more supplies inside, the slower the cabinet will gain heat. The overall time is unknown because there is no Australian standard set in place to give suggested appropriate times which the equipment must comply.

3.3. Will the refrigerator tolerate environmental air temperature fluctuations from 0°C (or even -3°C) to 42°C?

Arcus	Yes.
ICS PACIFIC	Working environment +2°C to +8°C at 0°C to +30°C ambient temperature.
Quantum Scientific	Ambient temperature operation is stated at -10°C to +35°C. However Sanyo have also indicated that temperatures in excess of 40°C can be tolerated.
Quirks	Yes.
Rollex	Yes.
Thermoline Scientific	The entire refrigerator is designed to withstand temperature fluctuations up to +32°C while maintaining cabinet temperature suitable for vaccines.

3.4. Does the refrigerator have a display of the cabinet air temperature independent of the chart/temperature recorder that is visible at all times?

Arcus	Yes, when the chart recorder is fitted.
ICS PACIFIC	Internal cabinet temperature displayed at all times on digital temperature controller.
Quantum Scientific	Yes.
Quirks	Yes.
Rollex	If required the fridges can have a data logging system independent of the fridge reader.
Thermoline Scientific	Yes, the sensor for the chart recorder and the cabinet display are independent of each other. The display of the cabinet air temperature is visible from the front of the refrigerator.

3.5. Does the unit have a built-in chart/temperature recorder (automatic recording device), with battery backup to automatically record the refrigerator temperature?

Arcus	No, optional extra.
ICS PACIFIC	Records high and low temperature memory to last record. Mains power operation only. In event of a power failure remote alarm activated. Please refer item 1.16 above.
Quantum Scientific	Yes, with QS1000 system or an Elpro datalogger.

Quirks	Yes, computer data logger.
Rollex	Some of our models do have 7 day chart recorders as an option but we consider this technology old fashioned and prefer to suggest data logging as a far more reliable and much more [independent] economic alternative. Price also has a bearing on alternative monitoring, one has to weigh up price against function and normally price is the primary consideration.
Thermoline Scientific	Chart/temperature recorder (sold as an additional option) is battery backed-up and is built-into the fridge if ordered together with the refrigerator.

3.6. Describe the process of obtaining the most accurate minimum and maximum temperatures from the refrigerator?

Arcus	<i>No answer.</i>
ICS PACIFIC	Single button operation. Press one button on digital temperature controller to read both minimum and maximum temperatures from refrigerator.
Quantum Scientific	The monitoring device attached to the fridge will give the most accurate information. Either writing down the values, downloading the information to a computer or keeping the chart paper record, shows the accurate temperatures.
Quirks	Install a data logger.
Rollex	The information is displayed on the LED screen and is current since the last recordings were taken [AND CLEARED]. By simply pressing the Max & Min buttons the appropriate temperatures are displayed. While this system is calibrated to determine stock temperature based on a 20 ml drug sample, placing extra independent monitoring devices could be deemed as a suitable alternative but some variations will occur as independent monitors are recording air temperature only while the fridge is giving data to users interested in [their] stock temperature only. Should the client choose more expensive models there are a range of add on monitoring options available, again price is usually the governing factor.
Thermoline Scientific	Press left arrow button for minimum temperature } Standard cabinet Press right arrow button for maximum temperature } only

3.7. Does the vaccine refrigerator continue to display the current temperature even during a power failure?

Arcus	No.
ICS PACIFIC	No.
Quantum Scientific	The fridge will not display temperature, however the monitoring device will continue to record in the event of a power failure. All three options contain a battery and can operate independently of the fridge itself.
Quirks	Yes, via battery back up.
Rollex	Not on the standard range, but again models can be fitted with a back battery system and this feature is standard on our more expensive models.
Thermoline Scientific	Only with Thermoscan option.

3.8. If the temperature monitoring device runs on battery, how is the battery changed?

Arcus	Not applicable.
ICS PACIFIC	Not applicable.
Quantum Scientific	Digital Thermometer: Remove battery cover, replace battery and close. Elpro Datalogger: Remove battery cover, replace battery and close. QS1000 Chart Recorder: Contact Quantum Scientific for instruction, if carried out by a non-engineer, ensure the unit is unplugged from mains and get instruction from Quantum Scientific staff.
Quirks	Minor disassembly.
Rollex	The systems have back-up batteries with a useable three day power life and are self charging once the power source is resumed. Clearly if power was off for more than a day there would be no point in worrying about what the temperature was inside the fridge as it would be the same as the ambient temperatures and most product stored inside would be rendered useless.
Thermoline Scientific	Detach old battery and attach new.

3.9. Are the temperature chart recorder sensors easily accessible and tolerate movement to allow manual checks for yearly calibration verification?

Arcus	Yes, when the chart recorder is fitted.
ICS PACIFIC	Not applicable.
Quantum Scientific	Digital Thermometer: Yes. Elpro Datalogger: Yes, if external not internal probe is chosen. QS1000 Chart Recorder: Yes.
Quirks	Yes.
Rollex	Not applicable in most models. But it depends on the type of calibration method adopted. If the probes are required to be properly certified then they should be removed and tested at a certified laboratory or at least on site by a professional testing authority. This will require the fridge being switched off, the probe being removed or replaced. Depending on the type of unit and where the probes are placed will govern the degree of difficulty. Moving the probes is never an issue. The other important point to consider is that with modern probes the degree of creep in accuracy is minimal particularly in digital equipment. The older analogue type probes did have a degree of accuracy creep but again minimal over years. The most cost effective method of checking probe accuracy is by testing against a certified probe and adjusting the offsets of the fridge probe should it be required. This method is probably a 1/3 of the cost to the end user and does not require switching the fridge off and emptying the contents.
Thermoline Scientific	Yes, a demonstration can be shown to staff, if requested, on how to access the chart recorder for calibration.

3.10. How do your personnel advise the customer as to the best method of obtaining the most accurate minimum and maximum temperatures if the refrigerator offers two different temperature monitoring mechanisms?

For example, if the refrigerator offers both a data logger and 'Hi' and 'Low' buttons (or similar) on the refrigerator.

Arcus	<i>No answer.</i>
ICS PACIFIC	Not applicable

Quantum Scientific	As the refrigerator display shows only the air temperature and can change after door opening, the monitoring device provides the accurate reflection of the vaccines actual conditions. (As they are often in solution, their temperature change can 'lag' behind what is reflected on the fridge display.)
Quirks	Refer to data logger temperature.
Rollex	If there are two different monitoring system in a fridge then a check on variation if this is the case should be undertaken, because the majority of probe units are only accurate to .5 of a degree therefore variations between readers could be up to a degree out at any time. If the probes are placed in different positions within the fridge then different results will occur. However if we are advised of a variation we would simply adjust the offsets in one of the probes to obtain as close a similarity as is possible.
Thermoline Scientific	Depends on which device the customer has certified by NATA. Generally the "Hi-Lo" buttons are preferred as it's cross-referenced.

3.11. Does the vaccine refrigerator indicate if the temperatures have been out of range even after it returns to the correct temperature range?

For example, once the alarm stops, does the refrigerator leave any visual feature such as a flashing red light to indicate that there has been a temperature excursion outside the preset temperature and time parameters?

Arcus	No.
ICS PACIFIC	Yes, the built in High/Low temperature recording function will provide a record.
Quantum Scientific	No, however there would be a permanent record available from the monitoring devices which would also have initiated visual/audible alarms.
Quirks	The Hi and Low feature will identify visually and the data logger will identify times out of parameter.
Rollex	On some models yes again depends on choice of options. However on standard models the max/min temperature reader retains this information even when the temperatures resume normal range (until manually cleared). The audible alarm will stop once the temperatures are back in range. That is the function of an alarm system; it is to warn people that there is an issue, if that issue does not continue then there is no reason for the alarm to continue. However as mentioned previously we do offer systems that continue to display alarm situations and can include many sophisticated additional alarming devices but all have a price consideration. Unfortunately it is price that governs most buying decisions and that sadly is not always the most effective method of selection in this critical industry.
Thermoline Scientific	Yes.

3.12. Does the temperature probe have an appropriate temperature lagging device?

(Note: When a substance is heated on one side, it takes time for the heat to travel through the substance. This time is called heat lag. Lagging is the process of using specific materials and thickness of materials so that heat lag takes a certain time. Temperature probes may be lagged so they don't respond to short term fluctuations, for example when the refrigerator door is open.)

Arcus	No.
ICS PACIFIC	Yes, is preset.
Quantum Scientific	Digital Thermometer: No, probe is sealed but not in a lagging solution. Elpro Datalogger: No, probe is sealed but not in a lagging solution. QS1000 Chart Recorder: Yes, glycerol/water lag solution for probe is included and installed prior to delivery.

Quirks	Yes.
Rollex	Yes, our systems can be adjusted to suit whatever lag is considered required. For instance our factory settings are based and tested with a probe setting to allow for an environment where 20 ml vials are stored. Whilst this is a generalisation it is a tried and tested calculation and has proved reliable throughout the world. However the factor can be easily adjusted if required.
Thermoline Scientific	Yes.

3.13. On installation is the alarm set to alert at air temperature or the lagged temperature?

Arcus	Set to air temperature. No links to internal/external monitoring systems can be connected by others.
ICS PACIFIC	Set to alert at air temperature.
Quantum Scientific	Sanyo Refrigerators: All units have high and low temperature alarms based on air temperature, but outside the required monitoring range. Digital Thermometer: Air temperature. Elpro Datalogger: Either, depending on chosen set-up. QS1000 Chart Recorder: Alarms are preset to +2.5°C and +7.5°C (probe is in a lagged solution).
Quirks	Air temperature.
Rollex	The setting is based on the air temperatures as is required by most monitoring standards. The alarm can be triggered by a number of criteria, some are based on product temperature, others on air temperature and can be adjusted to suit. The factory settings allow for a 15 minute delay before alarming which in turns relates generally to temperature of a "standard" 20 ml vial of product before any temperature variation will occur in the solid mass.
Thermoline Scientific	Thermoline sensor probes are lagged and are set to alarm outside the range of +2°C to +8°C. This is set prior to delivery, so customers don't need to concern themselves over it.

3.14. Does the customer need to request what the alarm is linked to (that is air temperature or lagged temperature)?

Arcus	<i>No answer.</i>
ICS PACIFIC	No, as it is set to alert at air temperature.
Quantum Scientific	Discussion as to the best solution (i.e. which monitoring and therefore set up) is recommended. Please contact Quantum Scientific on FREECALL 1800 777 168 to speak with your Territory Manager and discuss your best option.
Quirks	No.
Rollex	No.
Thermoline Scientific	No, alarm probe is always positioned to simulate a 10 ml vial of vaccine.

3.15. If the refrigerator door is ajar is there an alarm/indicator?

Arcus	No, the alarm will sound once the temperature has gone outside the +2°C to +8°C settings after 30 minutes but on the start-up, the alarm will not initiate for 20 minutes to allow the refrigerator to cool down first then the 30 minutes will kick in.
ICS PACIFIC	Audible alarm will activate after 15 minutes if air temperature goes above +8°C.
Quantum Scientific	Yes, light illuminates and a buzzer sounds after 2 minutes.
Quirks	Only when the temperature rises.
Rollex	Optional.
Thermoline Scientific	Alarm/indicator for leaving the door ajar can be sold as an additional device.

3.16. Is there a High/Low temperature alarm test facility to allow staff or a service technician to automatically test the alarm sensors and alarms?

Arcus	No, the refrigerator doesn't have that facility.
ICS PACIFIC	Yes, this can be done by a service technician.
Quantum Scientific	Digital Thermometer: No, manual test only. Elpro Datalogger: No, manual test only. QS1000 Chart Recorder: Yes, a test button validates the probe and alarm once a week or as needed.
Quirks	Service technician only.
Rollex	Optional.
Thermoline Scientific	Only the ThermoScan 1000 (sold as an additional device) has the capability to allow staff or a service technician to test the alarm sensors and alarms automatically.

3.17. If there is a power failure, is there an audible alarm and/or option for notification to an off-site facility/contact?

Arcus	Refrigerator has audible and visual alarm, there is also power free contacts available for connection to services provided by others.
ICS PACIFIC	Yes, voltage free external alarm facility.
Quantum Scientific	Digital Thermometer: No. Elpro Datalogger: Options available such as LAN/wireless monitoring and internet access, please discuss requirements further. QS1000 Chart Recorder: Yes, remote alarm contacts are standard (OPTIONAL – Telephone Autodialler can also be connected).
Quirks	Yes, auto dialler.
Rollex	Optional.
Thermoline Scientific	No audible alarm but the voltage free alarm contacts will provide notification to an offsite facility/contact. The ThermoScan1000 can be purchased as an additional upgrade which sounds an alarm and notify (if connected to an offsite facility) in the event of a power failure since it is battery backed-up.

3.18. Is there an alarm feature if the refrigerator goes outside the +2°C to +8°C range and/or an option for notification to an offsite facility/contact?

Arcus	Yes.
ICS PACIFIC	Yes, there is an audible alarm and an external voltage free alarm facility, which can be connected to a remote monitoring centre.
Quantum Scientific	Digital Thermometer: No. Elpro Datalogger: No, unless wireless LAN setup chosen. QS1000 Chart Recorder: Yes, via remote alarm contacts.
Quirks	Yes, auto dialler.
Rollex	Optional.
Thermoline Scientific	The fridge will sound an alarm outside the range and voltage free alarm contacts will provide notification to an offsite facility/contact.

4. PURCHASING AND INSTALLATION

4.1. Is there a rental scheme available, if so what options are available on rental plan?

Arcus	No rental plans available outside the Perth metropolitan area.
ICS PACIFIC	Yes, can be arranged via another company.
Quantum Scientific	No scheme available as yet, however depending on the demand and specific user requirements we may be able investigate this option further.
Quirks	Yes, via negotiation.
Rollex	Yes, a '36 months lease to own' scheme is available. Individual requirements can be tailored to suit. Bulk discounts are also handled. We work with a number of approved finance houses as well who specialise with medical (business) finance.
Thermoline Scientific	No, however there are leasing companies that may provide some schemes.

4.2. What quality standards does your product and the manufacturer meet?

Arcus	Arcus Australia manufactures the above range of vaccine refrigerators in Perth, Western Australia and they meet the standards set by the QCPP* group.
ICS PACIFIC	Fully compliant with the Quality Care Pharmacy Program (QCPP*) Cold Chain Standards. C Tick and MEPS^ approved.
Quantum Scientific	Locally our company conforms to the ISO 9000:2001 standards while Sanyo Japan conforms to ISO 9001, ISO 14001:1996 and JIS Q14001:1996; (QCPP), Cold Chain Standards and C Tick.
Quirks	QCPP* and MEPS^.
Rollex	As the LEC range is sold throughout the world, we meet all relevant international standards. They are C Ticked and meet World Health Organisation standards. These systems are the only ones that are endorsed by The Pharmacy Guild of Australia and are QCPP* compliant as well as being an AGPAL silver sponsored product.
Thermoline Scientific	Our products are manufactured to meet the Australian Standard ISO9001-2000 and the Pharmacy Guild Quality Assurance Accreditation. If any changes occur with the standards, we will comply to change and meet the new set standards.

*QCPP = Quality Care Pharmacy Program by The Pharmacy Guild of Australia (<http://beta.guild.org.au/qcpp/refrigerators.asp>).

^MEPS = Minimum Energy Performance Standards which relate to household electrical appliances (<http://www.energyrating.gov.au/rf1.html>).

4.3. Is the refrigerator tested in-house prior to delivery?

Arcus	All Arcus Australia vaccine refrigerators are tested prior to leaving the factory. Usually 2-4 days.
ICS PACIFIC	Yes, it is quality checked and tested.
Quantum Scientific	Yes.
Quirks	Yes.
Rollex	Yes and Rollex can also do a follow-up test when the fridge is loaded with a data logger as part of our service.
Thermoline Scientific	Yes.

4.4. Is suitable on-site training available for users at the time of installation?

Arcus	Comprehensive written instructions are provided with 24 hour customer care phone service available. Onsite training would also be available depending on location of refrigerator and could involve a cost.
ICS PACIFIC	Operation manual provided and full phone support available if required. ICS PACIFIC medical refrigerators are very user friendly.
Quantum Scientific	Local installation available (Gold Coast to the Sunshine Coast and Toowoomba). Remote install by phone or other arrangements on request.
Quirks	Yes.
Rollex	Yes, this is offered in most cases. Part of our installation service is to train staff on the correct functions of the fridge, as well as going through all the cold chain issues. In remote or distant locations systems can be freighted and instructions conveyed via conference calls or similar as the systems are user friendly.
Thermoline Scientific	At the time of installation, we can demonstrate/train you on the procedures and protocols of the refrigerator (Brisbane metropolitan areas only). A small cost maybe included outside Brisbane metropolitan area.

4.5. Does installation include the devices or systems that require assembly on-site, for example the data logger?

Arcus	There is no assembly required.
ICS PACIFIC	No onsite assembly is required. All cabinets are programmed and pre-tested before dispatch. ICS PACIFIC supplied cabinets are very user friendly.
Quantum Scientific	No installation or assembly required. Data loggers and max/min thermometers may require the end user to place the probe in an appropriate position in the fridge, suitable to their needs.
Quirks	Yes.
Rollex	When purchased with a fridge, the data logging options are not assembled onsite but like all software programmes require downloading. Again these are [in the main] user friendly with excellent back-up support via phone, internet and [where necessary] local agencies. The fridge itself requires no assembly onsite except in the event of a door hinge requiring switching from one side to the

	other. This is usually done in factory prior to despatch.
Thermoline Scientific	Additional devices (e.g. chart recorder, ThermoScan 1000) that are ordered along with the cabinet will be installed and fitted while the cabinet is being manufactured and tested in Brisbane.

4.6. Will software upgrades that become available during the warranty period be provided and fitted free of charge?

Arcus	No.
ICS PACIFIC	Not applicable.
Quantum Scientific	Not applicable.
Quirks	Yes, terms on negotiation.
Rollex	Yes, all software upgrades are provided [via the web – internet] free of charge even after the warranty has expired as long as clients register with the supplier.
Thermoline Scientific	Thermoline vaccine cabinets will not need software upgrades during the life of the cabinet, if additional options like the ThermoScan 1000 are purchased and software upgrades become available during the warranty period these will be provide free of charge.

5. SERVICE AND WARRANTY

5.1. Is the customer able to obtain service/maintenance if in a remote area?

Arcus	Yes.
ICS PACIFIC	Yes, service available throughout Australia.
Quantum Scientific	Yes, with costs negotiated with Quantum Scientific specific to area.
Quirks	Yes.
Rollex	Yes, we have over 4500 vaccine fridges installed all over Australia and New Zealand.
Thermoline Scientific	Yes, though it's subject to availability and urgency.

5.2. Is the customer able to negotiate a service/maintenance contract?

Arcus	Yes.
ICS PACIFIC	Only maintenance required is minimal cleaning, but a contract can be arranged if required.
Quantum Scientific	Yes.
Quirks	Yes.
Rollex	Yes.
Thermoline Scientific	Yes, we can negotiate a contract that will benefit the parties involved.

5.3. Will a service report be provided each time a service is undertaken?

Arcus	Yes.
ICS PACIFIC	Yes.
Quantum Scientific	Yes.
Quirks	Yes.
Rollex	Yes.
Thermoline Scientific	A service report will be provided each time a service is carried out.

5.4. How often is calibration of the refrigerator recommended?

Arcus	The refrigerator must be calibrated by a certified calibration instrument and can be completed as often as the customer feels the need to.
ICS PACIFIC	Only as required by relevant law.
Quantum Scientific	Once every 12 months.
Quirks	12 monthly.
Rollex	Where it is a requirement of supply we can arrange for this service. We do not recommend calibration as we believe it is an unnecessary extra cost to clients given the accuracy of the modern probe. However as part of a pre-agreed servicing contract calibration service can be supplied.
Thermoline Scientific	There is no Australian Standard but we would recommend every 12 months.

5.5. Does the refrigerator have to be moved or taken away for servicing?

Arcus	Depends on the type of repair to be carried out.
ICS PACIFIC	No, normally onsite, but depending on location and the type of work to be carried out.
Quantum Scientific	Servicing can be carried out in place onsite. An area the same size as the footprint of the instrument would be required in front of the unit so that it could be moved forward if access to rear is required.
Quirks	Invariably, possibly dependent on circumstances.
Rollex	This depends on what type of servicing is being undertaken. For annual servicing no. In the unlikely event of a re-gassing being required some locations have strict occupational health and safety policies regarding naked flame work. In this case, yes! Where possible loan systems could be provided or rented for a time.
Thermoline Scientific	Depending on the situation, we prefer service onsite.

5.6. Does the warranty include installation?

Arcus	No, there is no installation required, only positioning the refrigerator and plugging the power cord in.
ICS PACIFIC	No installation required.
Quantum Scientific	Local installation available (Gold Coast to the Sunshine Coast and Toowoomba). Remote install by phone or other arrangements on request.

Quirks	No, Quirks recommend installation by technician.
Rollex	Installation costs where charged are usually in addition to delivery but this is made clear at the time of quoting. Warranty is usually to do with the appliance's manufacture. In SOME cases, repeat clients or multiple orders may result in negotiated "one off" agreements being entered into.
Thermoline Scientific	Within the Brisbane metropolitan area we can include the installation if requested.

5.7. What are the service charges outside the warranty period?

Arcus	Normal rates.
ICS PACIFIC	This is dependant on location and technician charges.
Quantum Scientific	\$95.00 (plus \$9.50 GST) per hour for refrigeration, \$155.00 (plus \$15.50 GST) per hour electronic/scientific work, \$77.50 (plus \$7.75 GST) per hour travel.
Quirks	\$198.00 call out fee + first hour (plus GST) \$99.00 (inc GST) per hour after that + parts (plus GST). 7am-6pm Monday to Friday.
Rollex	This depends on what service is required. Hourly rates, travel etc vary on location. As a general rule approx \$180.00 +GST will cover a one hour period excluding [in remote locations] travel time to and from with an average charge of .80 cents per km being the standard. The first hour in most cases can be a MINIMUM charge with a call out fee and second hours thereafter being broken into 15 minute units [as a guide].
Thermoline Scientific	Generally a call out for a service is approximately \$75.00 and then approximately \$60.00 per hour thereafter on the point of arrival at the site. But a quote should be obtained before each service call.

5.8. Does the warranty cover defects in materials and workmanship for a period of 12 months from the date of acceptance of the equipment?

(Note: Warranty should include renewal or replacement of any parts including software that are or become defective during the warranty period.)

Arcus	Yes.
ICS PACIFIC	36 months parts and labour warranty against defective manufacture.
Quantum Scientific	36 months full parts and labour warranty, excluding user error.
Quirks	12 months parts and 3 months labour.
Rollex	Yes, but extended warranty periods can be negotiated to suit client requirements.
Thermoline Scientific	Yes, the warranty covers parts and labour for 12 months from the date of acceptance.