va-Q-tec

WE SOLVE THERMAL CHALLENGES

Last Mile Pharma

GDP-compliant shipments without dry ice or refrigerated vehicles

We produce our brochure sustainably:

EU Ecolabel
www.ecolabel.eu

EU Ecolabel: DE/053/004

Please collect used paper for recycling.

By producing our brochure in accordance with the provisions of EU Ecolabel, we emphasize our claim for sustainability. The EU Ecolabel is awarded to products and services that have a lower environmental impact than comparable products. This allows the identification of environmentally friendlier and healthier products and services.

Natural paper from sustainably managed forests

The EU Ecolabel places high demands on the entire manufacturing process, including the paper used. The wood fibers used in the paper come from sustainably managed forests. The product meets strict environmental and usability criteria. Certified regional waste disposal companies ensure resource-saving waste disposal and responsible wastewater policies.

Low-pollution printing with organic printing inks and varnishes

Our *bonitasprint* print shop uses low-pollution consumables in all printing processes and prints completely alcohol-free. Workflows and processes are constantly optimized in order to make the entire production process as sustainable as possible.

Renewable raw materials are the basis for organic printing inks and organic varnishes, which are used in our brochure.

Print product
CO2e balanced & compensated
natureOffice.com/365-1172-185

Emission-optimized company building & delivery

The *bonitasprint* company building is powered by electricity from 100% renewable energy sources. For this purpose, the company operates its own photovoltaic system. The waste heat from the printing machines and compressors is used to supply heat to the company building. Additional heating is obtained from climate-neutral natural gas with emission compensation.

bonitasprint has a continuous in-house production chain. The company's own fleet includes electric and natural gas vehicles. This prevents transport-related CO_2 emissions. The climate neutrality of these va-Q-tec printed products is also demonstrated by the "climate-neutral printing" logo.

Please collect used paper for recycling.

Imprint: **va-Q-tec Thermal Solutions GmbH,** Alfred-Nobel-Str. 33, 97080 Würzburg, Germany
Tel. +49 931 359 42-0 | info@va-Q-tec.com | www.va-Q-tec.com

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About va-Q-tec

va-Q-tec is a pioneer of sophisticated solutions for thermal energy efficiency as well as temperature-controlled supply chains. The company develops, manufactures and sells thin, highly efficient Vacuum Insulation Panels (“VIPs”) for thermal insulation as well as intelligent Phase Change Materials (“PCMs”) for reliable temperature control.

Through the targeted combination of VIPs and PCMs, va-Q-tec manufactures thermal packaging systems (boxes) that maintain constant temperatures for food and pharmaceuticals for up to five days during transportation without an external energy supply. In addition, VIPs and PCMs optimize the energy footprints of various applications, such as buildings, hot water storage tanks, local and district heating pipes as well as household appliances and laboratory equipment.

The products of va-Q-tec enable a global improvement in thermal energy efficiency and thus make a valuable contribution to climate protection. The company has been operating climate-neutral at all locations since 2021. Permanent process optimizations minimize the CO_2 footprint.

The company was founded in 2001, and has its headquarters in Würzburg.

We live Quality

Dr. Joachim Kuhn and Dr. Roland Caps, the founders and inventors of the technology, characterized the “Q” in the company name, which continues to stand for highest quality today. The “Q” is visible, measurable and firmly anchored in all processes of va-Q-tec – quality is the foundation on which the company is built on.

As an established **premium supplier**, we enable our customers to optimize their products ecologically and economically with targeted solutions by saving valuable energy or **dispensing with external energy sources**.

va-Q-tec is a **pioneer** in vacuum insulation technology and has more than **100 international IP rights** and applications. More than **70 international awards** confirm the leading role of the company in the industry.

va-Q-tec promotes resource-conserving and **CO_2-neutral production** and generates 1.7 million kWh annually from renewable energies, which underlines its **sustainable focus**.

Using strict quality controls, we enable **highest product quality** and offer exceptional **longevity**, **reliability** and **safety**.

Market Requirements & Technology

The last mile in pharmaceutical logistics is presenting companies with increasing challenges. Therapies are becoming more complex, supply chains more fragmented, and expectations in relation to reliability, sustainability and efficiency are constantly increasing.

A central aspect is the reliable, GDP-compliant transport of temperature-sensitive products to the patient. At the same time, there is growing pressure to reduce fleets of costly, energy-intensive refrigerated vehicles and to adopt more flexible solutions. The use of dry ice is also coming under increasing scrutiny, as it is classified as a hazardous material and therefore imposes specific requirements on handling and transport, while also being a significant cost and CO_2 driver.

Sustainability is also playing a crucial role. Companies are facing the task of achieving their ESG targets, reducing CO_2 emissions and consistently avoiding disposable packaging.

In addition, there is the increasing complexity of distribution. Growing shipping volumes and varying temperature requirements call for scalable, efficient and, at the same time, precisely controllable solutions. At the same time, conventional packaging solutions often have shortcomings: insufficient insulation combined with water-based cooling systems can cause temperatures to drop too far.

This is exactly where our innovative insulation and phase-change technologies come into play, offering significant advantages:

- Precise and reliable temperature control along the entire supply chain
- Passive, energy-efficient reusable packaging solutions
- Completely independent of an external supply of power
- No need for refrigerated vehicles

Vacuum insulation panels (VIPs)

va-Q-tec relies on advanced insulation technologies that significantly outperform conventional solutions. The centerpiece is vacuum insulation panels (VIPs) with insulation performance up to ten times higher than that of traditional materials such as PU foam or mineral wool. A VIP layer just 2 cm thick achieves the same insulation effect as around 20 cm of PU foam. The result is significantly more useful interior space with the same or even better insulation performance, along with maximum temperature stability.

Phase-change materials (PCMs)

This technology is supplemented by the use of phase-change materials (PCMs). Thermal energy is stored as latent heat in the transition between the liquid and solid states of matter and vice versa, without any change in temperature. In this way the temperature inside the packaging remains stable and constant, even if the ambient temperature fluctuates. A total of eight temperature ranges are available, covering shipments between -70 °C and +37 °C, with all sub-zero temperature ranges achieved without the use of dry ice. Reliable temperature control is ensured throughout the entire duration of the transport, irrespective of whether transport is refrigerated or temperature-controlled.

Products for the Last Mile in the Pharmaceutical Sector

va-Q-tec offers a comprehensive portfolio of passive reusable packaging solutions for the reliable last mile transport of temperature-sensitive pharmaceutical products. The systems are specifically designed to meet the requirements of regulated supply chains and make possible reproducible, GDP-compliant processes all the way to the patient.

Standardized box systems ensure easy integration into existing logistics structures and support efficient, scalable processes. At the same time, modular concepts and individual customization options provide the necessary flexibility for specific applications.

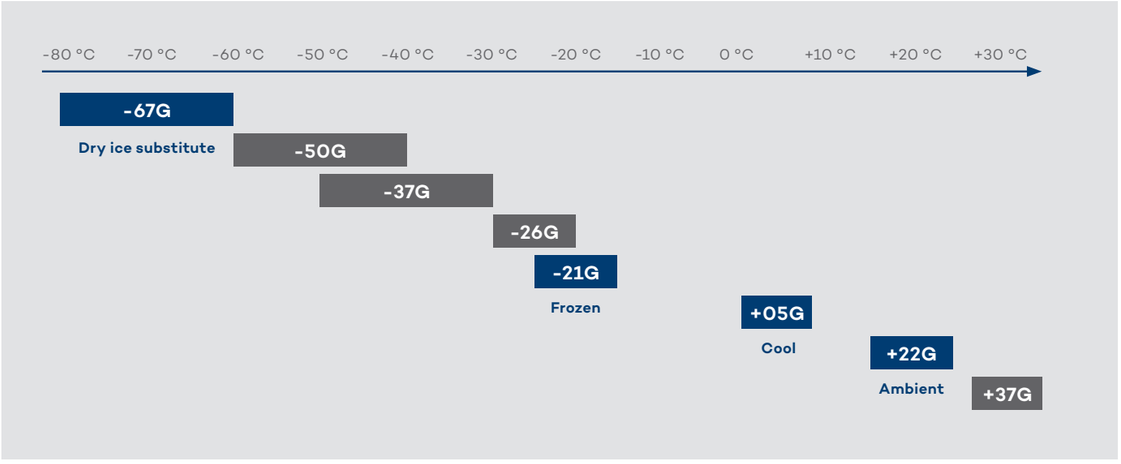
The portfolio covers various temperature ranges and volumes, making it suitable for use in a variety of scenarios, from direct delivery to the clinical environment. The figure on the right provides further details about the available temperature ranges.

va-Q-tec has developed solutions for temperature-sensitive supply chains as a pioneer in VIP and PCM technology since 2003. This experience flows into holistic concepts that go beyond the product and assist customers with the implementation and optimization of their processes.

Precise temperature ranges for every requirement

PCM technology from va-Q-tec permits reliable temperature control across eight qualified temperature ranges from -70 °C to +37 °C. The most important temperature ranges for pharmaceuticals include ambient (+22 °C), cool (+5 °C), frozen (-21 °C), and a dry ice substitute for (-67 °C).

PCM is available as hard-shell and blister packs



Products for the Last Mile in the Pharmaceutical Sector

va-Q-med

va-Q-med is the standardized reusable solution for efficient domestic last mile distribution. This sturdy transport box meets all GDP requirements and is ideal for use in integrator networks, pharmaceutical wholesalers, as well as direct deliveries and laboratory shipments.

- Two performance levels for different requirements
- Temperature retention time of up to 54 hours (ISTA 7E)
- Optimally designed for typical last mile applications
- Compact box portfolio for efficient, automated processes

va-Q-proof

va-Q-proof is the high-performance reusable solution for particularly demanding pharmaceutical transport tasks. It was designed for maximum reliability and flexibility in the clinical environment and covers a wide range of complex requirements.

- Two performance levels for maximum flexibility
- Temperature retention time of up to 168 hours (ISTA 7D)
- Significantly extended times for critical applications
- Broad portfolio, including large-volume solutions in pallet format
- Suitable for complex, demanding transport tasks

Individual solutions

va-Q-tec has an in-house development team that designs customer-specific solutions. In close co-operation with the business, we optimize existing systems, for example, to extend the self- sustained temperature retention time (thermal upgrade). Furthermore, we offer the option of producing boxes with custom dimensions, using special materials, and in accordance with the customer's corporate design. We validate and test new developments in our in-house climatic chambers to confirm the functionality and efficiency of the solutions.

- **Cost savings due to the elimination of the need for refrigerated vehicles and dry ice**
- **Individual consultation and bespoke solutions for every requirement**
- **Self-sustaining systems with reliable temperature control without an external supply of power**
- **GDP-compliant product safety due to precise temperature control**
- **Sustainable reusable solutions for the reduction of CO_2 and disposable materials**
- **Available as purchase option or lease option**

va-Q-med Advantages & Specifications

- **Two performance levels with temperature retention time of up to 54 hours (ISTA 7E)**
- **Coverage of all standard ranges relevant to pharmaceuticals, such as ambient (+22 °C), cool (+5 °C) and frozen (-21 °C)**
- **Additional qualified temperature ranges from -70 °C to +20 °C, depending on requirements (without the use of dry ice)**
- **Two sizes with an internal volume ranging from 5 L to 18 L, optimized for fully automated processes**
- **Easy, cost-efficient handling**
- **Transport of refrigerated & non-refrigerated goods in a single vehicle**
- **High energy efficiency and low CO_2 emissions**
- **Flexibly adaptable to individual requirements and logistics processes**
- **Available as purchase option or lease option**
- **Manufactured by a business that is globally CO_2 neutral**

va-Q-med 7

va-Q-med 7 (Premium)	
External dimensions	400 x 300 x 325 mm
Internal dimensions	245 x 135 x 165 mm
Internal volume	5 l
Weight	5.5 kg
Performance (+05G; Summer)	> 30 hrs

va-Q-med 7 (Standard)	
External dimensions	400 x 300 x 325 mm
Internal dimensions	245 x 165 x 165 mm
Internal volume	7 l
Weight	4.7 kg
Performance (+05G; Summer)	> 22 hrs

va-Q-med 21

va-Q-med 21 (Premium)	
External dimensions	600 x 400 x 345 mm
Internal dimensions	380 x 250 x 160 mm
Internal volume	15 l
Weight	11.3 kg
Performance (+05G; Summer)	> 47 hrs

va-Q-med 21 (Standard)	
External dimensions	600 x 400 x 345 mm
Internal dimensions	440 x 250 x 160 mm
Internal volume	18 l
Weight	9.7 kg
Performance (+05G; Summer)	> 36 hrs

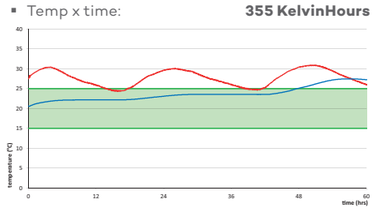
Qualified Test Scenarios in Accordance with ISTA 7E

va-Q-med 7 (Standard)

Ambient

With **va-Q-accu +22G**

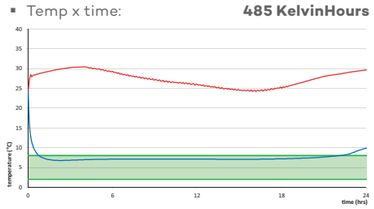
- Time between +15.0 °C and +25.0 °C: **48 hours**
- Temp x time: **355 KelvinHours**



Cool

With **va-Q-accu +05G**

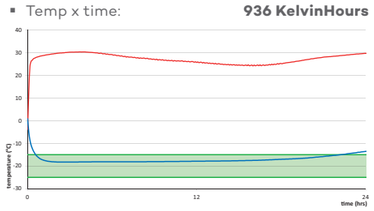
- Time between +2.0 °C and +8.0 °C: **22 hours**
- Temp x time: **485 KelvinHours**



Frozen

With **va-Q-accu -21G**

- Time between -25.0 °C and -15.0 °C: **20 hours**
- Temp x time: **936 KelvinHours**

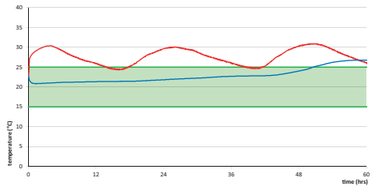


va-Q-med 7 (Premium)

Ambient

With **va-Q-accu +22G**

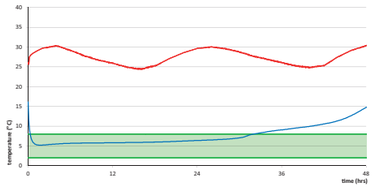
- Time between +15.0 °C and +25.0 °C: **50 hours**
- Temp x time: **380 KelvinHours**



Cool

With **va-Q-accu +05G**

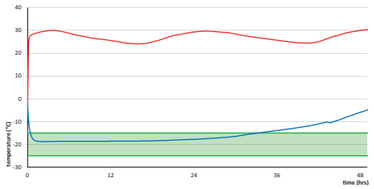
- Time between +2.0 °C and +8.0 °C: **32 hours**
- Temp x time: **729 KelvinHours**



Frozen

With **va-Q-accu -21G**

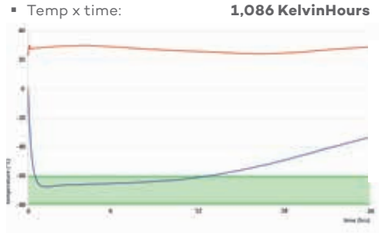
- Time between -25.0 °C and -15.0 °C: **34 hours**
- Temp x time: **1,612 KelvinHours**



Dry Ice Ersatz

With **va-Q-accu -67G**

- Time below -60.0 °C: **12 hours**
- Temp x time: **1,086 KelvinHours**

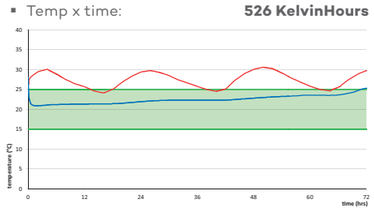


va-Q-med 21 (Standard)

Ambient

With **va-Q-accu +22G**

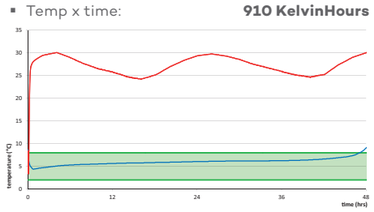
- Time between +15.0 °C and +25.0 °C: **71 hours**
- Temp x time: **526 KelvinHours**



Cool

With **va-Q-accu +05G**

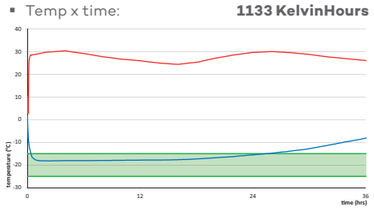
- Time between +2.0 °C and +8.0 °C: **41 hours**
- Temp x time: **910 KelvinHours**



Frozen

With **va-Q-accu -21G**

- Time between -25.0 °C and -15.0 °C: **24 hours**
- Temp x time: **1133 KelvinHours**

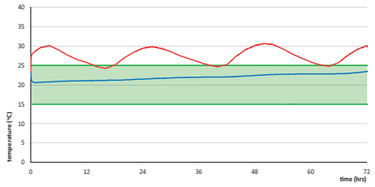


va-Q-med 21 (Premium)

Ambient

With **va-Q-accu +22G**

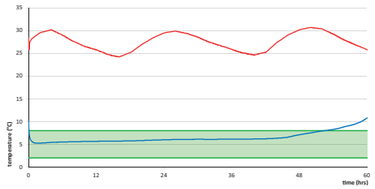
- Time between +15.0 °C and +25.0 °C: **72 hours**
- Temp x time: **540 KelvinHours**



Cool

With **va-Q-accu +05G**

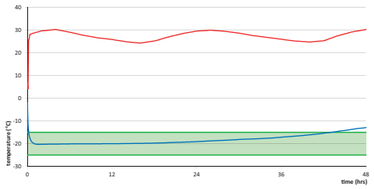
- Time between +2.0 °C and +8.0 °C: **50 hours**
- Temp x time: **1,110 KelvinHours**



Frozen

With **va-Q-accu -21G**

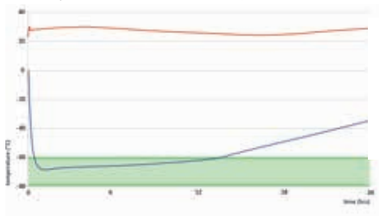
- Time between -25.0 °C and -15.0 °C: **42 hours**
- Temp x time: **1,982 KelvinHours**



Dry Ice Ersatz

With **va-Q-accu -67G**

- Time below -60.0 °C: **12 hours**
- Temp x time: **1,065 KelvinHours**



Other qualified test scenarios available upon request

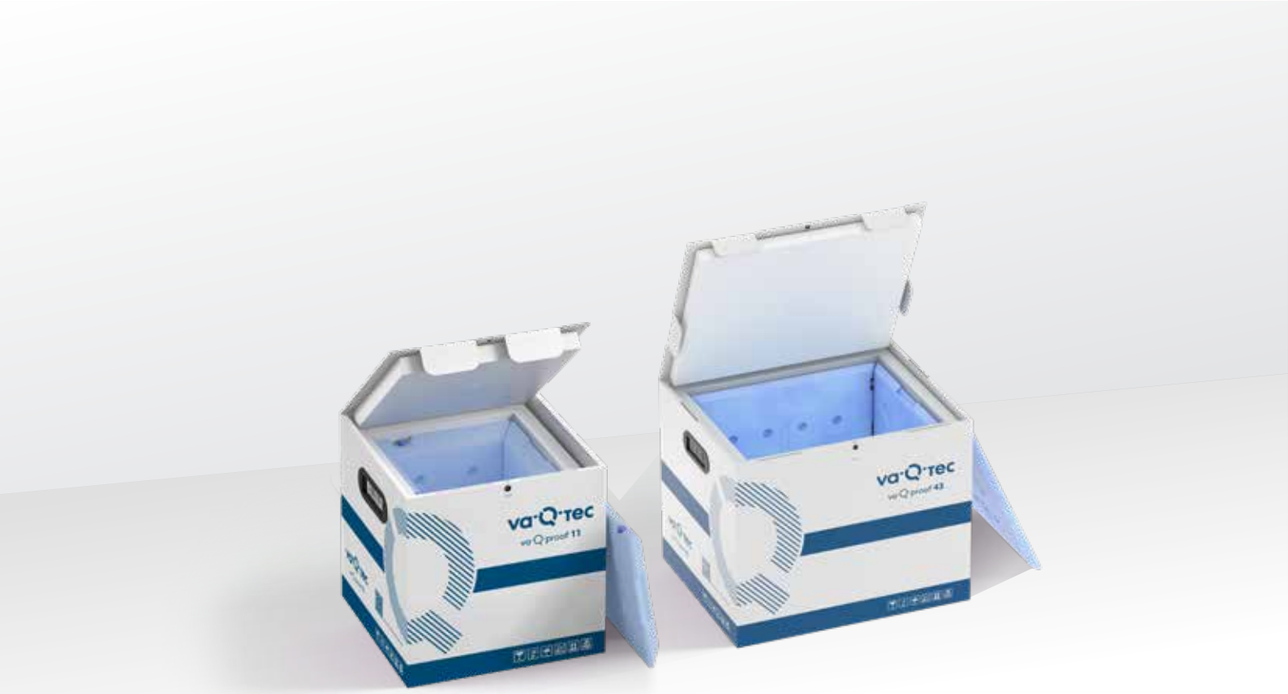
Qualified test scenario in accordance with ISTA 7E summer profile

Ambient temperature

Product core

Stipulated temperature range

va-Q-proof Advantages & Specifications



- **Two performance levels with temperature retention time of up to 168 hours (ISTA 7D)**
- **Coverage of all standard ranges relevant to pharmaceuticals, such as ambient (+22 °C), cool (+5 °C) and frozen (-21 °C)**
- **Additional qualified temperature ranges from -70 °C to +37 °C, depending on requirements (without the use of dry ice)**
- **Six sizes with an internal volume ranging from 4 L to 264 L**
- **Modular, customizable system with interchangeable components suitable for recycling**
- **Easy, cost-efficient handling**
- **High energy efficiency and low CO_2 emissions**
- **Manufactured by a business that is CO_2 neutral**

va-Q-proof 11

va-Q-proof 11 (Premium)		va-Q-proof 11 (Standard)	
External dimensions	365 x 360 x 325 mm	External dimensions	365 x 360 x 325 mm
Internal dimensions	200 x 200 x 200 mm	Internal dimensions	220 x 220 x 220 mm
Internal volume	8 l	Internal volume	11 l
Weight	12.3 kg	Weight	10.0 kg
Performance (+05G; Summer)	≥ 138 hrs	Performance (+05G; Summer)	≥ 81 hrs

va-Q-proof 43

va-Q-proof 43 (Premium)		va-Q-proof 43 (Standard)	
External dimensions	570 x 455 x 455 mm	External dimensions	570 x 455 x 455 mm
Internal dimensions	400 x 300 x 300 mm	Internal dimensions	420 x 320 x 320 mm
Internal volume	36 l	Internal volume	43 l
Weight	27.4 kg	Weight	22.4 kg
Performance (+05G; Summer)	> 144 hrs	Performance (+05G; Summer)	> 120 hrs

Individual Solutions

Upgrading existing solutions

va-Q-tec offers the option of upgrading a customers' existing transport solutions using highly efficient vacuum insulation panels (VIPs) and, if necessary, lids containing phase-change materials (PCMs).

Thermal upgrade by means of retrofitting with PCM, for instance in the lid

Retrofit of VIPs to existing containers as plug-in or fixed concepts

All upgrades ensure reliable temperature stability, maximized internal volume and optimized transport processes, tailored to the specific needs of our customers.

Thermal upgrade using PCM

The PCMs are specifically designed to meet the requirements of pharmaceutical applications and permit precise, stable temperature control within defined temperature ranges. They are available both as robust hard shells (va-Q-accus) and as flexible blister solutions (va-Q-gel) and can be optimally adapted to existing packaging concepts in pharmaceutical logistics.

va-Q-gel

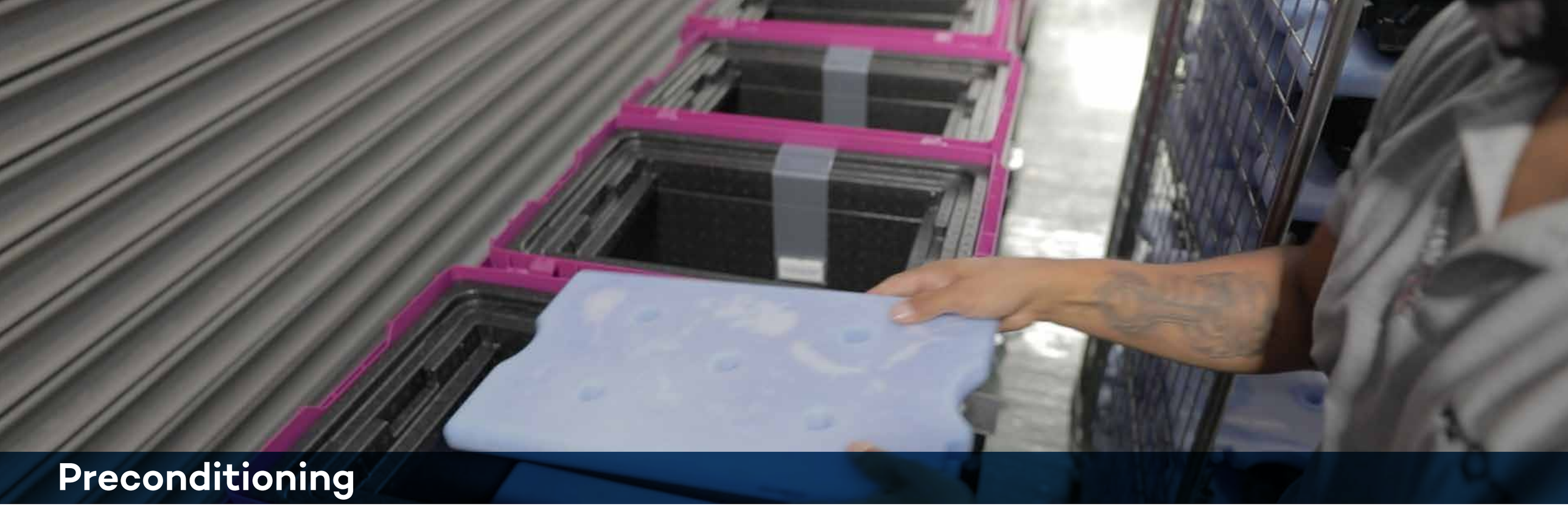
Leakproof and with maximum energy density for stable temperatures

va-Q-accu

Robust and reliable for long periods of use

Development of bespoke solutions

In addition to optimizing existing transport solutions, va-Q-tec develops individual systems that meet the requirements of the pharmaceutical last mile. In close co-operation with customers, we develop tailor-made solutions precisely matched to specific processes, temperature requirements and regulatory requirements. Development follows a clearly defined, proven process and ensures that every solution is optimally tailored to the specific requirements.

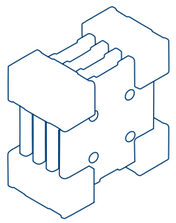


Preconditioning

Together with its customers, va-Q-tec develops bespoke solutions for the pharmaceutical last mile, relying on a clearly defined, validated process for preconditioning the PCM (phase-change material) elements.

Step 1:
Quality control & preparation

Each phase-change material element is checked for integrity. Placing the elements in specially developed racks with specified spacing ensures even air circulation and optimal preconditioning.



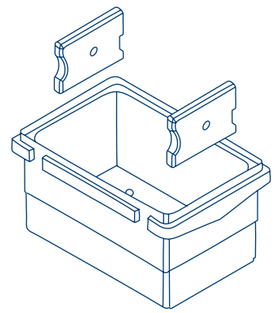
Step 2:
Conditioning

The thermal state of the PCM elements is optimized depending on the requirements of the shipment:

- **Standard method > 72 hours**
  For planned shipments, the PCMs are preconditioned at a constant temperature of +3.0 °C for at least 72 hours.
- **Flexible method (freezing & thawing) < 48 hours**
  For time-sensitive shipments, an accelerated two-stage process is used (-20 °C freezing | +3.0 °C thawing).

Step 3:
Verification & packaging

After conditioning, the thermal state is checked. The packaging is then loaded according to the qualified configuration.



Step 4:
Ready for shipment

After sealing, the system is ready for shipment and delivers fully qualified performance. It ensures maximum product safety over the entire supply chain, from the first mile to the last, irrespective of the conditioning method chosen.

The behavior of the system has been scientifically validated over more than 1,200 thermal cycles and ensures reliable performance for a period of more than 24 years.

Case Study: Swiss Post

> The passive boxes have proven to be extremely reliable and environmentally friendly, especially over longer distances. Compared to actively cooled transport solutions, we were able to reduce our environmental impact by about 40 %.
>
> **Frank Daubenfeld**
> Product Manager at Swiss Post

© Swiss Post

Patient groups and associations are calling for temperature-sensitive medicines to be transported reliably within the specified temperature ranges, even over the last mile. Swiss Post has taken a pioneering role in this area and is already relying on passive transport solutions.

Vacuum-insulated boxes from va-Q-tec are used, these boxes maintain a constant temperature for many hours. They permit reliable, energy-efficient and cost-effective delivery directly to the patient.

© Swiss Post

Partner since:
2017

Boxes used:
Approx. 10,000 va-Q-med boxes in the fleet

Savings and other advantages:

- Proven reliability with over **1 million** successful shipments to date in va-Q-tec boxes
- Deliveries of temperature-sensitive pharmaceutical products (e.g. Ozempic)
- At least 25 % saving in CO2 emissions and the elimination of disposable packaging waste due to a reusable, passive system
- Cost-effective logistics without refrigerated vehicles thanks to a standardized fleet of boxes
- Guaranteed temperature stability (15–25 °C or 2–8 °C)
- Meets complex pharmaceutical requirements (GDP)

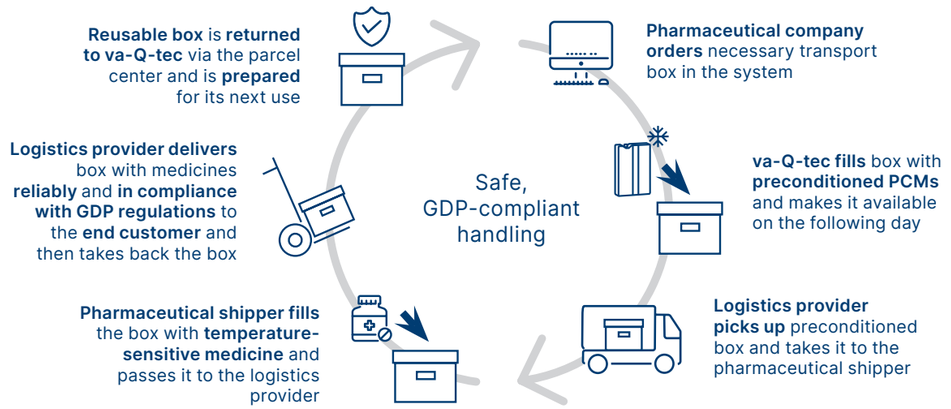
© Schweizerische Post

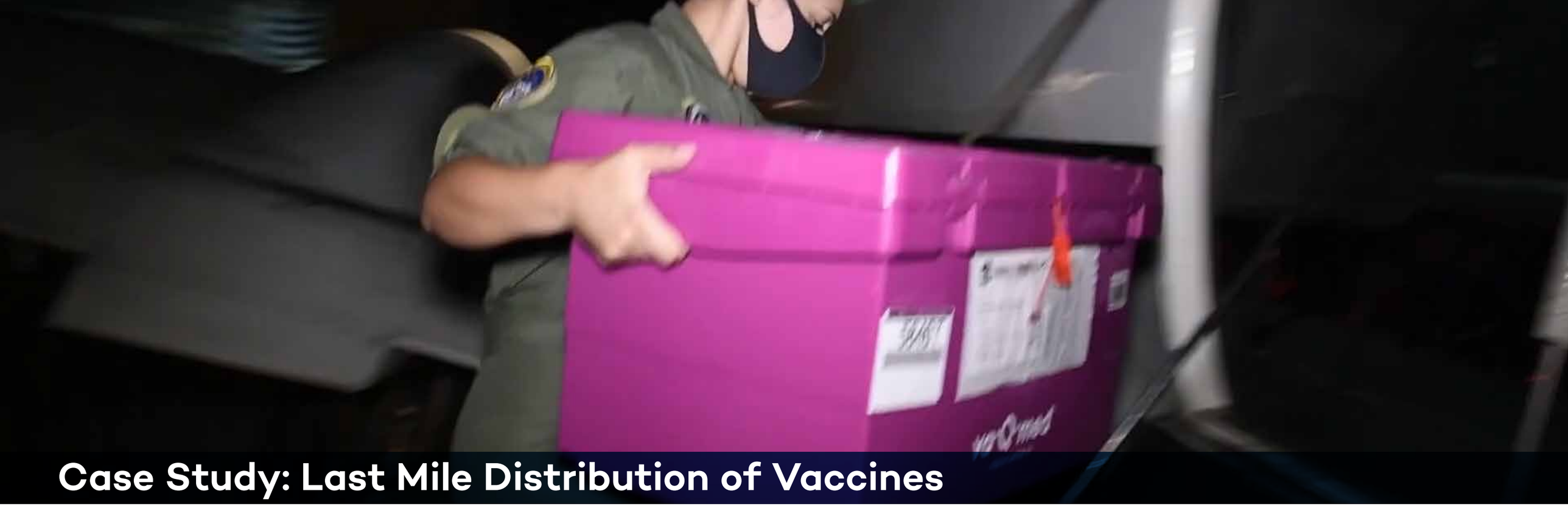
Case Study: Swiss Post

Swiss Post, in collaboration with va-Q-tec, has developed a logistics approach that permits the reliable, efficient B2C distribution of temperature-sensitive medicines directly to the patient. The entire logistics process is clearly structured and ensures seamless, reliable, cost-effective and efficient processing from filling the packaging to its return.

© Swiss Post

The B2C logistics approach of Swiss Post





Case Study: Last Mile Distribution of Vaccines

> While comparing various packaging solutions, we found that solutions from va-Q-tec are far superior to all others on the market. […] To date, we have delivered over 600,000 doses of Pfizer vaccines without a single temperature deviation.
>
> **Ing. Raúl Bianchi**
> Business Management Consultant
> for the Government of Uruguay

The global distribution of COVID-19 vaccines posed a significant logistical challenge, particularly over the last mile. In Uruguay, the challenge was to distribute vaccines reliably across various temperature ranges, particularly in remote regions with limited infrastructure.

The solutions from va-Q-tec enabled reliable, GDP-compliant distribution and contributed to ensuring reliable nationwide supply in challenging conditions.

Boxes used:
900 va-Q-med boxes

Savings and other advantages:

- No temperature deviations over more than 600,000 doses
- Reliable handling across multiple temperature ranges (-70 °C to +8 °C)
- Complete temperature traceability without the need to open the box
- Use of standard vehicles without active cooling (including aircraft/ helicopters)
- Reliable supply of remote regions
- Cost-effective and environmentally friendly solution thanks to a closed leasing system

Consultation & Implementation

va-Q-tec works closely with its customers to develop individual and customized solutions for the pharmaceutical last mile, systematically following a proven process:

Analysis & Concept Development

va-Q-tec analyzes the current process and develops a tailor-made concept that takes size, temperature requirements and special requests into account. This also includes comprehensive advice on the required pre-cooling. The developed concept is tested with proven in-house simulation software and adapted if necessary.

Prototypes & Tests

An initial prototype is produced in order to compare it with the current processes and to check its performance, handling and efficiency in initial tests. Based on the test results, the concept is optimized to further improve functionality and efficiency. If required, the concept can be qualified in the in-house laboratory with over 30 climate chambers or by independent partners.

Production

After concept validation, the production phase begins at va-Q-tec. During this phase, customers receive comprehensive on-site support, including implementation assistance, staff training, video tutorials and information material to ensure smooth integration of the solution into existing operations.

Post-live Operation

After the initial operating phase, a results analysis is carried out to evaluate the performance of the solution. Furthermore, additional services such as repair and maintenance processes can be implemented to reduce future costs and offer a comprehensive service.

va-Q-tec

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