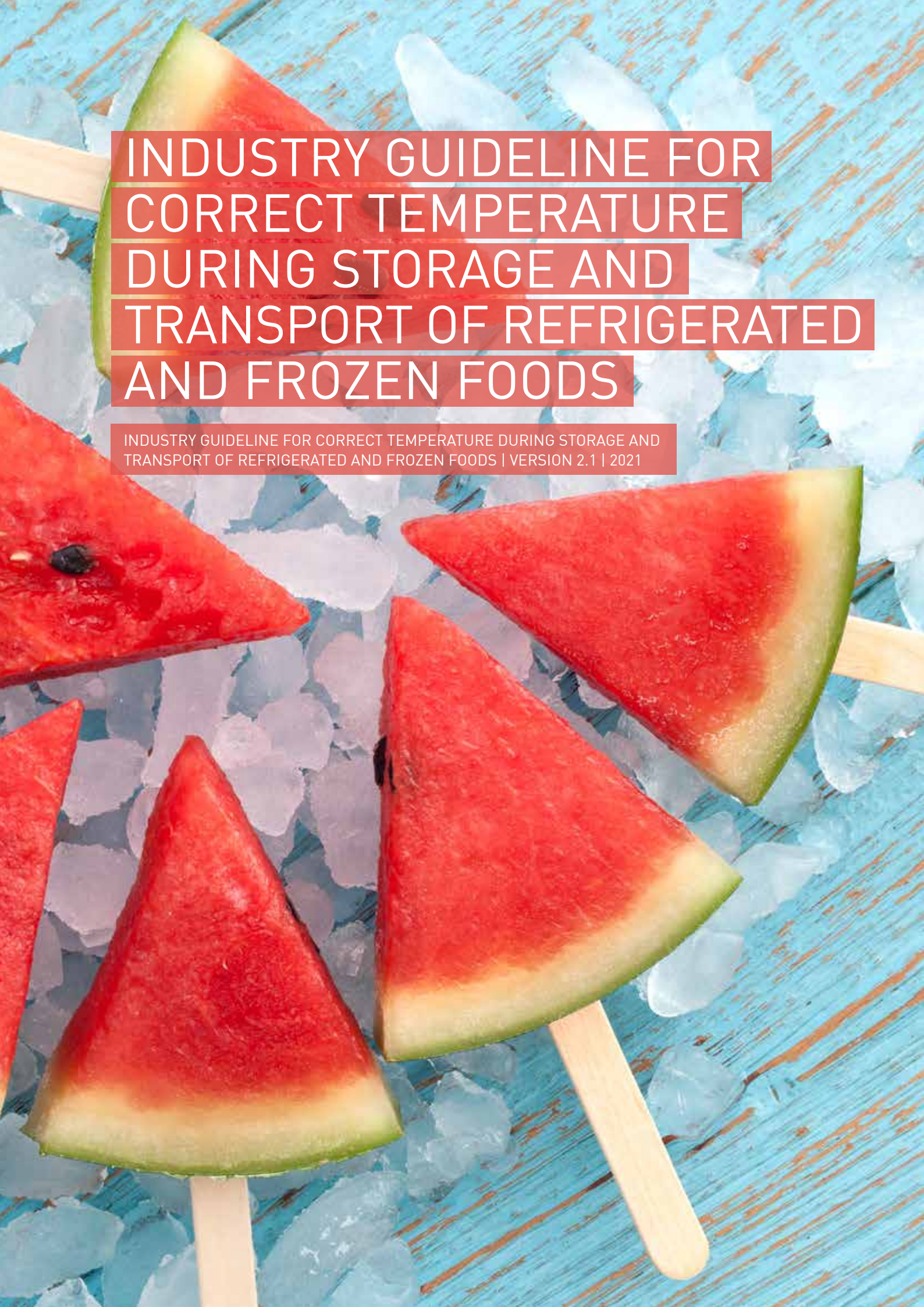
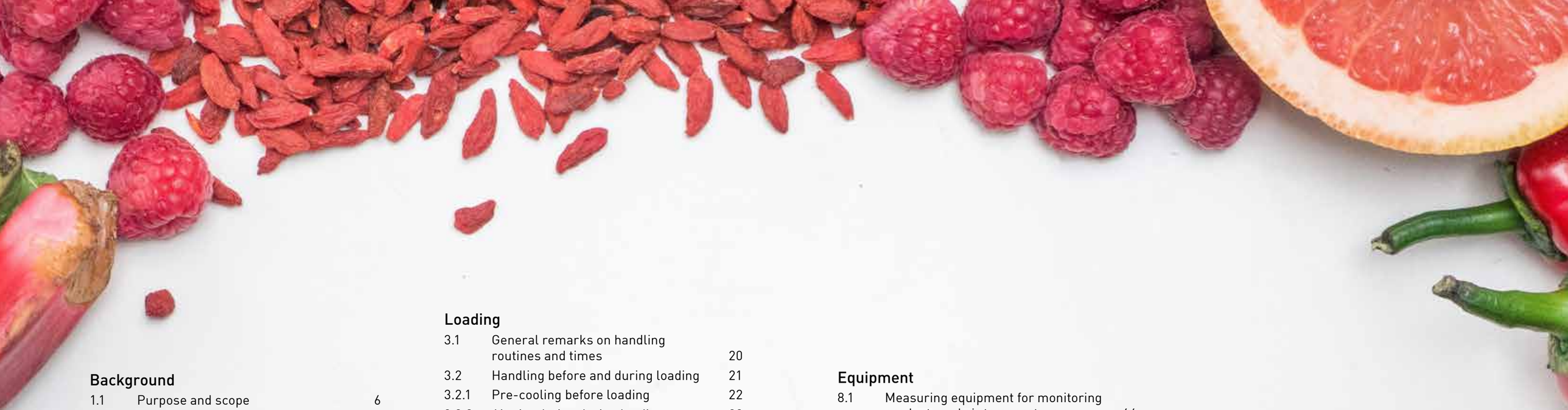
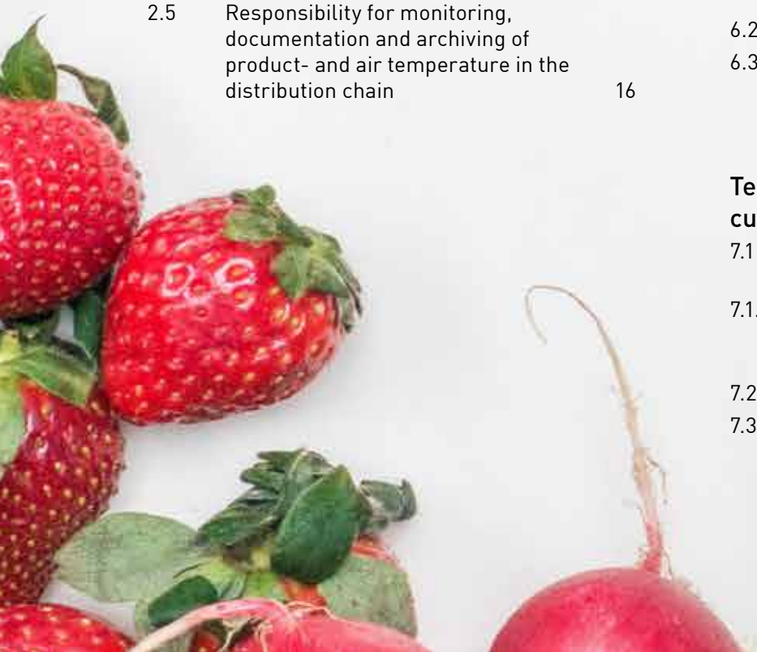


INDUSTRY GUIDELINE FOR CORRECT TEMPERATURE DURING STORAGE AND TRANSPORT OF REFRIGERATED AND FROZEN FOODS

INDUSTRY GUIDELINE FOR CORRECT TEMPERATURE DURING STORAGE AND TRANSPORT OF REFRIGERATED AND FROZEN FOODS | VERSION 2.1 | 2021





INDUSTRY GUIDELINE FOR CORRECT TEMPERATURE DURING STORAGE AND TRANSPORT OF REFRIGERATED AND FROZEN FOODS

This revised industry guideline has been produced by a task force made up of members and representatives of the Council for the Refrigerated and Frozen Supply Chain (Rådet för kyl- och fryskedjan), Swedish Food Retailers Federation (Svensk Dagligvaruhandel).

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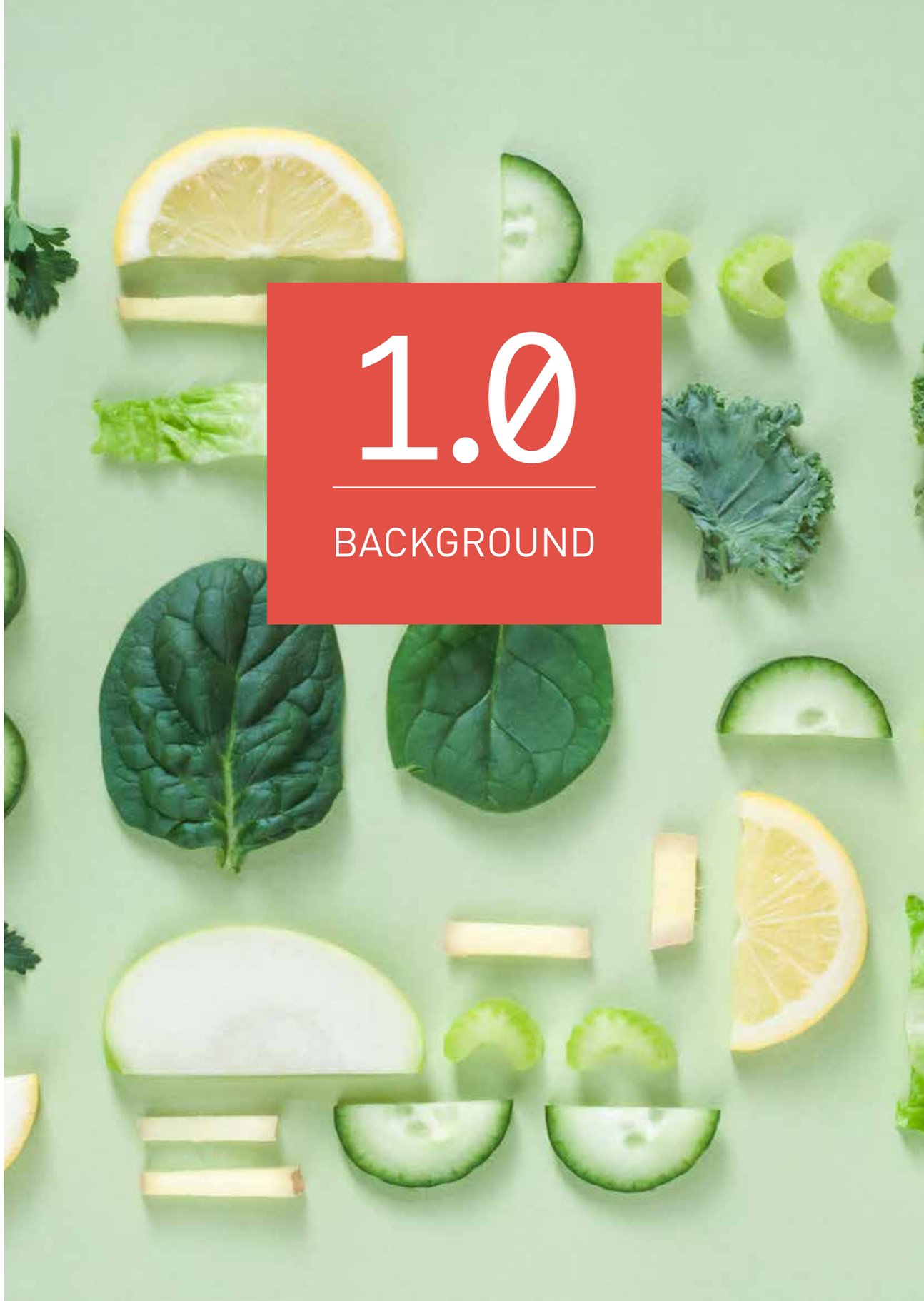


1.0

BACKGROUND

1.0

BACKGROUND

In 2007 the Swedish Frozen Food Association (Djupfrysningsbyrån) drew up temperature guidelines for the frozen-food industry. These guidelines were revised in 2016 by the Swedish Association for Frozen and Refrigerated Foods (Föreningen kyld och fryst mat), which produced the industry guidelines: Correct Temperature During Storage and Transport. Since 2017, the Industry Guideline for Correct Temperature During Storage and Transport of Refrigerated and Frozen Foods has been managed, developed and revised by the Council for the Refrigerated and Frozen Supply Chain, Swedish Food Retailers Federation. This industry guideline (hereafter Industry Guideline) differs from is predecessors in that it takes into account new legislation and is limited to the handling of these products from the time between the manufacturer's shipping dock to their arrival at the retailer's/restaurant's receiving dock, where other guidelines for the retail and restaurant industry take effect.
For retailers, food safety guidelines for retail shops apply (Säker mat i din butik). For restaurants and institutional kitchens, food safety guidelines for these food establishments (Säker mat på restaurang and Offentlig säker mat, respectively) apply. The Industry Guideline should, when suitable, also be used as a guideline for e-commerce, and extends all the way to the e-commerce consumer, as at the time of issue of this version there is no other specific guideline for e-commerce. The documentation further referred to in the Industry Guideline has not been included in the National Food Agency's assessment of this guideline.

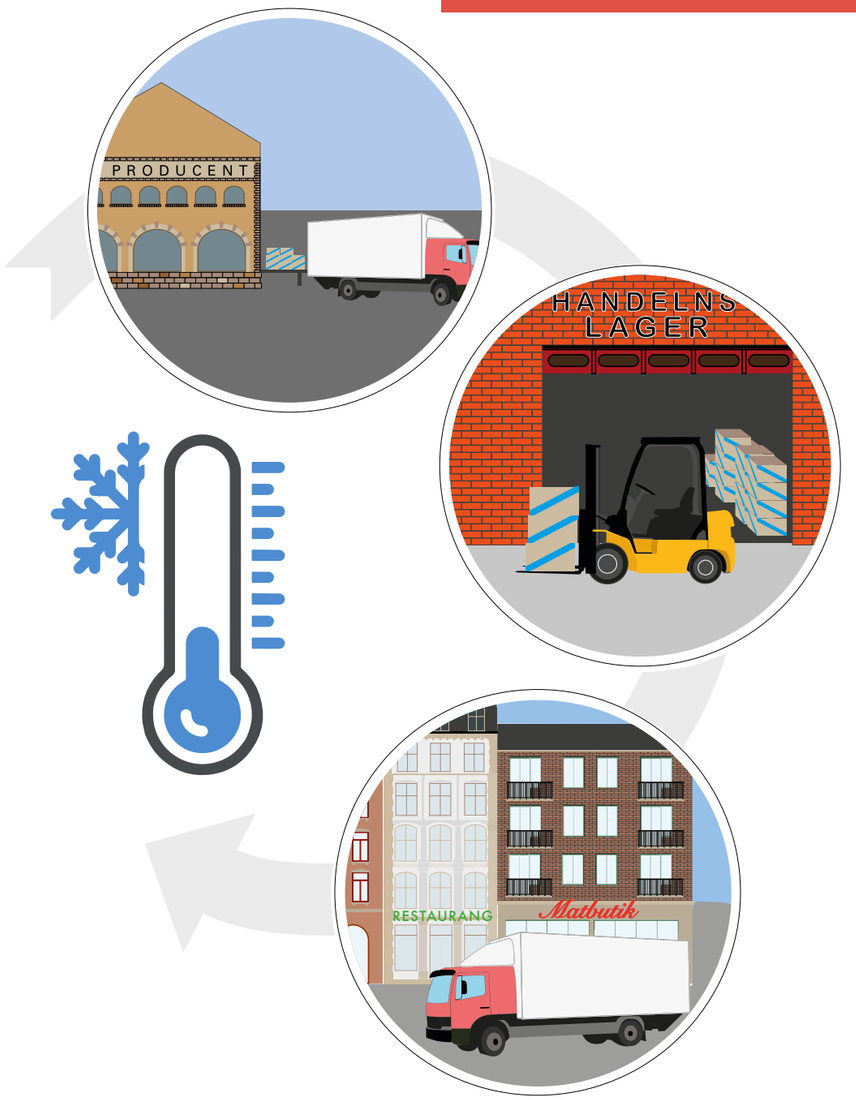
1.1 Purpose and scope

In order to ensure the safety and quality of refrigerated and frozen (which refers throughout the guideline to deep-frozen) foods during distribution from producers, suppliers, wholesalers and transporters to shops and restaurants/ institutional kitchens and e-commerce consumers, the Council for the Refrigerated and Frozen Supply Chain has produced and adopted the guideline presented below for the handling, storage and transport of refrigerated and frozen foods. The intentions and instructions for quality assurance described herein may suitably be included in the self-monitoring programs of the companies that make up the distribution chain.

The Industry Guideline applies to the flow of goods from loading and leaving the producer to arrival of the goods at the receiving department of the retailer/ restaurant/institutional kitchen and e-commerce consumer (see Figure 1) For e-commerce consumers, it applies only to traditional refrigerated and frozen transports.

The Industry Guideline assumes adherence to the rules and specifications for the production, processing and handling of foods in retail shops/restaurants/ institutional kitchens. Companies must comply with the provisions stated in laws, regulations and other rules. Compliance with national industry guidelines is voluntary, and business owners can elect to draw up agreements regarding them.

FIGURE 1: SCOPE OF THE GUIDELINE: FROM THE PRODUCER'S SHIPPING DOCK TO THE RETAILER/ RESTAURANT'S RECEIVING DEPARTMENT.



1.2 Council for the Refrigerated and Frozen Supply Chain

The Council for the Refrigerated and Frozen Supply Chain is made up of members and representatives from the entire value chain, including producers, suppliers and transporters, as well as wholesalers in the retail and restaurant/ institutional kitchen businesses and e-commerce.

The Council for the Refrigerated and Frozen Supply Chain manages and develops the Industry Guideline for Correct Temperature during Storage and Transport of Refrigerated and Frozen Foods, and its work covers the following areas (for more information, please visit www.svdh.se):

- quality and food safety
- reduced food waste
- an uninterrupted refrigeration and frozen distribution chain
- knowledge and training

The Industry Guideline is based on interpretation of the legislation as well as the collective experience of the sector regarding how to meet the goals of legislation.

The guideline serves as a complement to other industry-specific national and international agreements and guidelines. Other industry guidelines relevant to refrigerated and frozen foods are listed in the references and source material given at the end of this guide (see section 10).

One of the overarching goals of the interpretations and recommendations presented in the guideline is to optimize the flow of goods, while taking into account food safety, product quality and food waste, as well as environmental and economic considerations.

The guideline has been adopted as an agreement between representatives of the various links in the frozen and refrigerated food distribution chain. Adherence to the guideline is voluntary, but can become binding if so stated in contractual agreements or other arrangements met between the parties involved. The revised Industry Guideline shall be reviewed when necessary to determine whether changes have occurred that are significant enough to prompt an updated version.

The Industry Guideline has been produced in consultation with Sweden's National Food Agency (Livsmedelsverket), which has in turn notified the EU Commission of the guideline. The guideline has also been circulated for comment to the Swedish Food Retailers Federation, the Swedish Food Federation (Livsmedelsföretagen), Visita (sector organization for the Swedish hospitality industry), as well as representatives of individual producers and other parties in the refrigerated and frozen food distribution chains.

To summarize, the goal of the Council for the Refrigerated and Frozen Supply Chain is an uninterrupted refrigerated and frozen distribution chain that preserves the original quality of foods, maintains high food safety, and minimizes food waste.

2.0

INTRODUCTION

Foto: Christina Schwab | unsplash.com

2.0

INTRODUCTION

This section describes the basic requirements for the handling, mixed storage, mixed loading and transport of frozen and refrigerated foods. The aim of all food distribution is to move food products while preserving the product's original quality and food safety, and do so as cost-effectively as possible.

2.1 Food law

Swedish food law builds on European Parliament and Council of Europe regulations and directives. The regulations apply in all EU Member States and supersede an individual country's national legislation; the directives are incorporated into the country's national legislation.

In Sweden, the laws that encompass this are the Swedish Food Act (SFS 2006:804) and Food Decree (SFS 2006:813), and it is the National Food Agency that issues regulations.

The food law is focused on food safety and integrity, and applies to the entire value chain, from primary food production to retail shops and restaurants. The responsibility for food safety lies with the individual actors that make up the chain, which places demands on extensive self-monitoring to ensure food safety throughout the entire flow of the refrigerated and frozen food chain, from the producer to food retailers and restaurants. The control body monitors the food companies' compliance with the legislation.

Regarding responsibility for storage and warehousing, readers are referred to the General Rules of the Nordic Association of Freight Forwarders (Nordiska speditörsförbundets allmänna bestämmelser).

2.2 Food safety and product quality

Chemical, biochemical and physical changes that occur during handling, storage and transport of affect both the safety and product quality of refrigerated and frozen foods (see Frozen Food Association publications: Kalla fakta, 2009). Refrigerated foods are also affected by microbial changes, which in turn can affect food safety. All of these changes are temperature-dependent – whereby the lower the temperature, the slower the changes occur. Although some changes may be desirable or indeed necessary for certain foods to develop correctly, such changes successively lead to a deterioration of the product's sensory and nutritional quality as well as the safety of the food.

Production and processing of goods in the food sector is regulated by food law. With respect to product temperature, correct handling from harvest, capture and slaughter, to preparation is of decisive importance. Cooling and freezing to the proper temperatures during production and processing represent the most important steps for the subsequent distribution of the foods, and must be performed correctly.

2.3 General remarks on temperature requirements

In general, the handling, storage and transport of frozen and refrigerated foods must occur at a temperature that ensures that health hazards can not arise. Unless otherwise stated in legislation or other guidelines, the general rule is that the product temperature stated on the packaging must be maintained throughout the entire distribution chain.

2.3.1 Temperature reserve in products

Maintaining a temperature reserve means that the food product is cooled or frozen, in conjunction with production, to a lower product temperature than specified. Mixed storage, mixed loading and normal handling procedures outside temperature-controlled areas all give rise to a need for a temperature reserve in food products, as these steps can lead to temperature increases.

Sector experience shows that the entire value chain, from the producer to the consumer, must work systematically to create a temperature reserve of at least 2°C for refrigerated products, and 2-7°C for frozen products. For frozen products, this corresponds to a product temperature of between -20° and 25°C. This is necessary in order to accommodate mixed storage, mixed loading and normal handling outside temperature-controlled areas. When setting product lead times from producers, wholesalers should also take into account the need for a temperature reserve in products.

2.3.2 Product temperature – Frozen[1] foods

The handling, storage and transport of frozen foods must occur such that the product temperature does not exceed -18°C.

This means that product temperature and air temperature in the distribution chain must be lower than the legislated -18°C2 (see information on temperature reserve in 2.3.1, above). The air temperature required so that product temperature does not exceed -18°C is worked out in consultation with the distribution chain actors, aided by tests and analyses associated with a HACCP risk analysis.

2.3.3 Product temperature – Refrigerated foods of non-animal origin

In the case of refrigerated foods of non-animal origin, it is the producer's responsibility to establish a suitable temperature for each individual product. This temperature must be stated on the packaging next to the date label.3

For fruit, berries, vegetables and root vegetables (with the exception of processed, i.e. peeled/cut/shredded, products), no specific rules apply with respect to either product- or air temperature. The general requirement for product safety applies also to products in this category. Storage climate for foods of plant origin is governed primarily by the product's sensitivity to temperature. For more information on mixed storage and mixed loads of plant foods, see sections 4.1 and 4.2.2.

For processed (i.e. peeled/cut/shredded) products, specific temperature requirements apply. (see 2.3 generally about temperature requirements)

2.3.4 Product temperature – refrigerated foods of animal origin

For refrigerated foods of animal origin, the law has strict temperature requirements for the distribution chain (handling, storage and transport) to retailers and restaurants. Thereafter, the temperatures stated on the product apply. For most refrigerated foods of animal origin – the lower the maintained product temperature, the longer the product can be stored before food quality is adversely affected (see Figure 2).

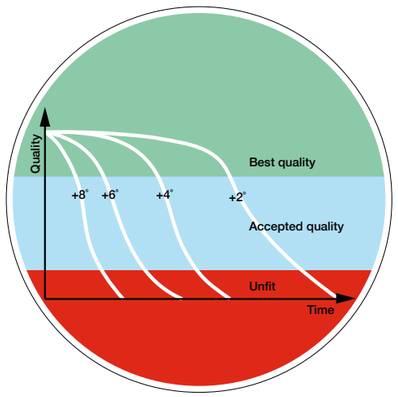


FIGURE 2. GENERAL CONNECTION BETWEEN DURABILITY AND PRODUCT TEMPERATURES IN REFRIGERATED FOODS OF ANIMAL ORIGIN

2.4 Required documentation and archiving of temperature measurements

The results of product- and air temperature measurements and actions taken in the event of deviations must be documented and archived according to Table 1. The parties responsible for performing these tasks are laid out in Table 2.

TABLE 1: DOCUMENTATION AND ARCHIVING OF PRODUCT- AND AIR TEMPERATURE CONTROLS.

REQUIRED DOCUMENTATION AND ARCHIVING	PRODUCT TEMPERATURE[4]	AIR TEMPERATURE DURING STORAGE[4]	AIR TEMPERATURE DURING TRANSPORT[4]
Documentation of recorded measurements must be retained and made available upon request – for a minimum of:	12 months**	12 months*	12 months*
Documentation of actions taken in the event of a deviation must be retained and made available upon request – for a minimum of:	12 months	12 months*	12 months*
Measuring equipment and measurement results must be able to be identified, with the name or number of the cargo space, e.g. vehicle/trailer registration number, container name, etc., as well as date and time	Not applicable	Not applicable	YES
Measuring equipment and measurement results must be able to be identified, with the company's name, address, name or number of the storage space, date and time, and location of the temperature gauge at time of measurement	Not applicable	YES	Not applicable

* Or longer depending on the nature and shelf-life of the food – EN 12830.
** Or longer depending on the nature and shelf-life of the food.

[1] Refers here to deep-frozen foods. See definition in section 9

[2] LIVSFS 2006:12

[3] (EU) No. 1169/2011; Appendix X LIVSFS 2006:12

[4] (EC) No. 37/2005

2.5 Responsibility for monitoring, documentation and archiving of product- and air temperature in the distribution chain

Every time a product passes from one party to another along the logistics chain, the receiver must perform a product temperature control. Controls are carried out by measuring the temperature with a thermometer. The transporter is always responsible for monitoring the air temperature in the cargo area of the transport vehicle. Each party is responsible for documenting its respective part of the chain. Table 1 lists the documentation and archiving requirements and Table 2 the parties responsible for these controls.

The product temperature must meet the requirements and air temperature must adhere to contractual terms agreed upon by the parties in the value chain. The equipment used must meet the requirements set out in Table 5, section 8.1. Regarding actions to be taken if temperature measurements indicate a deviation, see section 7.1.1.

TABLE 2: OVERVIEW OF RESPONSIBILITY FOR MONITORING, DOCUMENTATION AND ARCHIVING OF PRODUCT- AND AIR TEMPERATURE IN THE DISTRIBUTION CHAIN

STEP IN DISTRIBUTION CHAIN	PARTY RESPONSIBLE FOR PRODUCT TEMPERATURE CONTROLS: CURRENT LEGISLATION AND AGREEMENT TERMS APPLY	PARTY RESPONSIBLE FOR AIR TEMPERATURE CONTROLS: CURRENT AGREEMENT TERMS APPLY
Placement in shipping area	Dispatching handler	Dispatching handler
Loading of vehicle	Driver	Driver
Loading of vehicle, container or trailer to be driven by other party (e.g. by rail or ship)	Dispatching handler	During loading: Dispatching handler During transport: Driver/Transporter
Transport by sealed container or trailer	Dispatching handler	During loading: Dispatching handler During transport: Driver/Transporter
Transport by vehicle loaded by party other than vehicle driver	Dispatching handler/Driver	During loading: Dispatching handler During transport: Driver/Transporter
Unloading	Receiving handler	Driver or Receiving handler

3.0

LOADING

3.0

LOADING

3.1 General remarks on handling routines and times

When the doors are opened during loading, the refrigeration unit must always be turned off (otherwise the compartment will fill with outside air). Instructions for performing product temperature controls must be included in the company's self-monitoring program.

Interruptions in refrigerated and frozen supply chains affect not only product quality, but also the safetly of the food. Identification of the critical handling steps and actions to be taken to monitor and minimize their effects is therefore of vital importance. Identifying these critical points is a requirement stipulated in food law and is achieved by performing a hazard analysis according to HACCP principles.1

The handling steps that frozen and refrigerated foods are subjected to (temperature controls, labelling, loading onto pallets, order-picking, etc.) must be carried out as much as possible in temperature-controlled areas. This helps to limit increases in product temperature and thereby to avoid food safety risks and adverse effects on product quality.

When handling products outside temperature-controlled areas, handling times must be kept to a minimum. The type of product itself and the product temperature should guide the order in which handling steps are carried out. This means that temperature-sensitive products, as well products with increased temperatures, must be given priority. The hazard analysis that forms the basis for handling routines must take into account the points noted above in all areas where frozen and refrigerated foods are handled.

Due to the risk of microbial growth, refrigerated products are more sensitive to temperature increases that frozen foods. The need for a temperature reserve when handling refrigerated products is therefore greater (see section 2.3.1). Because of the growth of microorganisms, from a food safety standpoint, temperature deviations in the refrigeration chain are more serious than those in the frozen food chain.

For both frozen and refrigerated products – the smaller the packaging units, the faster product temperature rises. The placement of packaging units on the loading pallet also affects how quickly product temperatures rise. Figure 3 illustrates the variation in product temperature increases depending on where in the pallet a package is placed. Figure 3 depicts a pallet loaded with frozen spinach when stored at an ambient temperature of +15°C. As the graph shows, air temperature does not affect the product temperature of packages placed in the middle of the pallet as rapidly as packages on the pallet's outer edges.

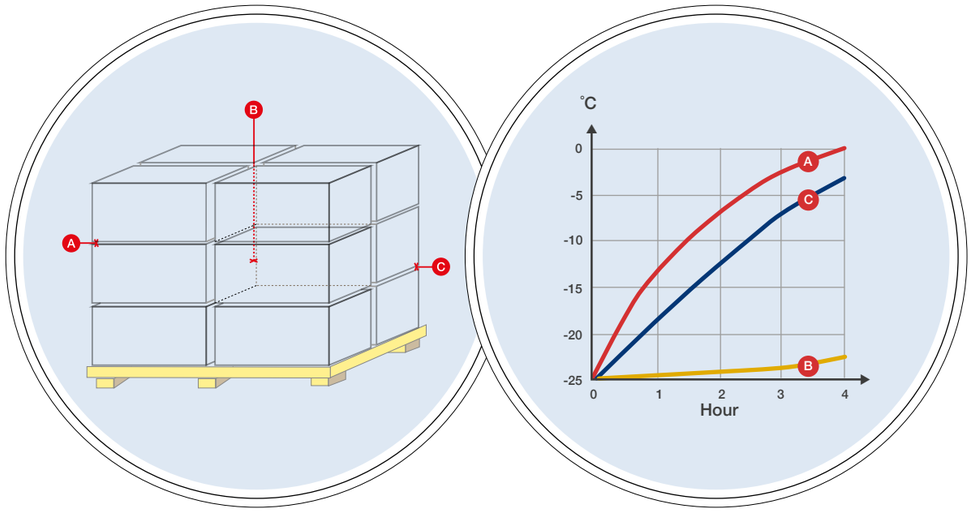
[1] (EC) No. 852/2004

3.2 Handling before and during loading

In connection with loading, product temperature readings must be taken in the cargo space and loading areas. The parties responsible for these measurements are listed in Table 2, section 2.5, and requirements regarding documentation and archiving in Table 1, section 2.4. Regarding actions to be taken in the event of temperature deviations, see Table 4a, section 7.3.

When loading, sensitive refrigerated goods must always be placed far enough from the refrigeration unit's outflow to prevent cold/heat damage. Keep in mind that the refrigeration unit is always working to maintain the temperature set point, meaning that the temperature of the air from the unit's outflow may be warmer or cooler than what a particular product tolerates.

FIGURE 3: A PALLET LOADED WITH FROZEN SPINACH WHEN STORED AT AN AMBIENT TEMPERATURE OF +15°C.



3.2.1 Pre-cooling before loading

The cargo space must be cooled to the respective refrigeration or freezing temperature before loading so that the product temperature can be maintained. Attention must be paid to the risk of possible freezing of refrigerated foods. Pre-cooling is not required if loading occurs from areas that are not air-temperature controlled. This helps to prevent unnecessary defrosting in the beginning of the transport. The background to this is the risk for condensation on the walls, floors and ceilings of the cargo space, which can lead to a faster build-up of ice in the refrigeration unit's evaporator resulting in worse temperature maintenance. To prevent loss of the pre-cooling effect, weather seals around the doors must be in in working order and must be used.

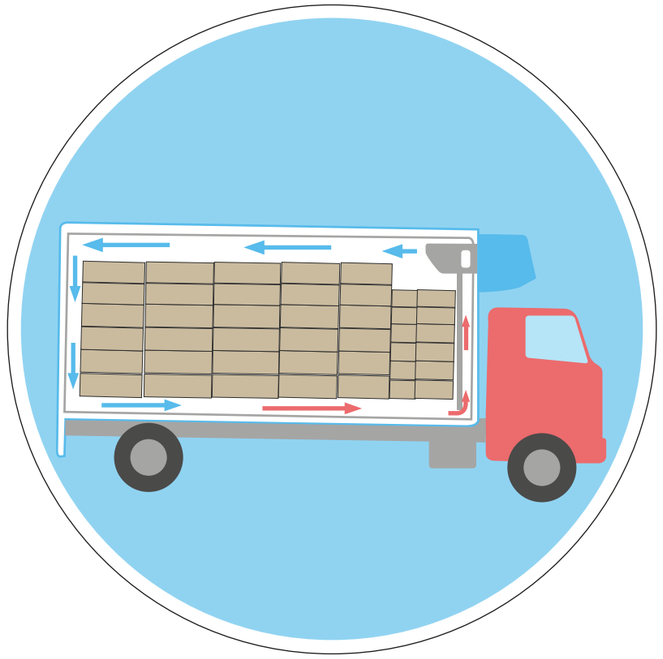
3.2.2 Air circulation during loading

In order to ensure proper air circulation throughout the entire cargo space (see Figure 4) and thereby correct air temperature, the placement of products in a load must allow air to circulate freely between the product and the transport space's floor, walls and ceiling.

This means that:

- Products must be loaded on pallets or in cargo carriers to facilitate circulation between the product and the floor.
- Products must not be packed or loaded such that the pallet's or carrier's measurements are exceeded.
- The pallet's or carrier's lift openings must not be covered.

FIGURE 4: LOADING MUST ENSURE PROPER AIR CIRCULATION THROUGHOUT THE ENTIRE CARGO SPACE



4.0

TRANSPORT

4.0

TRANSPORT

4.1 Requirements for air temperature during transport

The air temperature during transport must always be low enough to prevent risks to the quality and safety of the food. For frozen and refrigerated foods, this means that the air temperature selected must ensure that the product temperature does not fall outside legislated limits and that the product temperature requirements specified for the particular product are followed. This must be able to be substantiated, e.g. through documented analyses and assessments (i.e. HACCP risk analysis) carried out by persons with the necessary competence. If an air temperature increase that affects product temperature is permitted, this must be taken into account in the shelf-life labelling of the products.

Foods of plant origin (e.g. fruits, berries, vegetables) are often divided into two groups – those that require a low temperature and those that can be handled at higher temperatures for short periods during mixed storage and mixed loads during transport. This categorization relates to how sensitive the products are to temperature changes (see Appendix 1). Note that foods of plant origin are highly sensitive to temperature variations and drafts, which have a significant impact on product quality.

4.2 Mixed loads during transport

A consignment containing several types of products requires an air temperature that ensures that legislated requirements1 regarding the product temperatures of the different products in the load are met. For products whose temperatures are not regulated by law, attention must be paid to producer-set product temperature requirements to avoid any deterioration of product quality.

For frozen products, the regulation requires a temperature of 18°C or lower in all parts of the product during distribution, storage, handling and transport. A brief temperature increase to at most 15°C can be accepted during transport and local distribution. This does not extend to ice-cream and ice-cream products, however, where 18°C always applies.

For foods of animal origin, special temperature requirements apply. Product temperatures for these products must be maintained during all storage and transport, all the way to the retail outlet, restaurant/institutional kitchen or e-commerce consumer.

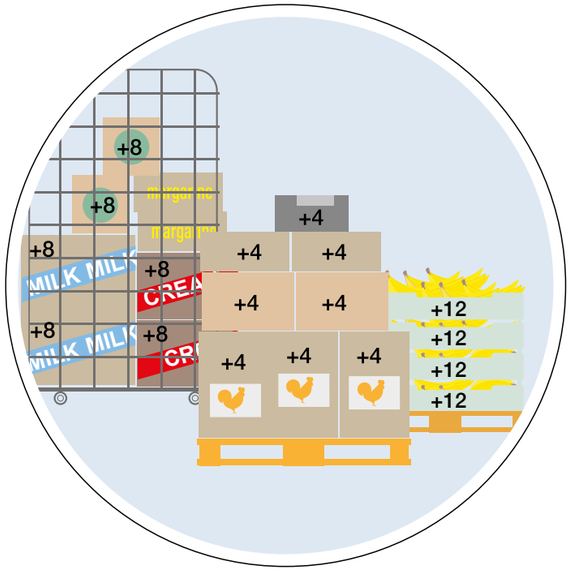
For minced or ground meat, product temperature must not exceed +2°C.1 For refrigerated unpackaged fish, the fish must be kept on ice. For shorter transports or for limited time periods, the air temperature may be +4°C.

4.3 Monitoring of air temperature during transport

According to the legislation,2 the air temperature of all refrigerated and frozen foods transport areas/spaces must be measured and recorded. There is no legal reference for the monitoring of air temperature during transport of refrigerated foods, but the same principle applies for refrigerated transports.

This guideline requires that air temperature be set out in agreements. For more on the requirements for measuring equipment, see Table 5, section 8.1. Requirements regarding documentation and archiving are listed in Table 1, section 2.4, and the parties responsible for air temperature controls given in Table 2, section 2.5.

FIGURE 5: ILLUSTRATION OF MIXED LOADS



[1] (EC) No. 852/2004

[2] (EC) No. 37/2005, LIVSFS 2006:12

5.0

UNLOADING

5.0

UNLOADING

5.1 Monitoring of product temperature when unloading

When the doors are opened during loading, the refrigeration unit must always be turned off (otherwise the compartment will fill with outside air). Instructions for performing product temperature controls must be included in the company's self-monitoring program.

To attain a quick indication of product temperature, the first control of the consignment must be performed immediately in connection with unloading. Further measurements must occur in the cargo space or directly on the receiver's dock. The number of readings to be taken is determined by the receiving handler. Table 2, section 2.5, lists the parties responsible for these controls, and Table 1, section 2.4, the requirements regarding documentation and archiving.

Routine product temperature monitoring should be carried out primarily with non-invasive measuring methods and non-destructive tests. If the measured value is in question, a new measurement must be carried out using a different instrument of the same type (see section 8). In the event of different results, the average of the readings taken on the same thermometers applies.

If the temperature recorded deviates from the legislated or contractually agreed product temperature, if there is disagreement regarding the measured results, or if the measurements are to be used as a basis for returning a consignment and/or for a complaint, a destructive measurement (i.e. measurement inside the product) must always be performed. For information regarding temperature deviations and product complaints, see section 7; regarding responsibility and actions to be taken in the event of a substantiated deviation, see Table 4b, section 7.3; and regarding methods for measuring product temperature, see Appendix 2.

Because liability provisions do not include possible deviations during handover to e-commerce consumers, it is recommended that the respective goods owner regulate this via internal complaint routines. The temperature must, however, always be ascertained when handing over the product to the e-commerce consumer by the party performing the transport or the owner of the goods. Definition of the issue of liability during the actual handover and complaint routines are specified in agreements between the goods owner and the transporter.

6.0

STORAGE

6.0

STORAGE

This Industry Guideline describes only the conditions for short-term storage of food products and, here, generally for mixed storage of different products. More lengthy storage of individual products at the optimal storage temperatures for those products is not covered here.

6.1 Air temperature requirements in storage

Requirements regarding air temperature in storerooms where a mix of different products are stored together must be based on a HACCP risk analysis of how the product quality of the different goods is affected by different temperatures. Loading and unloading may require longer handling times outside temperature-controlled areas. Table 3 provides information on how long different cargo units can be kept outside temperature-controlled areas without impacting product temperatures.

6.2 Relative humidity in storage

For limited periods of mixed storage, there are no requirements regarding relative humidity. Requirements associated with longer periods of warehousing and storage fall outside the scope of this Industry Guideline.

6.3 Monitoring of air temperature in refrigerated and frozen storage/handling areas

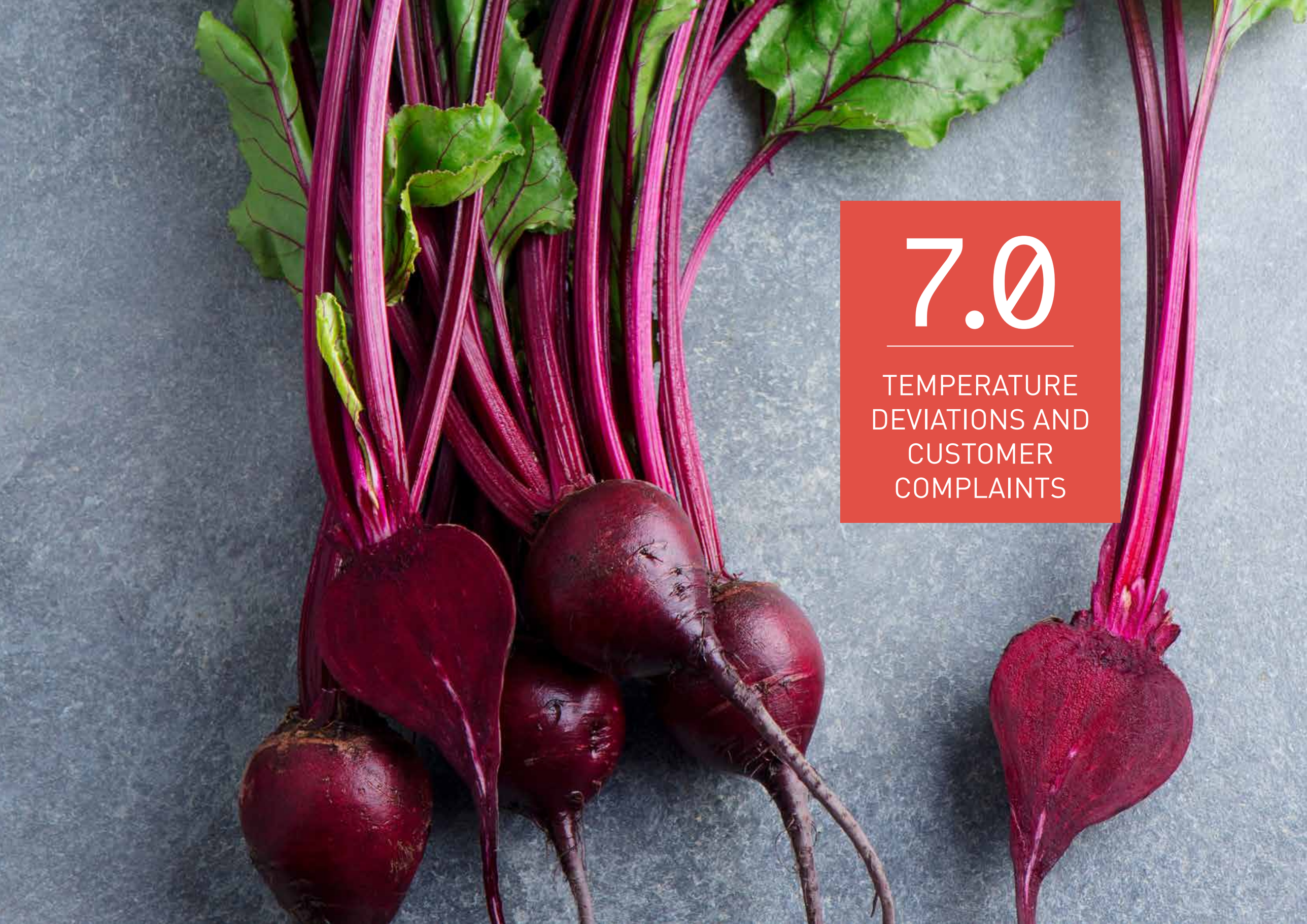
According to the legislation,[1] the air temperature in all storage and handling areas for frozen foods must be measured and recorded. The same principle applies to refrigerated storage spaces and handling areas.

In addition, the same requirements as for air temperature during transport also apply, see section 4. For requirements regarding documentation and archiving, see Table 1, section 2.4; for the parties responsible for controls, see Table 2, section 2.5.

[1] (EC) No. 37/2005, LIVSFS 2006:12, (EC) 852/2004

TABLE 3: MAXIMUM HANDLING TIMES BEFORE PRODUCT TEMPERATURE OF REFRIGERATED AND FROZEN FOODS ARE AFFECTED AT AMBIENT TEMPERATURES OF +15°C TO +25°C.

CARGO UNIT	REFRIGERATED FOODS (MINUTES)	FROZEN FOODS (MINUTES)
Whole/half pallets	10	30
Rolling cargo cages	10	20
Retail/institutional packages	5	20
SRS crates	5	20
Consumer packages	5	10



7.0

TEMPERATURE DEVIATIONS AND CUSTOMER COMPLAINTS

7.0

TEMPERATURE DEVIATIONS AND CUSTOMER COMPLAINTS

7.1 Routines for temperature deviations and customer complaints

Temperature deviation refers to a higher or lower product temperature reading than the legislated, recommended or contractually agreed value. The tolerance for deviations in measured temperatures is the same as that of the measuring instrument's accuracy, i.e. ±0.5°C. For more information, see Table 5, section 8.1.

In the event of a return and possible complaint due to incorrect product temperature, the law requires that deep-frozen foods be traceable back through the supply chain through a documented record of temperatures and handling. 1 This means that all documentation on air- and product temperatures must be made available upon request. For more information, see Table 1, section 2.4. The same principle applies to refrigerated foods

7.1.1 Corrective actions to be taken if measurements indicate a temperature deviation

If routine monitoring indicates a deviation in product temperature, a destructive test must be performed (see Appendix 2) with representatives from the dispatching goods handler and driver, or driver and receiving handler present. If no other agreement has been met, before a destructive measurement is carried out it must be authorized by the owner of the goods at the time of measurement.

If a temperature deviation is indicated, more tests must be performed to ensure a reliable result. It is important, in connection with this, to identify the extent of the deviation, i.e. which pallets/rolling cages/outer packages etc. contain goods with the correct product temperatures and which do not. To do this, there may be a need to perform a measurement along the diagonal and two sides of each cargo unit (see Figure 6).

Instructions regarding corrective actions to be taken when temperature deviations are detected must be included in the company's self-monitoring program.

[1] (EC) No. 37/2005, LIVSFS 2006:12

7.2 Assessment of damages

In following with industry practice, in all damage assessment all parties have a responsibility to minimize the damaging effects with regard to food waste and overall costs, by salvaging any remaining value without compromising food safety.

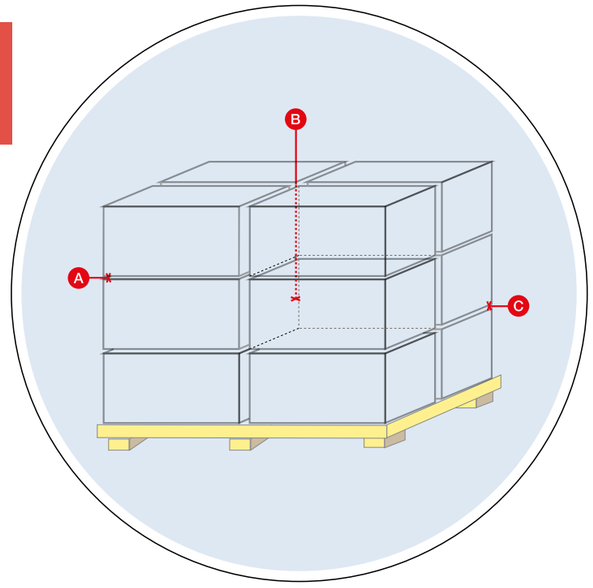
Addressing the situation as quickly as possible is of utmost importance. Actions such as returning the product to the correct temperature, further measurements, documentation and assessments must be taken as soon as possible in connection with the suspected case of damage.

A deviation in temperature does not necessarily mean that the product is entirely unusable and must be disposed of, with subsequent negative impacts on the environment. It is therefore important that suspected damage be inspected in following with HACCP principles by a person with the proper product- and food safety knowledge.

Among other considerations, this inspection includes consideration of the impact of the product's shelf-life and/or expiry date.

Based on the risk analysis, a joint assessment of the goods is made in consultation with the goods owner, the carrier (transporter) and the receiving party. This should be regulated in agreements between the parties.

FIGURE 6: DESCRIPTION OF MEASUREMENT ALONG THE DIAGONAL AND TWO SIDES OF EACH CARGO UNIT



7.3 Responsibility and corrective actions to be taken when a temperature deviation is confirmed

Tables 4a, 4b and 4c show who is responsible and the actions to be taken in the event of a confirmed temperature deviation in connection with loading and unloading, or unloading at an unmanned receiving department. The examples of the division of responsibility given in the tables can provide support for contracted agreements. If no other agreement has been met between the parties and reference is made in an agreement to the Industry Guideline, these matrices apply. Agreements between the parties should include a description of how temperature deviations are to be managed, what actions are to be taken, and who is responsible for those actions. The parties involved are always responsible for salvaging goods wherever possible.

Agreements between purchasers and providers should define how deviations in temperature for goods delivered to unmanned retail shops/restaurants/institutional kitchens and e-commerce consumers are to be handled, and who is responsible for those actions. The descriptions in tables 4a-4c provide an example of how responsibilities can be divided.

TABLE 4A: RESPONSIBILITY AND CORRECTIVE ACTIONS TO BE TAKEN IN THE EVENT OF A CONFIRMED TEMPERATURE DEVIATION IN CONNECTION WITH LOADING.

DEVIATION CONFIRMED BY TEMPERATURE CONTROL BEFORE LOADING	CORRECTIVE ACTION	PARTY RESPONSIBLE FOR CORRECTIVE ACTION
Determination of extent of deviation	Perform as many measurements of the entire consignment as necessary in order to assess the extent.	Driver & dispatching handler
Documentation of extent of deviation	Dispatching handler approves deviation and extent of deviation.	Driver & dispatching handler
Decision to load or not	Measured temperatures and number of damaged cargo carriers is documented on the waybill and signed.	Driver
Decision to load or not when the purchaser/transport company can't be reached	Contact the purchaser/transport company regarding decision/action to be taken.	Driver

TABLE 4B: RESPONSIBILITY AND CORRECTIVE ACTIONS TO BE TAKEN IN THE EVENT OF A CONFIRMED DEVIATION IN CONNECTION WITH UNLOADING.

DEVIATION CONFIRMED BY TEMPERATURE CONTROL WHEN UNLOADING	CORRECTIVE ACTION	PARTY RESPONSIBLE
Determination of extent of damage	Perform as many measurements of the entire consignment as necessary in order to assess the extent.	Receiving handler & driver
Documentation of extent of deviation	Document the number of measurements taken, where in the consignment load they were taken, and the results on the waybill. The documentation must be signed.	Receiving handler & driver
Decision to unload or not*	Contact the purchaser/transport company regarding decision/action to be taken.	Receiving handler

* According to accepted legal practice, the receiver is responsible for taking the goods and storing them at the correct temperature until collection of the goods can occur. Only if the goods pose a risk of contamination to the receiver's premises does the receiver have the right to refuse to accept the goods. It should be clearly stated that this is the case.

TABLE 4C: RESPONSIBILITY AND CORRECTIVE ACTIONS TO BE TAKEN IN THE EVENT OF A CONFIRMED DEVIATION IN CONNECTION WITH UNLOADING AT AN UNMANNED RECEIVING AREA.

UNLOADING AT UNMANNED RECEIVING AREA	CORRECTIVE ACTION	PARTY RESPONSIBLE
Determination of extent of deviation	Perform as many measurements of the entire consignment as necessary in order to assess the extent.	Driver
Documentation of extent of deviation	Document the number of measurements taken, where in the consignment load they were taken, and the results on the waybill.	Driver
Decision to unload or not	The documentation must be signed.	Driver
Decision to unload or not when the purchaser/transport company can't be reached	Contact the purchaser/transport company regarding decision/action to be taken.	Driver

8.0

EQUIPMENT

8.0

EQUIPMENT

Every business is responsible for having a self-monitoring program that ensures that the equipment used meets the requirements for food safety approved/registered food businesses and that the equipment is fully functional. This requirement applies regardless of which part of the distribution chain the equipment is used in.

8.1 Measuring equipment for monitoring product- and air temperature

The requirements for instruments (both gauges and sensors) used to measure and record the product temperature of deep-frozen foods are regulated for official control in accordance with Directive 92/2 EEC and Swedish food regulation LIVSFS 2006:12. This Industry Guideline recommends that the same requirements be applied to all types of product temperature controls. Requirements for instruments used to measure and record air temperature in refrigerated and frozen food storage and transport areas are similarly regulated according to Commission Regulation (EC) No. 37/2005. Table 5 lists the requirements for the respective measuring instruments. There is no legal reference for the monitoring of product temperature during transport of refrigerated foods, but the Industry Guideline applies the same requirements for refrigerated foods.

Fixed-installation measuring instruments may suitably be equipped with an alarm that monitors for deviations from the set air temperature. If an alarm function exists, instructions regarding actions to be taken when an alarm is triggered must also be available.

Brief fluctuations in air temperature may occur without impacting the product temperature. From a practical standpoint, it is therefore suitable to take action if the alarm is activated in a number of successive 30-minute intervals. Calculate the average of several air temperature readings to gain a more representative value.

8.2 Transport areas

All areas and spaces used for transporting foods are defined as food establishments and must meet the requirements in the legislation[1] regarding food establishments.

All vehicles, loading areas and cargo spaces used in the transport of refrigerated and frozen foods must be:

[1] (EC) No. 37/2005, (EC) No. 852/2004, (EC) No. 853/2004

- Insulated: the Industry Guideline requires that the transport equipment meet ATP regulations (approved transport of perishable goods in following with Agreement on the International Carriage of Perishable Foodstuffs) for equipment and vehicles used to transport refrigerated and frozen foods. This includes classification according to:

  - FNA – the empty cargo area can be maintained at ±0°C at an ambient temperature of +30°C.

  - FRC – the empty cargo area can be maintained at -20°C at an ambient temperature of +30°C.

Should this be technically impossible, e.g. when using double-decker trailer or vehicle with a tailgate/platform lift, a HACCP risk analysis must be conducted by a person with the necessary microbiological knowledge who can verify that food safety has not been adversely affected by the use of such vehicles.

- Equipped with:

  - Refrigeration units and air circulation systems to maintain a constant product temperature in accordance with the set requirements.

  - Instruments that continuously measure and record the air temperature in the cargo space.

- Designed to prevent the slightest temperature changes possible, e.g. with energy curtains to minimize air exchange when doors are opened.

In cases not where the legislation does not cover the monitoring of temperature in the transport vehicle (e.g. vehicles requiring Class B driving licenses), it is recommended that the guidelines for other vehicles be applied.

8.2.1 Placement of temperature sensors in the cargo space

For correct follow-up, this guideline requires that temperature sensor probes be placed in three locations in the cargo area: next to the evaporator's outflow and return intake, and at ceiling height about a meter from the rear door (see Figure 7). For cargo spaces divided into several temperature zones with refrigeration units, each unit must be equipped with temperature sensors (outflow and return air). All measured results and information on thermostat value/set temperature must be documented and made available upon request.

8.2.2 Measuring and recording frequency of the temperature sensors

The air temperature of all transport areas and cargo spaces must always be measured and recorded with the exception of small insulated cargo carriers/containers. For these exceptions, the use of manual measurements and mobile thermometers is recommended. Regarding measuring and recording f requency, see Table 5.

For requirements regarding documentation and archiving, see Table 1, section 2.4. These Industry Guidelines require the recording of air temperature measurements even for short transports lasting only brief periods of time, despite such transports being an exception in the legislation.[1]

FIGURE 7: PLACEMENT OF TEMPERATURE SENSOR FOR OPTIMAL CONTROL OF AIR TEMPERATURE

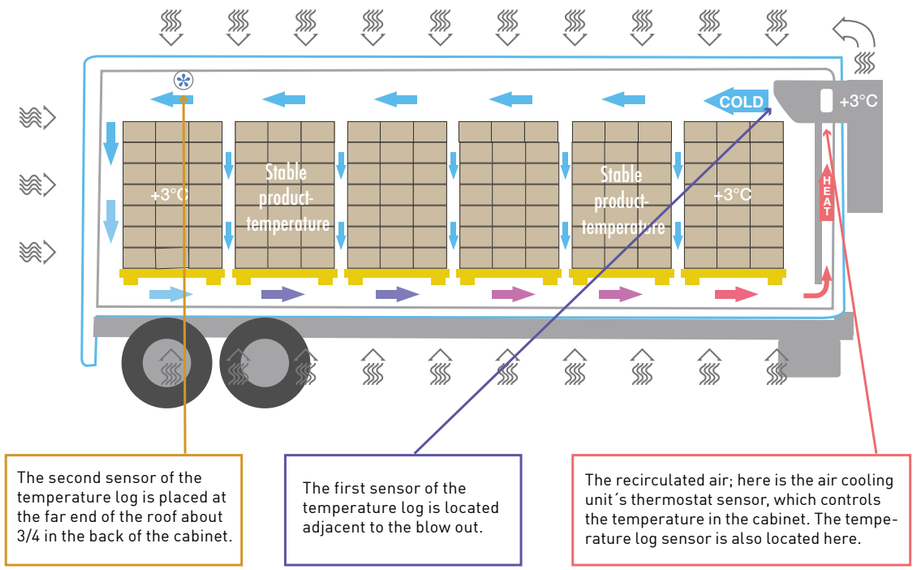


TABLE 5: SOME REQUIREMENTS FOR EQUIPMENT USED TO MEASURE PRODUCT- AND AIR TEMPERATURE FOR STORAGE AND TRANSPORT.

REQUIREMENTS FOR MEASURING EQUIPMENT	PRODUCT TEMPERATURE OF REFRIGERATED AND FROZEN FOODS[1]	AIR TEMPERATURE IN AREAS WHERE REFRIGERATED AND FROZEN FOODS ARE STORED AND TRANSPORTED[2]
Recorded measurements taken at regular time intervals must be readable in connection with unloading or as soon as possible after unloading, either directly on the instrument or on a print-out.	Not applicable	YES [3]
Measuring equipment must have a valid, traceable calibration certificate.	YES	YES [4]
Measuring equipment must show at least 90% of the measured reading within 10 minutes for transport, and within 20 minutes for storage.	Not applicable	YES [4]
Measuring equipment must show at least 90% of the difference between initial value and final reading within 3 minutes.	YES	Not applicable
Calibration documentation for measuring equipment must be retained for: [3]	36 months [5]	36 months [5]
Measuring equipment must be able to read temperatures within the range of:	-30°C to +30°C [5]	-30°C to +30°C [5]
Measuring equipment must be able to record readings at least:	Not applicable	Storage areas: • every 30:e min Transport areas: • every 5 min. for recording periods ↖24 h • every 15:e min. for recording periods →24h ↖7 days • every 60 min. or recording periods →7 days
Measuring equipment must meet requirements of standard:	EN13485	EN12830
Measuring equipment must be easy to clean.	YES	Not applicable
Measuring equipment must show temperature differences of:	> 0,1°C [6]	> 0,1°C [5]
Measuring accuracy of the equipment must be within:	±0,5°C [6]	±0,5°C [5]
Temperature-sensitive parts of the measuring equipment must provide good thermal contact with the product.	YES	Not applicable
Temperature reading must be shown directly on the measuring equipment.	YES	Not applicable

[1] LIVSFS 2006:12, Industry Guideline requirement (for refrigerated foods)
[2] (EC) No. 37/2005, Industry Guideline requirement (for refrigerated foods)
[3] Industry Guideline requirement
[4] EN 12830
[5] EN 13485, Industry Guideline requirement
[6] EN 13485

8.3 Refrigerated and frozen storage

All storage spaces and handling areas connected to these areas where food is stored or handled are defined as food establishments and must comply with legislated requirements. The following requirements apply for all storage and connected areas:

- The cooling capacity must be dimensioned such that correct product temperature can be maintained without large variations when these areas are in use.
- The capacity of the refrigeration equipment must be able to cool products with a marginally raised product temperature to the intended product temperature without breaching the critical limits for air temperatures.
- The air circulation must provide an even temperature throughout the entire area/space. For refrigerated storage, fresh air ventilation must be dimensioned to prevent any occurrence of respiration products (carbon dioxide or ethylene) from exceeding levels that could damage the products.
- Defrosting must occur in a manner that does not affect the product temperature, and such that the products are not exposed to dripping water or other effects.
- Equipment to measure and record temperature must be installed.

8.3.1 Placement of temperature sensors in storage spaces and handling areas

Temperature sensors must:

- Be placed at a height relevant to the practical handling that takes place in the storage or handling area, i.e. as close to the goods as possible.

TABLE 6: REQUIRED NUMBER OF TEMPERATURE SENSORS ACCORDING TO SIZE OF STORAGE AREA

SIZE OF STORAGE AREA (M^3)	NUMBER OF TEMPERATURE SENSORS
10 – 500	1
501 – 5 000	2
5 001 – 20 000	3
20 001 – 50 000	4
50 001 – 85 000	5
→ 85 000	6

- Not be affected by brief variations in temperature (which normally occur when doors are opened or when defrosting occurs).
- Be able to be calibrated and adjusted.

In spaces smaller than 10 m^3, air temperature can be measured with a calibrated thermometer that shows the reading on the instrument. In storage spaces larger than 10 m^3, air temperature must be measured using equipment able to record the measurements. To attain a representative picture of the air temperature, the number of sensors to be placed in the space varies according to the size of the space; see Table 6.

8.3.2 Measuring and recording frequency of the temperature sensors

In spaces smaller than 10 m^3, a reading of the air temperature must be taken twice daily (i.e. twice per 24 h). Regarding the required frequency for measuring and recording air temperature in storage spaces and connected handling areas larger than 10 m^3, see Table 5. For requirements regarding documentation and archiving, see Table 1, section 2.4.

8.4 Alternative measurement methods

8.4.1 Measuring temperature with IR technology

Due to the many sources of error, infrared (IR) measurements of product temperature are not permitted as a basis for returns or complaints. Product temperature readings attained with IR often show a poor correlation with actual product temperatures as it is the temperature of the outer packaging that is measured. Different packaging materials also give off varying amounts of heat, meaning that the measuring equipment must be adjusted for each particular material. If this is not done, the measured value is incorrect. Because IR measurements are taken from a distance, many other factors can also interfere with the accuracy of the reading.

8.4.2 General remarks on temperature indicators and time-temperature integrators

Different types of indicators and integrators have been developed for fast and efficient monitoring of product- and air temperature in the refrigerated and frozen distribution chain, and for other temperature-sensitive products. These can be used to complement the temperature controls described in this Industry Guideline.

There are two types of temperature indicators: temperature indicators (TI) and time-temperature integrators (TTI). The measuring principle for both involves a temperature-dependent process that can be either mechanical, physical, chemical, biochemical or electronic. The process results in a measurable and often visible change, e.g. a change in colour, which can also be read by an instrument, e.g. scanned. Depending on an instrument's construction, the resulting measurements can also be read and recorded electronically.

8.4.2.1 Temperature indicator (TI)

When handling particularly temperature-sensitive products, a temperature indicator can be used to show whether a selected temperature limit has been breached (i.e. exceeded or not attained). A TI may suitably be used to complement a TTI or for particularly temperature-sensitive products whose characteristics can be significantly altered by too high- or too low a product temperature. This is done through temperature controls that monitor for deviations from the set temperature requirement entered by the producer.

8.4.2.2 Programing of temperature indicator (TI)

When programming and using a temperature indicator, the following requirements must be met:

- Verified test results from the producer must support the TI's settings and time and temperature tolerances.
- The outcome of tests must form the basis for the TI's set tolerance levels.
- A written record of the measurement log and documentation must be able to be presented upon request.

If an error is indicated, a temperature control must be performed in accordance with the controls described in this Industry Guideline. Temperature indicator results are not permitted as a basis for returns or complaints.

8.4.2.3 Time-temperature integrator (TTI)

A time-temperature integrator measures time and temperature and integrates these into a measurable result. It shows the time-temperature history that the product has been exposed to as an integrated value.

The aim of using temperature indicators is to simplify and streamline product monitoring along the refrigerated and frozen food distribution and handling chain, all the way to the retailer/restaurant, and do so as cost-effectively as possible. The equipment can be used to monitor the quality of handling conditions throughout the distribution chain, indicating and identifying suspected temperature errors, which in turn help companies to set priorities in their self-monitoring work. The use of time-temperature integrator results as a basis for returns or complaints is not permitted.

8.4.2.4 Programming of time-temperature integrator (TTI)

When programming and using a TTI, international requirements (International Institute of Refrigeration) must be met and a written record of the measurement log and documentation must be made available upon request. The TTI must:

- respond to temperature variations across a very broad temperature range
- be easy to program
- have high accuracy and reproducibility
- be able to monitor product temperature
- be able to be stored before use without activation
- be easy to activate
- tolerate incorrect physical, chemical or mechanical handling
- be difficult to remove from measured objects during the measuring period
- not contaminate the product (only contain approved food-grade materials/ ingredients)
- be easy to read and the measured results easy to understand
- designed to prevent manipulation or altering

For more on indicators and integrators, readers are referred to the literature listed in the references at the end of this guideline.

8.5 Testing and calibration of measuring equipment

EU and national legislation places high demands on the equipment used to monitor and record air- and product temperatures. In order to ensure that these legal requirements are met and measuring results are correct, the instruments used must undergo regular testing and calibration.

This can be conducted in several ways:

8.5.1 Testing

- According to testing instructions provided by the equipment manufacturer.
- According to built-in testing functions found on many of today's measuring instruments, which guarantee the accuracy of measurements across an instrument's entire measuring range. Such testing functions do not replace calibration. Sometimes the function is merely a control of the battery life and yields no measure of the electronic equipment's measuring accuracy.
- Through a simple control of the readings of the working thermometer in an ice/water bath and at room temperature. The thermometer must in this case show 0°C and the current ambient temperature, respectively.

8.5.2 Calibration

- Through a calibration of the measuring instrument against a calibrated reference thermometer with a traceable calibration certificate. This proof of calibration for the reference thermometer must be issued by an accredited calibration laboratory.

Calibration of measuring instruments must be conducted according to the manufacturer's recommendations, or at least every 12 months, and must cover:

- Permanently installed measuring equipment in storage spaces and connected handling areas, as well as transport vehicles and cargo spaces.
- Portable instruments for manual temperature measurements.
- Data logs used to follow up temperatures.
- Instructions for how this calibration is to be performed based on the type of measuring and calibration equipment must be included in the company's self-monitoring program.
- The documentation must contain the following:
- Information regarding deviations from required measuring accuracy.
- Calibration frequency for different types of measuring equipment.
- A calibration record covering all measuring equipment.
- Actions such as adjustments must be documented in the calibration record.

For information on the calibration method for a specific measuring instrument, readers are referred to the instrument's manufacturer.

9.0

DEFINITIONS & GLOSSARY

9.0

DEFINITIONS & GLOSSARY

Legislation, regulations, industry guidelines and similar sources provide a number of definitions of particular relevance for refrigerated and frozen foods. The following list contains terms that appear in the guideline as defined below. This is not an exhaustive list, but a selection of terms with relevance to this guideline.

Animal products
Products of animal origin.

Cargo carrier
Where the goods are placed and kept during distribution, i.e. pallet, rolling cage, SRS crate.

Cold-sealed
A hermetically treated and packed product with a shelf-life of at least 6 months when refrigerated.

Cold storage
Storage of foods at a controlled temperature between the product's freezing point and +8°C for animal products, and from just above freezing to +15°C for products of plant origin. Certain products may be stored at higher temperatures.

Consignment
A specified batch or shipment of goods, e.g. a package, a pallet, or entire load.

Delivery
Moving goods between different points.

Contamination
The infecting, soiling or spoiling of a product, which can not be restored.

Destructive test
Measurement of product temperature taken within a product.

Distribution
The moving of goods.

Frozen foods
Unless otherwise stated, the use of frozen refers in this document to deep-frozen, in keeping with the definition given in LIVSFS 2006:12, §2. Frozen foods are thereby foods that:

a. Have undergone a freezing process where the product is frozen as quickly as requirements stipulate for that particular product.

b. Always, in all their parts, maintain a temperature of -18°C or colder after freezing and temperature equalization.

Goods owner
Person or company that owns the goods.

Handler/Goods handler
Person or company that handles and moves goods.

HACCP
Hazard Analysis and Critical Control Points is a standardized method that describes a systematic approach to how workers identify, assess and control hazards in food production with the aim of ensuring that the food will be safe for the consumer. The hazards may be microbiological, chemical, allergen-related, or physical in nature. Within the EU, all companies that handle food are required to employ HACCP principles and have self-monitoring programs in place, which must also be based on good hygiene practice (GHP). More information on HACCP can be found on the National Food Agency's website (https://www.livsmedelsverket.se/).

Layer
A level of goods in/on a cargo carrier, i.e. pallet, rolling cage, SRS crate.

Microbiology
The study of microorganisms, i.e. bacteria, moulds, viruses.

Microbiological risk
The risk for transmission or growth of microorganisms.

Mixed load
Loading of different products in the same cargo area/space.

Non-destructive test
Measurement of product temperature taken between packages/products.

Packaging types
Transport packaging = collective packaging for a number of outer packages.
Outer packaging = collective packaging for a number of consumer/inner packages.
Consumer packaging = individual packages for sale to the consumer.

Pre-cooling
Cooling of the cargo space to refrigeration or freezing temperature before loading.

Primary production
Products from the earth or nature, such as vegetables, fruit and berries, products from livestock rearing, hunting and fishing, or milk/dairy and egg production.

Products of plant origin/plant products
Products from the plant kingdom, e.g. fruit, berries and vegetables.

Random sample
Testing of a small, random selection from a larger group in order to draw conclusions about the entire group.

Reference thermometer
A thermometer calibrated by an accredited testing facility, laboratory or company certified according to ISO/IEC 17025:2005.

Refrigerated- or frozen supply chain
Handling, storage and transport under temperature-controlled conditions from harvest/slaughter/capture/preparation and refrigeration/freezing to the retailer/restaurant.

Refrigerated product/goods
Foods that must be kept cold, but not frozen, for their shelf-life.

Relative humidity
A measure of the amount or water vapour (humidity) present in the air given as a percentage of the maximum possible water vapour content (i.e. saturation level) at the current temperature.

Reloading area
A handling place or area for reloading or temporary storage.

Respiration products
Gases (e.g. ethylene and carbon dioxide) released as certain plant products ripen and break down. These gases can have an adverse effect on other foods of plant origin.

Routine monitoring/control
A method of approach for testing, to ensure adherence to correct temperature or to identify possible deviations.

Self-monitoring
According to food law, all activities that include some form of occupational handling of foods must have a self-monitoring program adapted to those activities. Self-monitoring controls must be based on good hygiene and production practices and HACCP. The self-monitoring program describes the routines workers follow and the testing conducted, as well as corrective actions to be taken when a control test is not approved.

Sensory quality
A subjective measure of a food's quality with respect to characteristics we experience with our senses: taste, smell, sight, hearing and touch.

Set temperature/set point
The temperature at which a refrigeration unit is set. The same as thermostat value.

Simple control
Testing of measuring equipment according to the instructions of the manufacturer (usually a simple control of a thermometer's readings in an ice/water bath and at ambient temperature).

Spacers
Strips of wood, plastic or other material laid between products or cargo carriers.

SRS crate
A cargo carrier used in a national return system for plastic crates and pallets. SRS is an abbreviation of Svenska Retursystem, the name of the system in Sweden.

Thermometer adjustment
Refers to adjusting the thermometer so that it reads as correctly as possible after calibration.

Thermometer calibration
Comparison of a thermometer to a known norm (see traceability below). Calibration provides a measure of the thermometer's deviation at a certain time-point and under certain specified conditions, that is, how large an error a measurement taken with the thermometer may contain.

Thermostat value
The same as set temperature/set point.

Traceability
In the context of calibration, traceability refers to being able to traced back to a national/international norm, i.e. a reference point, via an unbroken chain of comparisons against relevant norms, all of which have stated uncertainties.

Working thermometer
A thermometer used in the day-to-day monitoring work; it must be calibrated.

10.0

SOURCE MATERIAL FOR REFERENCE

10.0

SOURCE MATERIAL FOR REFERENCE

Industry guidelines and other reference sources (including guidelines that have not been assessed by the National Food Agency)

Industry guidelines for bakeries and confectioners, 2012
(Branschriktlinjer för bageri och konditori, 2012)
Produced by the Association of Swedish Bakers & Confectioners.
Contents: Guidelines for production of baked goods and pastries.

Industry guidelines for Swedish fish and shellfish market, 2012
(Branschriktlinjer för den svenska marknaden. Fisk och skaldjur, 2012)
Produced by the Fish and Shellfish Council, Swedish Frozen Food Association.
Contents: Guidelines for handling fish and shellfish.

Industry guidelines for milk and dairy products, 2017
(Branschriktlinjer för hygienisk produktion av mjölkprodukter, 2017)
Produced by Svensk mjölk AB.
Contents: Guidelines for production and handling of milk and dairy products.

Industry guidelines for restaurants
(Branschriktlinjer för restauranger)
Produced by Visita, a sector organization for the Swedish hospitality industry.
Contents: Food handling and meal preparation guidelines for restaurants and caterers.

DIN 10508 Food hygiene – Temperature requirements for foodstuffs, 2012
Produced by the German national organization for standardization (Deutsches Institut Fur Normung E.V.).

Guide to Good Hygiene Practice: Distribution of quick-frozen food, 2001
Produced by SYNDIGEL, France.

Guideline for Good Hygiene Practice in Cold Stores, 2008
Produced by the Austrian Ministry of Health and Women (Bundesministerium für Gesundheit und Frauen).

Food safety handbook for schools and care, 2009
(Handbok för säker mat inom vård, skola och omsorg. Branschriktlinje för kök)
Branch guideline for institutional kitchens, Swedish Association of Local Authorities and Regions (see website: offentligsakermat.se).
Contents: Guidelines for food handling and meal preparation in schools and (health) care facilities.

Safe Food in Your Store, 2018
(Säker mat i din butik, 2018)
Produced by a task force with representatives from Swedish Food Retailers Federation (Svensk Dagligvaruhandel) members.
Contents: Guidelines for self-monitoring programs based on HACCP according to (EC) No. 852/2004.

Transportation of Foodstuffs – Guide to Good Hygiene Practice for Food Transportation, 2001
Produced by Transfrigoroute Deutschland E.V. and the German freight transport association (Bundesverbandes Güterkraftverkehr Logistik (BGL).
Contents: Regulations regarding food transport.

European Ice Cream Association
Contents: Regulations regarding ice-cream products.

Regulations, directives and laws

Regulation (EC) No. 178-2002
Contents: General principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety.

Regulation (EC) No. 852/2004
Contents: Hygiene of foodstuffs.

Regulation (EC) No. 853/2004
Contents: Specific hygiene rules for food of animal origin (there are no specific legal provisions regarding temperature for foods of plant origin).

Regulation (EC) No. 37/2005
Contents: Monitoring of temperatures in the means of transport, warehousing and storage of quick-frozen foodstuffs intended for human consumption.

Regulation (EC) No. 2073/2005
Contents: Microbiological criteria for foodstuffs.

EU Council Directive 89/108/EEC
Contents: Approximation of the laws of the Member States relating to quick-frozen foodstuffs for human consumption.

EU Commission Directive 92/2/EEC
Contents: Sampling procedure and the Community method of analysis for the official control of the temperatures of quick-frozen foods intended for human consumption.

National Food Agency regulations (SLVFS 1980:4) on the application of the international agreement on the transport of perishable foods (ATP)
(Internationell transport av lättfördärvliga livsmedel)
Contents: Implementation rule for the application of the 1970 ATP and special equipment used for transport, reprinted 1995:17.

National Food Agency regulations (SLVFS 1980:5) on the international agreement on the transport of perishable foods (ATP)
(Internationell transport av lättfördärvliga livsmedel)
Contents: Agreement on the ATP and special equipment used for transport, reprint of appendices 1995:18.

National Food Agency regulations (SLVFS 1980:6) on the application of the ordinance on the application of the international agreement on the transport of perishable foods (ATP)
(Internationell transport och ATP-utrustning)
Contents: Implementation rules for the ordinance on the application of the 1970 ATP and special equipment used for transport, reprinted 1995:19.

National Food Agency regulations (LIVSFS 2006:12) on frozen foods
Contents: Regulations regarding deep-frozen foods. Areas addressed include definitions, food preparation, refrigerants and temperature measurement. Does not apply to ice-cream and ice-cream products.

Product Liability Act (1992:18) with revisions up to and including SFS 2010:975
Contents: Swedish Product Liability Act laying out the conditions and liabilities for damages in the event of harm to person or property arising from an unsafe product.

Literature

3rd Informatory Note on Refrigeration and Food, Temperature Indicators and Time-Temperature Integrators
L Bogh-Sörensen and G Löndahl, International Institute of Refrigeration, Nov. 2004

Kalla fakta (Cold Facts)
Swedish Frozen Food Association (see website: www.svdh.se)

Recommendations for the Processing and Handling of Frozen Foods
Leif Bøgh-Sørensen et al., International Institute of Refrigeration, Paris, France

Temperaturvårdande checklista för transport och hantering av livsmedel
(Temperature checklist for the transport and handling of foods) (Art. no. 30-5020026), H-O Nilsson Service AB

Standarder

Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be Used for such Carriage (ATP)
ATP is a UN treaty that lays out standards for the international transport of perishable foods between the states that have ratified the treaty.
There are also Sweden National Food Agency rules regulating the application and implementation of ATP: SLVFS 1980:4, SLVFS 1980:5, SLVFS 1980:6.

General Requirements for the Competence of Testing and Calibration Laboratories: ISO/IEC 17025:2005
This standard specifies the general requirements for the competence to carry out tests and/or calibrations, including sampling. It covers testing and calibration performed using standard methods, non-standard methods, and laboratory-developed methods. It is applicable to all organizations that perform tests and/or calibrations.

British Retail Consortium Global Standard, Storage & Distribution (BRCGS S&D), Issue 3
Standard for ensuring best practice for storage and distribution with regard to food safety and food quality.

Thermometers for measuring the air and product temperature for the transport, storage and distribution of chilled, frozen, deep-frozen/quick-frozen food and ice-cream. Tests, performance, suitability: EN 13485
Handheld instruments used to measure and record temperatures in refrigerated and deep-frozen food products must comply with international standard EN 13485. Both gauges and sensors must be EN 13485-compliant. Temperature gauges and sensors must be verified by calibration according to EN 13486 (see below).

Temperature recorders and thermometers for transport, storage and distribution of chilled, frozen, deep-frozen/quick-frozen food and ice-cream. Periodic verification: EN 13486
Temperature gauges and sensors must be verified by calibration according to EN 13486.

Temperature recorders for the transport, storage and distribution of temperature sensitive goods – Test, performance, suitability: EN 12830
Instruments used to measure and record air temperature in areas and spaces used to store and transport refrigerated and deep-frozen foods must comply with international standard EN 12830. Both gauges and sensors must be EN 12830-compliant. Temperature gauges and sensors must be verified by calibration according to EN 13486 (see above).

Food safety management systems, ISO 22000:2018
Standard used in companies' quality assurance and certification work related to food safety.

ISO 22000:2018 – Food Safety Management Systems. A practical guide.
A guide to using ISO 22000:2018.

APPENDIX 1

RECOMMENDED AIR TEMPERATURE FOR PRODUCTS OF PLANT ORIGIN IN MIXED STORAGE AND MIXED LOADS DURING TRANSPORT

TABLE 7: EXAMPLES OF LOWER- AND HIGHER-TEMPERATURE PRODUCTS OF PLANT ORIGIN.

LOWER-TEMPERATURE PRODUCTS ←+8°C	HIGHER-TEMPERATURE PRODUCTS →+8°C
berries (in general)	aubergine (egg plant), guava, rambutan (lychee)
cauliflower, broccoli, brussels sprouts, Chinese cabbage	avocado
cherries	banana
dill, parsley	basil
fruit (in general)	carambola (star fruit), cherimoya, chilli pepper
kiwi	cucumber, sweet pepper, tomato
lettuce	lemon, lime, grapefruit, limequat
melon (depending on type)	melon (depending on type)
plums	pineapple, mango, papaya, passion fruit
raspberries, strawberries	pomegranate, kiwano (horned melon)
vegetables, root vegetables (in general)	potato, sweet potato

Table 7 lists examples of products of plant origin that require lower temperatures and those that can be stored at higher temperatures. The products are grouped to facilitate the handling of products of plant origin for brief periods of mixed storage and in mixed loads during transport. For more information about lower- and higher temperature plant products, see section 4.1.

APPENDIX 2

METHOD FOR MEASURING PRODUCT TEMPERATURE[1]

A video entitled Ta tempen rätt demonstrates how to measure product temperature. The video can be viewed at: https://www.svenskdagligvaruhandel.se/riktlinjer/branschriktlinjer/

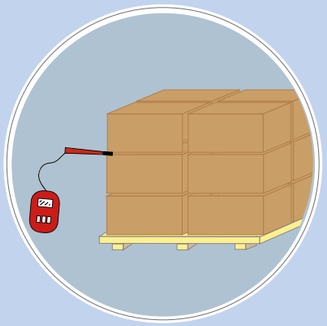
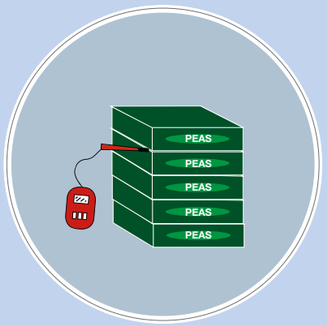
Performing a measurement

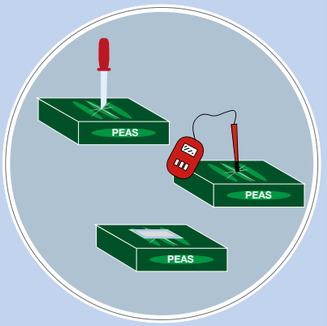
1. Pre-cool the temperature sensor before measurement, e.g. by placing it between the packages in a spot other than the planned measuring site. Pre-cooling has been achieved when the temperature reading on the instrument's display has stabilized.

2. The measured value is calculated differently depending on whether the product being measured is a refrigerated or frozen product:

PRODUCT TYPE	HOW IS THE MEASURED VALUE CALCULATED?	REMARKS
Frozen product	The measured value is calculated by subtracting +2°C within the range of -5°C to 30°C. A displayed reading of -16°C thus corresponds to a product temperature of -18°C.	The subtraction is based on testing and compensates for the temperature difference between the surface of the packaging and the product.
Refrigerated product	The reading shown on the instrument is the measured value.	No adjustment is needed as the difference in temperature between the packaging surface and the product is too small.

[1] 92/2/EEC, Appendix 2; LIVSFS 2006:12

Measurement instruction refrigerated and frozen products	***Figure***	***How to perform the measurement***	***Corrective action in the event of deviations***	***Remarks***
Step 1 (non-destructive measurement) Applies only to frozen products.		If the product is packed in cartons: take measurement between the first and second layers in one corner of the pallet. If it is packed in SRS crates: take measurement directly between two consumer packages. If an additional measurement is needed: perform this in the lower part of the pallet following the same procedure. If the pallet contains several different products: at minimum, a measurement must be performed on the most sensitive product.	If temperature reading in Step 1 deviates from the set limits: continue to Step 2. If the product is packed in SRS crates: go to Step 3.	- - -
Step 2 (non-destructive measurement) Applies to refrigerated and frozen products.		Place the thermometer between cartons/inner packages, ensuring that the temperature sensor has as much thermal contact as possible and that it remains firmly in place. In some cases it may be suitable to stack two inner packages on top of each other to hold the sensor in place. Wait for the temperature reading on the thermometer to stabilize. This usually takes about 3-4 min. Once the measurement has been taken, reseal the outer packaging or tape over the hole. Using a sticker that indicates a temperature control has been performed is a good way to do this.	If temperature reading in Step 2 deviates from the set limits: go to Step 3.	In the case of a deviation, a temperature inspection protocol must be drawn up.

Measurement instruction refrigerated and frozen products	***Figure***	***How to perform the measurement***	***Corrective action in the event of deviations***	***Remarks***
Step 3 (destructive measurement)		Measure the product temperature by inserting the sensor probe directly into the product packaging. For frozen products, use a small hand drill or similar tool to make a small hole in the product. The diameter of the hole should not be much larger than the diameter of the sensor probe. Allow the temperature to equalize after making the hole, which takes about a minute, before taking the measurement. Measure the temperature in the middle of the product, or at least 2.5 cm below the surface (if product thickness is less than 2 cm, always take the measurement in the centre of the product). Tape over the hole in the packaging and the carton/ SRS crate. Using a sticker that indicates a temperature control has been performed is a good way to do this. To prevent contamination, the sensor probe must be cleaned and disinfected, e.g. with an alcohol wipe, both before and after measurement.	If the deviation in temperature persists after Step 3, the company's self-monitoring routines must be followed. For larger consignments, further testing must be performed to assess/ ascertain how much of the consignment is not approved.	In the case of bulk packages and products packed directly in outer packaging, a destructive test must always be performed. A description of how to deal with products after a destructive temperature control must be included in the company's self-monitoring program.

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