

# MASTER YOUR GAS MIX

GET A CONSISTENT AND  
ACCURATE GAS MIX FOR  
MODIFIED ATMOSPHERE  
PACKAGING

$O_2$

$CO_2$



$N_2$

**Dansensor**<sup>®</sup>  
**AMETEK**<sup>®</sup>

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# MASTERING THE GAS MIX IS A CRUCIAL PART OF MODIFIED ATMOSPHERE PACKAGING

## WHAT IS MODIFIED ATMOSPHERE PACKAGING?

Modified Atmosphere Packaging (MAP) is a method of extending a product's shelf life by replacing the composition of gases inside the package. The basic principle is to control and reduce the amount of oxygen ( $O_2$ ) in the package by using a specific gas mixture of atmospheric gases to substitute the ambient air. In the MAP packaging process, the gases we use to preserve the product are usually a mix of nitrogen ( $N_2$ ) and carbon dioxide ( $CO_2$ ).

## MASTER YOUR GAS MIX

To succeed with MAP, you must be able to control the gas mix. This is achieved by careful preparation, precise instrumentation, and constant monitoring.

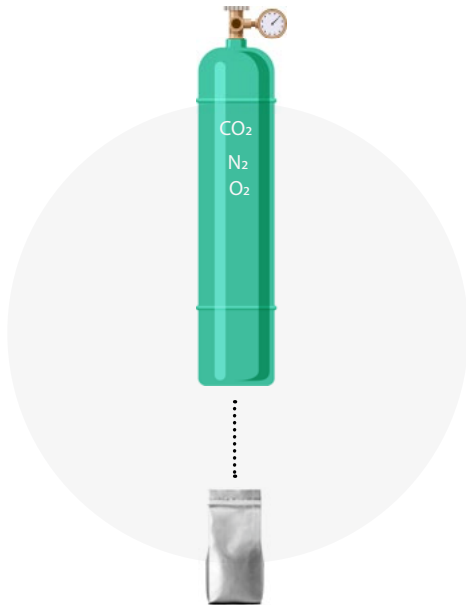
This paper is meant to be a practical guide to help you understand the options and requirements of gas mixing for MAP.



# THE CHARACTERISTICS OF PRE-MIXED GAS AND ON-SITE MIXED GAS

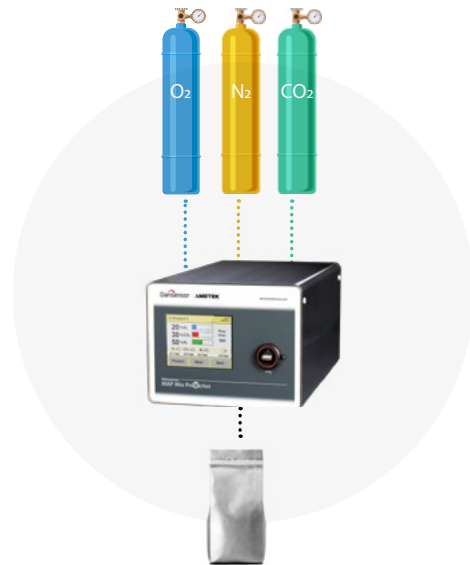
The desired mix can be created on site by mixing two or more pure gases, or they can be supplied as pre-mixed products in various containers and cylinders. Both methods are widely used ways to supply gas to the MAP packaging line. Before you decide on which way is best

suited for your packaging line, it's a good idea to take all factors into consideration. The comparison chart below gives you an overview of the pros and cons of both methods.



## PRE-MIXED GAS

- ✓ Limited initial investment (fewer instruments and less infrastructure)
- ✓ Suitable for limited production (limited product types and number of packages)
- ✓ Suitable for single-gas MAP applications (e.g. 100% N<sub>2</sub>)
- ✓ No need for monitoring
- ✗ Higher gas cost
- ✗ Not flexible for packaging of different products
- ✗ No monitoring = reduced quality control (rely on gas supplier for accuracy of mix)



## ON-SITE GAS MIX

- ✓ Homogeneity/Quality
- ✓ Flexibility - easy scale up/down to fit packaging line speed, package sizes and products requiring different gas mixes on same packaging line
- ✓ Suitable for any production capacity
- ✓ Lower gas cost
- ✓ Potential gas savings/optimization
- ✗ Higher initial investment
- ✗ Need for continual monitoring (operator)

Talk to a MAP expert about gas mixers

[CLICK HERE](#)

# REDUCE PRODUCTION COSTS WITHOUT COMPROMISING QUALITY

Are your MAP packaging costs higher than they need to be? There are several things to pay attention to that can make a big difference over time. But you don't have to compromise your quality to cut costs. In fact, the more precision and control - the more confidently you can run your MAP packaging – without unnecessary costs.

REDUCE  
HUMAN  
ERRORS



A safe way of reducing human errors is to simply reduce human interaction. This is best done by automating the routine functions where mistakes are often made. Modern gas mixers and analyzers enable the operator to shift focus from routine monitoring to proactive tasks. This will improve both the quality of work life as well as the and the product quality.

Be critical and make sure the instruments are:

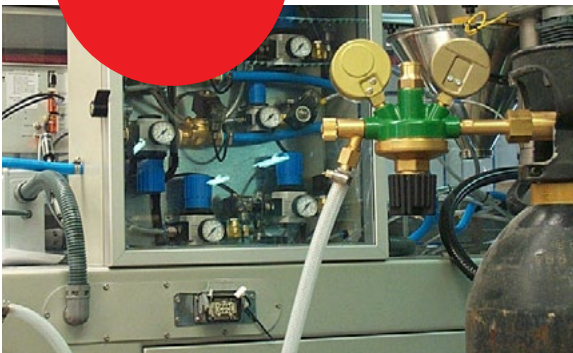
- Easy to learn
- Intuitive to operate
- Have optional gas mix presets
- Provide easy readout and data in real time
- Have automatic notification in case of irregularities

REDUCE  
DOWNTIME



Strategies for avoiding downtime are low-hanging fruit. Sometimes a single gas mixer will feed multiple production lines. This is a smart way to get more benefit out of the gas mixer, but it also makes you more vulnerable to breakdowns. On most modern MAP packaging lines, the benefits of an additional gas mixer outweigh the cost – by far.

REDUCE  
GAS  
CONSUMPTION



What happens if you're unsure about the current gas mix or flow rate? It's common practice to overcompensate by adding more N<sub>2</sub> or CO<sub>2</sub> than necessary – to be on the safe side. This will, of course, cause unnecessary gas consumption and cost, without raising the quality. You can solve this issue through precise and continuous automated monitoring.

CUT GAS  
COST



Source : [www.boconline.co.uk](http://www.boconline.co.uk)

Single gases are generally cheaper than pre-mixed. Purchasing pure gas and mixing it on-site will get you lower gas prices. Besides the economic benefit, you will also be able to control and change the mix any time. This adds flexibility and control.

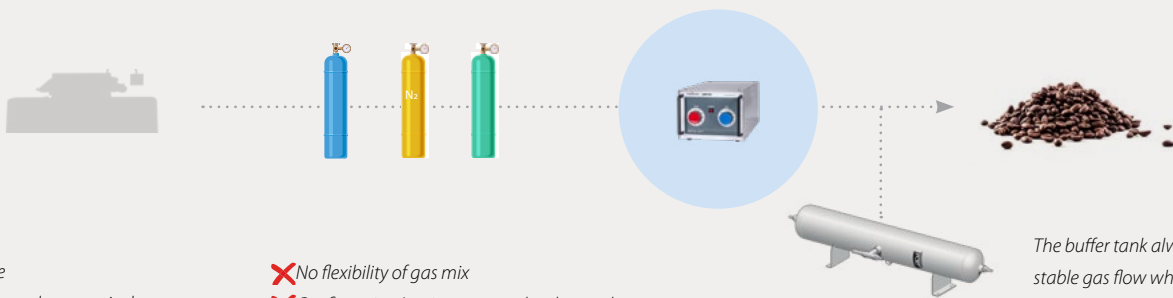
# WHAT KIND OF GAS MIXER FITS YOUR PACKAGING NEED?

Which gas mixer is the right choice for your production line and product? Some considerations are:

- Will it deliver a sufficient flow rate?
- Can it handle sufficient volumes of incoming gases?
- How skilled is your operator? Will they be able to maintain an overview overlook and adjust the gas mix and pressure as needed

## MECHANICALLY REGULATED GAS MIXERS

For a consistent and predictable MAP packaging



- ✓ Reliable
- ✓ Durable and economical
- ✓ Low to medium speed/capacity

- ✗ No flexibility of gas mix
- ✗ Configuration/settings cannot be changed
- ✗ Not suitable for higher capacity/speed
- ✗ No monitoring of fluctuation in supply gases

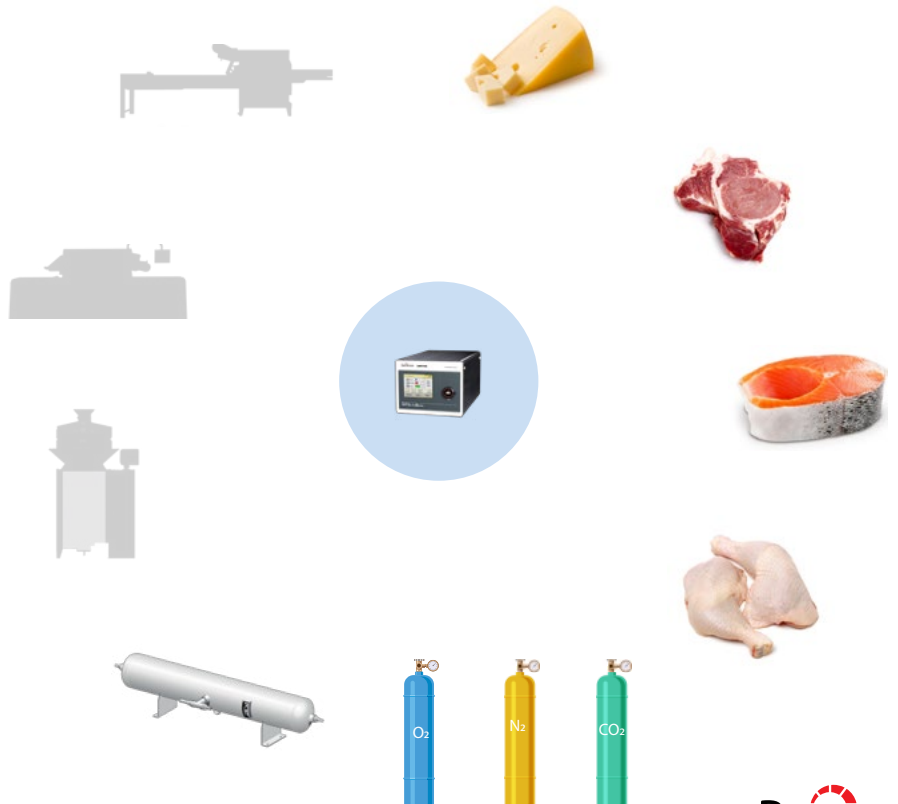
The buffer tank always ensures stable gas flow when feeding multiple packaging lines, well suited for thermopackaging and tray sealers

## ELECTRONICALLY REGULATED GAS MIXERS

Can adapt to present and future needs regardless of conditions

- ✓ Precise and reliable
- ✓ Fast and accurate adjustments
- ✓ Flexible (change settings, programs, adjust flows and alarms)
- ✓ Save pre-set programs for different products/package sizes
- ✓ Continually monitor factors like gas supply pressure, gas flow, gas mix
- ✓ Traceability (data continually saved to unit)

- ✗ More expensive
- ✗ Less robust



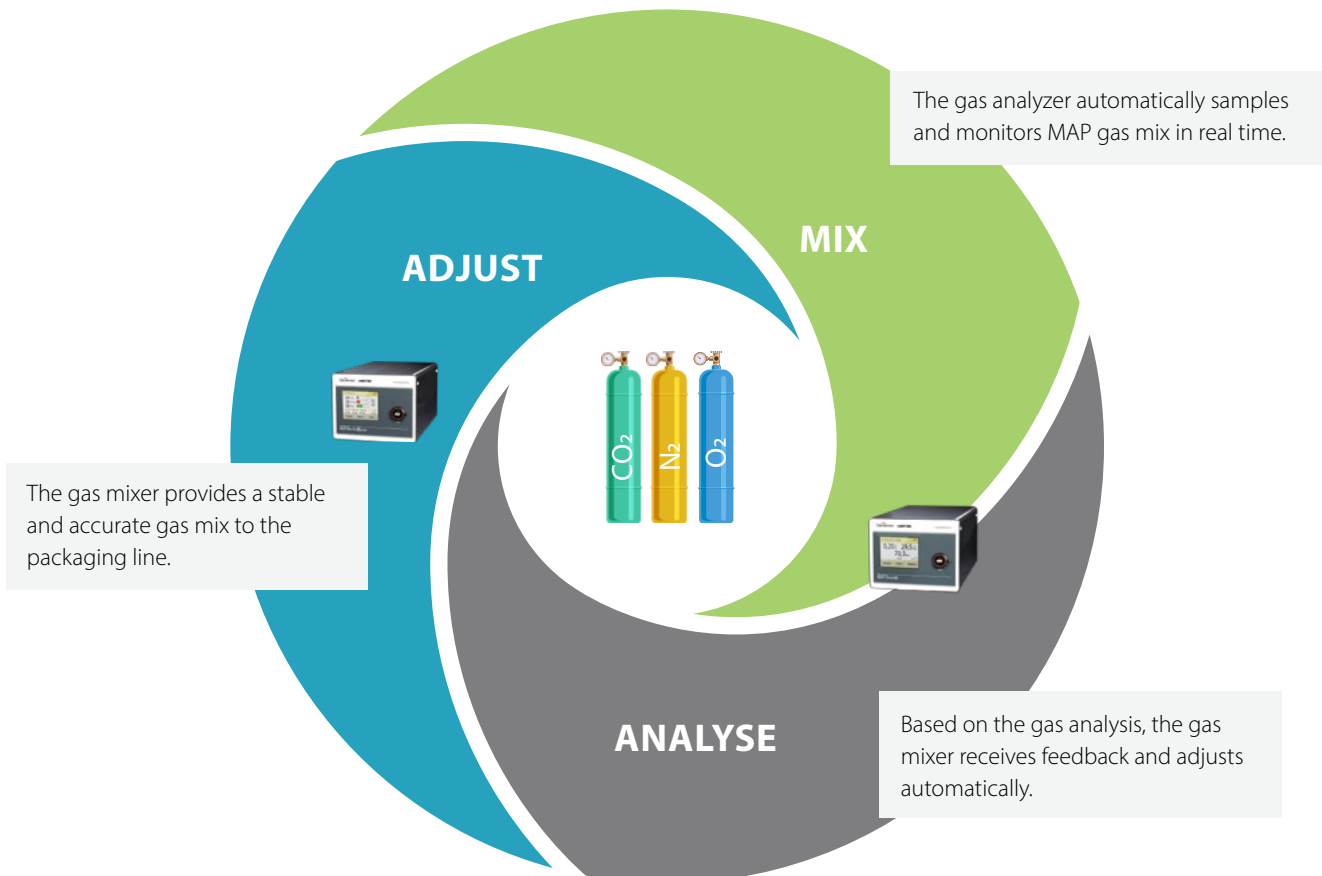
# THE CRUCIAL FACTOR IN QUALITY ASSURANCE: ANALYZING THE GAS MIX

## THE BENEFIT OF CONTINUOUS GAS ANALYSIS

Gas mixers are designed to ensure the correct correlation between the MAP gases. But a mixer doesn't always give you accurate information about the actual gas mix that goes *into* the package headspace. Deviations can arise due to oxygen not being sufficiently flushed out before sealing – or insufficient flow rate. Hence, a gas analyzer is often integrated in the process. It continuously and precisely monitors the gas mix and if the values are outside

the specified limits, it can adjust the dosing. If values are outside the upper limits, it will notify the operator and stop the production line to prevent potential waste and re-packaging. Gas analyzers provide a proven and safe solution which allows high production speed without sacrificing quality. Analysis requires only a small amount of gas which also means it is suitable for packaging with minimal headspace.

## THE NEVER-ENDING LOOP OF GAS MIX AND GAS ANALYSIS



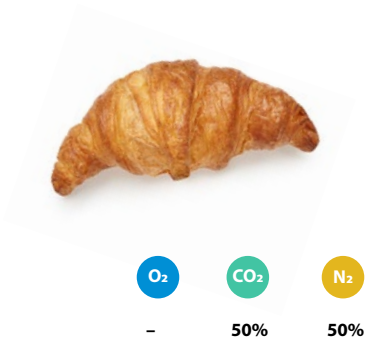
**Talk to a MAP expert about gas analysis**

[CLICK HERE](#)

# MAP GAS MIX AND THE MAIN FOOD CATEGORIES

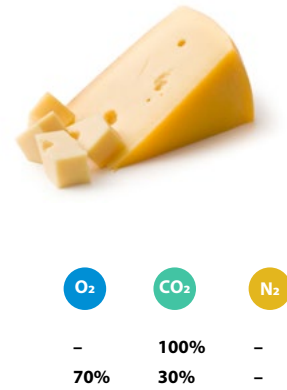
## BREAD AND CAKE

Since the water activity of bakery products is low, the growth of microorganisms other than mold is not typically a problem. A high standard of hygiene during production and packaging can significantly minimise this risk. Packaging should exclude O<sub>2</sub> completely and carbon dioxide (CO<sub>2</sub>) is used to slow down mold growth. To prevent the packaging from collapsing due to CO<sub>2</sub> absorption by the products, nitrogen N<sub>2</sub> can be used as a supporting gas.



## DAIRY PRODUCTS

One hundred percent carbon dioxide (CO<sub>2</sub>) effectively reduces microbial activity and retains the texture in hard cheeses. But even concentrations of as low as 20% strongly inhibit the growth of mold fungi. For soft cheeses, lower levels of CO<sub>2</sub> supplemented with higher levels of nitrogen (N<sub>2</sub>) is enough to inhibit bacterial growth and rancidity. CO<sub>2</sub> levels of up to 100% are used for hard cheeses. This is usually restricted to between 20% and 40% in the case of soft cheeses. The reason for this is to prevent the package from collapsing as the CO<sub>2</sub> is absorbed by the cheese. Grated cheese is normally packaged in an atmosphere of 70% N<sub>2</sub> and 30% CO<sub>2</sub>. By limiting CO<sub>2</sub> to 30%, manufacturers can avoid package collapse.



Hard cheese  
Soft cheese

## FISH AND SEAFOOD

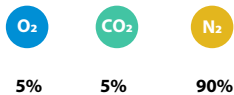
Fish and seafood are at high risk of declining quality shortly after being caught due to their high water activity and neutral pH (where microorganisms thrive). The presence of enzymes quickly undermine both taste and smell and the breakdown of proteins by microorganisms gives rise to unpleasant odors. It is essential that the temperature is kept as close to 0°C as possible. The right gas mixture alone will not prevent a decline in quality, but combined with proper temperature control, the shelf life can be extended with a few crucial days - provided the refrigeration chain is unbroken.



## FRUIT AND VEGETABLES

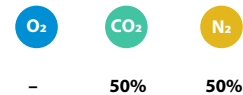
Fruit and vegetables continue "breathing" after the harvest and therefore require a level of oxygen in the package to remain fresh. Therefore, a controlled permeation of the packaging is desirable, e.g. micro-perforations.

Carbon dioxide, nitrogen and low amounts of Oxygen are ideal for this product category. The gas composition is individually adapted to the individual product.



## FRESH PASTA

The principal spoilage mechanisms affecting fresh pasta are yeast and mould growth. A mixture of CO<sub>2</sub> and N<sub>2</sub> is used to prevent microbial growth and oxidative reactions. A ratio of 2:1 is often used. For green fresh pasta, pigmented or metalised films are commonly used to exclude light. Pasta varieties with lower water activity values tend to have long shelf life. Pasta varieties having lower water values will tend to have longer shelf life.



## COFFEE

Coffee contains fatty acids which can oxidize and make the product rancid. Subsequently, a complete exclusion of oxygen is desired. Pure nitrogen is frequently used in coffee sachets and capsules.



## SNACKS AND NUTS

The fat content of this food category entails risk of oxidation, which can make the products taste rancid. The general rule is to minimize the contact with oxygen. Gas with 100 % nitrogen is frequently used to prevent premature spoilage. In certain cases, the MAP gases can also function as a "cushion" protecting the product, such as potato chips, against damage.





# DANSENSOR GAS MIXER OVERVIEW



Dansensor® MAP Mix Provectus®



Dansensor® MAP Mix Focus



Dansensor® MAP Mix 9001+

## Dansensor® MAP Mix Provectus®

Digital gas mixer, highly adaptable and precise for high capacity

✓ For the **highest** outlet flow capacity 1500 L/min

✓ **High stability** - low pressure drop

✓ **2 or 3** gas mix

✓ **10 pre-configured mixes** to select during operation  
Digital gas setting via touchscreen

✓ Visual indication alarm and **automatic mixer stop**

✓ Operator mode **for flow** or buffer tank applications

## Dansensor® MAP Mix Focus

Digital gas mixer, precise and reliable for medium to high capacity

✓ For the **medium** outlet flow capacity 750 L/min

✓ **High stability** - low pressure drop

✓ **2 or 3** gas mix

✓ **3 pre-configured mixes** to select during operation, setting via touchscreen

✓ Acoustic gas inlet pressure alarm with **visual indication**

✓ Operator mode **for flow** or buffer tank applications

## Dansensor® MAP Mix 9001+

Mechanical gas mixer, durable and economical for low to medium capacity

✓ For the **smaller** outlet flow capacity 20-250 L/min

✓ **Good stability** - medium pressure drop

✓ **2 gas** mix

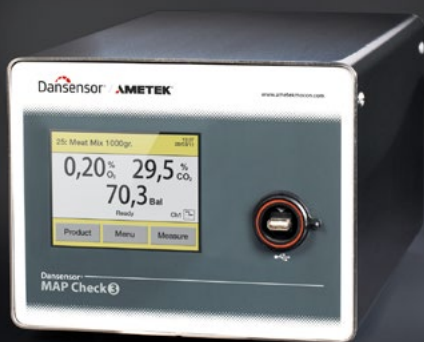
✓ **Manual gas settings**

✓ Acoustic gas inlet pressure alarm with **visual indication**

✓ Operator mode **for flow** or buffer tank applications

# DANSENSOR GAS ANALYZER OVERVIEW

Dansensor® MAP Check 3



Dansensor® ISM-3



## Dansensor® MAP Check 3

Dansensor® MAP Check 3 continuous gas analyzer is designed to precisely monitor gas content on vertical and horizontal flow packaging machines.

- ✓ Major gas savings with optional GasSave function when paired with Dansensor® MAP Mix Provectus® gas mixer
- ✓ On-line Quality Assurance of every package – more efficiently and with reduced labor and waste costs compared to manual testing
- ✓ Logging and displaying of actual gas consumption with the GasSave function for easy traceability
- ✓ Automatic stopping of the packaging machine if preset limits are exceeded, helping to avoid recalls and repackin
- ✓ Reduced CO<sub>2</sub> levels in the work area to protect employees

## Dansensor® ISM-3

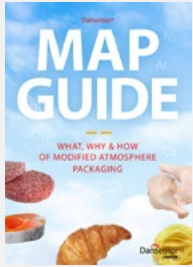
The industrial process analyzer ISM-3 is a digitally controlled analyzer capable of measuring inert gases and CO<sub>2</sub>.

- ✓ Great reliability (better than  $\pm 1\%$  of reading)
- ✓ Low demand for maintenance
- ✓ Large measuring range: 1 ppm – 100 %
- ✓ Self-diagnostics system

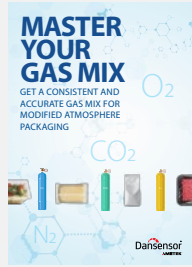
# ADDITIONAL RESOURCES

Find more information about MAP, quality control of MAP and in-depth MAP Guides for specific food applications here.

## Dansensor® operational e-guides



DOWNLOAD



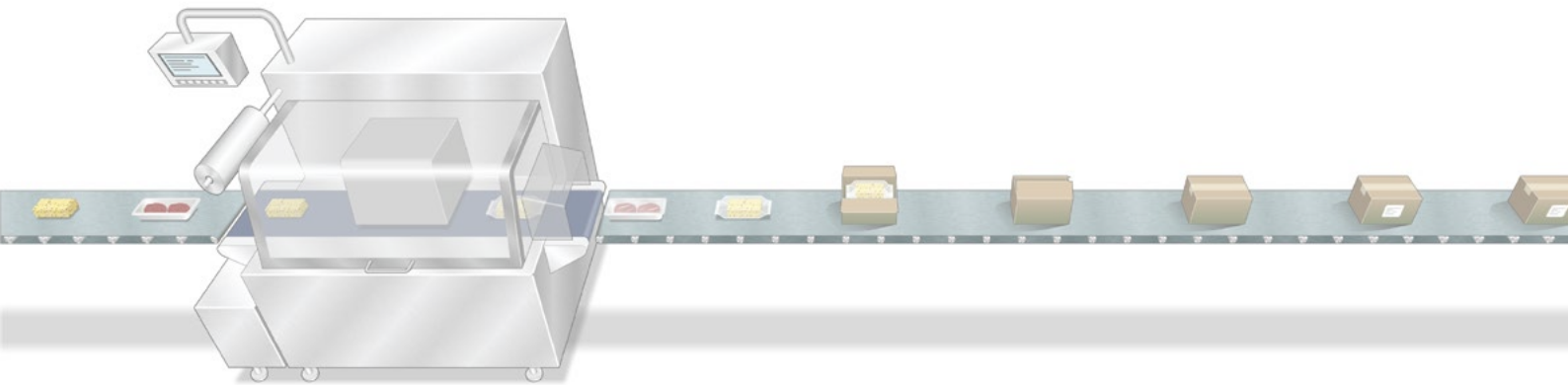
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## Dansensor® category e-guides



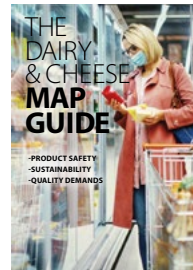
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# LET'S MIX TOGETHER



## Let's look at the big picture together

There is no one-size-fits-all-method that can be applied to your product and give you all the benefits. Every product and its associated circumstances are different. Experimenting and research are the ways to find out what set-up and instruments are ideal for your MAP packaging; however, there is a wealth of experience and knowledge on which to base your research.

We have experience and are here to help you. You don't have to interrupt your production to determine what works best for you. Don't make your own mistakes by trial and error. We can work with your situation and product to determine what gas mix, materials and instruments best fit your needs.

You can discover more about our instruments on our website here: [www.ametekmocon.com/products](http://www.ametekmocon.com/products)

CLICK HERE!

Get in touch with a MAP expert