



MetaSmart®

**ADISSEO**  
A Bluestar Company

# MetaSmart®

## USERS' GUIDE

Building a Better Future  
for Animal Nutrition



# MetaSmart<sup>®</sup> Users' Guide



**MetaSmart<sup>®</sup>**

The Unique Isopropyl Methionine  
Analog for Ruminants

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## INTRODUCTION

MetaSmart® is the unique isopropyl methionine analog for ruminants.

This guide contains technical information, storage and handling procedures, and application and inclusion guidelines for using MetaSmart® dry and liquid products in modern premix facilities and feed plants.

It is designed as a practical tool to help manufacturers everywhere produce top-quality feeds enriched with MetaSmart®, that will reach the feed bunk with maximum nutritional value.

The recommended techniques are based on accurate physical and chemical results, gathered from extensive tests carried out both within Adisseo experimental facilities and under a wide range of field conditions. These techniques provided state-of-the-art recommendations for the use of MetaSmart® throughout the production process.

For further details on procedures, equipment and safety measures, please contact your local Adisseo representative or the Director of Ruminant Business.

## IMPORTANT CONTACT INFORMATION

**CareChem24 International (Emergency/HAZMAT Services):**

[See the Material Safety Data Sheet \(MSDS\) for your country](#)





## 1/ TECHNICAL INFORMATION

### METASMART® LIQUID

#### Chemical formula:

**Butanoic Acid 2Hydroxy-4-(Methylthio)-1-Methylethyl ester**

$\text{CH}_3\text{S}-(\text{CH}_2)_2-\text{CH}(\text{OH})-\text{COO}-\text{CH}-(\text{CH}_3)_2$   
 N° CAS 57296-04-5

#### Description

MetaSmart® Liquid is a liquid source of metabolizable methionine for ruminants. It is the isopropyl ester of the HMB (2-hydroxy-4-(Methylthio) butanoic acid), also known as HMBi.

#### Main Specifications

Appearance: liquid

Color: brown to colourless

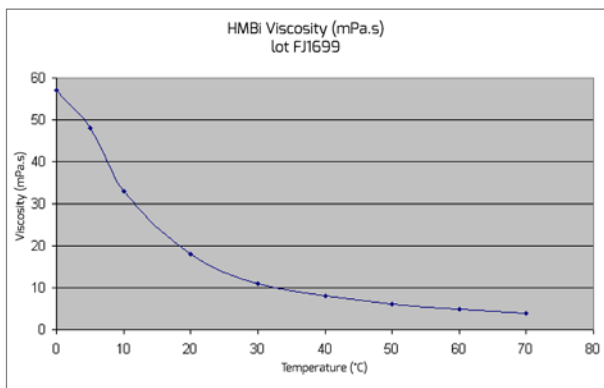
HMBi monomer content: min. 95 %

Water content: max. 0.5 %

- Concentration of active ingredient: guaranty > 95%
- pH: 4.5
- Melting Temperature: + 12°C (54°F)
- Start of crystallization +12°C (54°F)
- At 12°C (54°F) and below, MetaSmart® is in a state of superfusion, i.e. it can crystallize at any time in a random way.
- The return to the liquid form occurs by heating the product without changing its physical, chemical and nutritional properties.
- Enthalpy of fusion: 136 J/g
- Specific heat: 0.490 cal/g/°C at 10°C  
0.507 cal/g/°C at 50°C
- Flash Point: 115°C (239°F)
- Temperature of self ignition: 240°C (464°F).
- Density: 1.07 kg at 20°C
- Viscosity at 20°C: 13.6 mPa.s



## Relationship of viscosity vs. temperature



**Conductivity:** 0.5  $\mu\text{S}/\text{cm}$

**Solubility in water:** 20 g/L of water at 30°C (86°F)

**Storage period:** 12 months at above 12°C (54°F)

## METASMART® DRY

### Description

MetaSmart® Dry is a powder source of metabolizable methionine for ruminants. It is the isopropyl ester of the HMB (2-hydroxy-4-(Methylthio) butanoic acid), also known as HMBi, adsorbed onto a silicon dioxide carrier.

### Main Specifications

Appearance: powder

Color: white to beige

HMBi monomer content : min. 57%

Water content : max. 4%

### Compatibilities:

When MetaSmart® and RumenSmart® are included together at high incorporation rates in a feed, lumping or caking may occur. For more on this, please refer to our RumenSmart® Users' Guide.





## 2/ STORAGE AND HANDLING

**MetaSmart® is not a dangerous product and does not require particular conditions for its storage or handling.**

However, a warning notice should be posted for operators.

**Warning:**

MetaSmart® has the strong and characteristic smell of sulfur containing organic compounds (similar to cabbage for example), but it is not classified as toxic or dangerous.

**To avoid any potential discomfort:**

- Avoid handling the product in small closed-in rooms.
- Close packages tightly after use.
- **Wear a mask, gloves and goggles** when handling the product or its packaging



### TANK

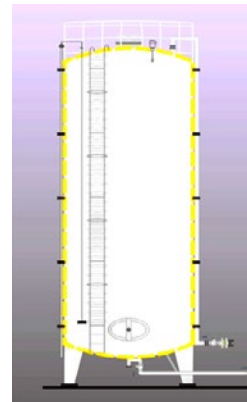
MetaSmart® can crystallize at temperatures below +12°C (54°F) and should be stored at a temperature at or above +12°C (54°F).

The tank must be insulated and equipped with a heating coil. To avoid any risk of overheating, the heating coil should be heated by circulating hot water controlled with a thermostat. In the event of crystallization inside the tank, increase the heat of the heating coil, and then by convection allow the product to return to its liquid state. MetaSmart® is not damaged by crystallization.

Heater power minimum: 20KW

Vent must exhaust directly into the external atmosphere. Over time, venting directly in the building will produce a persistent unpleasant odor.

Material: High Density Poly Ethylene; STAINLESS 316 L; Derakane 470 36



### IBC

IBCs require a constant recycling system to prevent the temperature in any part of the IBC from falling below +12°C (54°F). The dosing pump can also be used to recycle the liquid in the tank.



If the product is already crystallized in the IBC, thermo housing should be used for defrosting. 40 kWh is necessary to defrost an IBC of MetaSmart®. It is thus necessary to use a heating device with a heating capacity of 5 KW to defrost an IBC in eight hours.

Simply reheat MetaSmart® to return it to the liquid phase. The physical, chemical and nutritional characteristics of MetaSmart® are not affected by crystallization.





## 3/ APPLICATION

### BY METERING

The low conductivity of MetaSmart® (0.5  $\mu\text{S}/\text{cm}$ ) does not allow the use of certain magnetic flow meters. Check compatibility with the supplier of the flow meter. Otherwise, a mass flow meter type Coriolis should be used.

We do not advise using a flow meter if the quantities of MetaSmart® added in feed are highly variable according to the formulation. This can prolong the time of application which can disrupt the blending process. It is important to allow proper time for application and mixing of ingredients.

If application is done by metering, a 5 m<sup>3</sup>/h pump (22 gal / min.) is necessary to ensure product application compatible with the mixing time. Use injectors calibrated for injection into the mixer.

#### Example with a mixture of 4000 kg:

- Quantity of MetaSmart®: 8 to 120 kg
- Time of injection with a flow of 4000 l/h (18 gal / min): 8 to 108 seconds

### BY WEIGHING

(Alone or in a mixture with other liquids)

In this case, the dimensions of the tank and the weigh cell are a function of the capacity of the mixer. The range of the weigh cell will be defined by the minimum and maximum incorporation rates of MetaSmart® or the other liquids to be added during mixing.

### Weighing in conjunction with other raw materials

#### Compatibility with other liquids:

Molasses: physical separation of the products but no chemical reaction

Residuary liquors: physical separation of the products but no chemical reaction

Fat: homogeneous mixture, no apparent chemical reaction.

#### Example: Mixer of 4000 kg

Molasses: 120 Kg

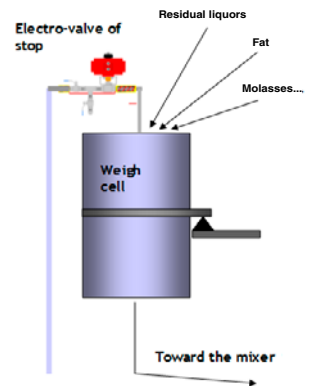
Residuary liquors: 120 Kg

Oil: 40 Kg

**MetaSmart®**

Balance capacity: 400 Kg (10% of the mixer size)

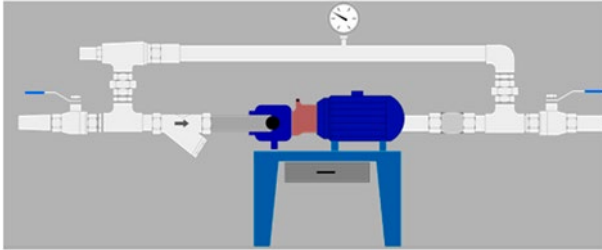
Weighing precision: +/- 0.2 Kg





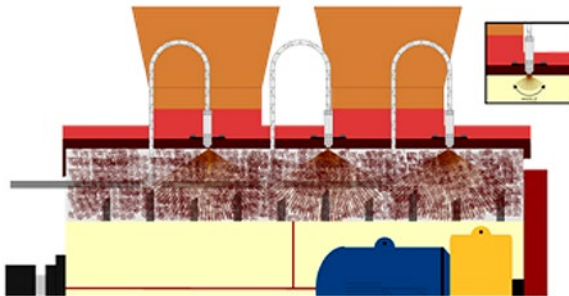
## LIQUID TRANSFER

MetaSmart® is pumped from the tank or the IBC and is transferred toward the mixer for weighing: A traditional positive-displacement pump is necessary. In the case of weighing, a standard gear pump of 4m<sup>3</sup>/h (18 gallons / minute) is sufficient.



The entire liquid application system must be insulated and maintained at +20°C (68°F).

A thermal tracing of piping is the best means to avoid any risk of solidification in the piping. In the event of crystallization, a simple reheating is sufficient to return to the liquid phase.



### Injection of MetaSmart®:

If MetaSmart® is weighed out in a specific hopper, a simple pump is needed to extract the MetaSmart® from the hopper and to spray it into the mixer through nozzles.

In this case, a test should be considered in order to select the best performer: size of droplet, flow, and angle of dispersion. Consider approximately two nozzles per meter length of mixer.

If MetaSmart® is weighed together with other liquids, the existing system can be used. Often liquid additions are done through holes in a manifold. In this case, specific mixers designed to mix feed with high proportion of added liquid are advised.





## 4/ LIQUID FEEDS

Liquid MetaSmart® is stable in liquid feed supplements ranging in pH from 4.0 to 7.5.

Although MetaSmart® has been shown to be chemically stable in liquid feeds, some concern has been raised about homogeneity of liquid feeds which include it.

A recent study investigated the homogeneity of of MetaSmart® Liquid when mixed into several important liquid feedstuffs. It investigated 3 liquid feedstuffs – cane molasses, beet molasses and a vinasse (stillage or fermentation residue), without or with rapeseed oil. Several emulsifiers were also tested.

This test's conclusions were that MetaSmart® Liquid remained more homogeneously mixed in cane molasses than in beet molasses, which in turn was better than vinasse.

Lecimax (a lysolecithin) was the best emulsifier of those tested, particularly when rapeseed oil was added.

An important point is that the mixing technology used can have a great incidence on homogeneity and stability over time. High-pressure in-line mixers in particular seem to give very good results.



## 5/ BASE MIXES/PROTEIN BLENDS

Similarly to liquid feeds, if the pH of the final product is between 4 and 7.5, MetaSmart® stability will be excellent. In fact, good stability has also been observed up to a pH of 9.0 when temperatures do not exceed 25°C (77°F). Degradation will be less than 5% after 14 days in storage and no more than 10% after 28 days. For final products containing a high percentage of “base mix,” this is important as the final pH may well be above 7.5. This is generally due to the inclusion of mineral ingredients such as calcium carbonate, sodium sesquicarbonate and magnesium oxide.

Nevertheless, at temperatures exceeding 25°C (77°F), a finished product pH of between 4 and 7.5 should ensure good stability. At elevated storage temperatures (>100°F), the inclusion of MetaSmart® into feed or supplements with a pH above 7.5 can be detrimental – losses can be >50% after 28 days of storage.





## 6/ PRACTICAL GUIDELINES FOR INCLUSION

1. It is not recommended to include MetaSmart® in any formulation where the end product pH exceeds 9.0.
2. MetaSmart® stability in mixes will be excellent for at least one month in the non-summer months up to a finished product pH of 9.0.
3. Inclusion of ingredients such as soybean, canola and DDGs will help neutralize the higher pH of the base mix ingredients.
4. To reduce losses during the summer months, the pH of the final product containing MetaSmart® should not be below pH 4.0 or above pH 7.5.
5. In the summer, final products with pH between 7.5 and 9.0 should be consumed within 14 days of manufacture and MetaSmart® overage of 20% should be considered.
6. Where applicable, consideration should be given to using dry MetaSmart® directly on farm where it can be included in an on-farm premix and used on a daily basis.



## 7/ MIXING

The mixers most adapted to receiving large quantities of liquids are paddle mixers or ploughshare mixers.

In this case, it is possible to add all liquids by only one outlet.

Mix by injection in a ribbon mixer:

Injection in less than one minute

Rate of incorporation

- 0.45% CV: 1.2 to 2%

- 2.54% CV: 0.7%

There is a risk of clumping when the product is injected cold. To avoid this phenomenon in the mixers, it is preferable to heat the liquids before injection and to clean the most exposed parts of the mixer regularly. The temperature of the liquid to be sprayed must increase if the temperature of the feed decreases. For instance, feed at 25°C (77°F) can handle MetaSmart® at 20°C (68°F), but feed at 5°C (41°F) must receive MetaSmart® at 40°C (104°F).





## 8/ PELLETING

MetaSmart® has a lubricating effect with consequences on pellet quality. Example of protein concentrate:

- Peanut meal 28%
- Canola meal 14%
- Soybean meal 49%
- Molasses 2%
- Corn 5%
- Urea 1%
- Salt 0.5%
- Premix 0.5%

MetaSmart Liquid was added to this mix at rates of 1%, then 2% for the purpose of these tests.

Influence on Durability: - 4 points of durability  
Influences on Hardness: - 3 points of hardness  
(May need to use more compressing dies).

Raising the temperature of feed from 60°C to 65°C (140°F to 149°F) on the die may reduce electric consumption and improve pellet quality (gain in 2 points of hardness).

Limit of incorporation: 2% under known conditions to obtain pellets of good quality.



## 9/ ANALYSES

MetaSmart® can be analyzed in feeds by Adisseo's Carat Laboratory, using HPLC, to assist you in your quality assurance program or feed technology tests. The method used determines both the HMBi and the HMTBa contents of the feed. (Some of the HMBi can be hydrolyzed to HMTBa + isopropanol.)

Once the HMBi and the HMTBa contents have been determined, one can recalculate the total MetaSmart® Liquid or Dry content in the feed with the formulas below and then determine a recovery rate according to the initial target inclusion rate of MetaSmart® Liquid or MetaSmart® Dry.

- MetaSmart® Liquid in feed =  $([HMBi]/0.95) + ([HMTBa]/0.78/0.95)$
- MetaSmart® Dry in feed =  $([HMBi]/0.57) + ([HMTBa]/0.78/0.57)$ ,

Where [HMBi] and [HMTBa] are the measured concentrations of HMBi and HMTBa in the feed.

MetaSmart Liquid contains 95% HMBi.

MetaSmart Dry contains 57% HMBi.

HMBi contains 78% HMTBa and 22% isopropanol.





## 10/ MAIN SAFETY DATA - METASMART® DRY

### Hazard Identification:

Not classified as a “hazardous preparation.”

In use, may form flammable/explosive dust-air mixture.

By precaution, if material is pneumatically transferred a proven bonding and grounding system should be utilized.

Keep away from strong oxidizing agents and acids.

### PPE

### Recommended:



### First aid measures:

As a general rule, in case of doubt or if symptoms persist, always call a doctor.

- Exposure by inhalation: If inhaled, move the patient into the fresh air and keep warm and at rest.
- Contact with eyes: wash thoroughly with soft, clean water for 15 minutes holding the eyelids open.
- Contact with skin: wash skin thoroughly with soap and water or a recognized cleaner.
- Swallowing: do not force vomiting. Seek medical attention, showing the label.

### Packaging:

Always keep in packaging made of an identical material to the original.

### Firefighting measures:

Non-flammable.

In the event of a fire, immediate and rapid evacuation is necessary.

### Extinguishing media:

Suitable:

- sprayed water or water mist
- foam
- powder
- carbon dioxide (CO<sub>2</sub>)

Not Suitable:

- Water jet



**Special hazards arising from the substance or mixture:**

Combustion may release toxic gases (carbon monoxide, carbon dioxide, sulphur dioxide).

Due to the toxicity of the gas emitted on thermal decomposition of the products, firefighting personnel are to be equipped with autonomous insulating breathing apparatus.

**Accidental release measures:**

Retrieve the product by mechanical means (sweeping/vacuuming): do not generate dust.

Recycle or dispose of waste in compliance with current legislation, preferably via a certified collector or company.

**Environmental protection:**

Do not pour into drains and waterways.

Soluble in water.

The substance is considered as not degrading quickly. Not potentially bio accumulative.

This preparation does not present any particular risk to the environment.

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For further information, please refer to the **Material Safety Data Sheets (MSDS)**.

European MSDS available in the website QuickFDS.

Please find in this link guidelines to consult them:

<https://plm.adisseo.com/share/s/81qZVtlwTQ54GtFL9Usm5w>

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If needed:

CareChem 24: 24 hours international emergency (phone number available in MSDS).

Carechem 24 will provide rapid access to information about the hazards of MetaSmart® Dry in addition to expert advice on appropriate response actions to protect your employees, the public and the environment.





## 10/ MAIN SAFETY DATA - METASMART® LIQUID

### Hazard Identification:

Not classified as a “hazardous preparation.”

In use, may form flammable/explosive dust-air mixture.

Keep away from strong oxidizing agents and acids.

### First aid measures:

As a general rule, in case of doubt or if symptoms persist, always call a doctor.

- Exposure by inhalation: move victim to the open air.
- Contact with eyes: wash thoroughly with soft, clean water for 15 minutes holding the eyelids open.
- Contact with skin: wash skin immediately and thoroughly with water.
- Swallowing: do not force vomiting. Seek medical attention, showing the label.

### Packaging:

Suitable packaging materials:

- Coated steel
- Stainless steel
- IBC plastic container
- PEHD tank

### Firefighting measures:

Non-flammable.

In the event of a fire, immediate and rapid evacuation is necessary.

### Extinguishing media:

Suitable:

- sprayed water or water mist
- foam
- powder
- carbon dioxide (CO<sub>2</sub>)

### PPE Recommended:



**Special hazards arising from the substance or mixture:**

Combustion may release toxic gases (carbon monoxide, carbon dioxide, sulphur dioxide).

Due to the toxicity of the gas emitted on thermal decomposition of the products, firefighting personnel are to be equipped with autonomous insulating breathing apparatus.

**Accidental release measures:**

Contain and control the leaks or spills with non-combustible absorbent materials such as sand, earth, vermiculite, diatomaceous earth...

Recycle or dispose of waste in compliance with current legislation, preferably via a certified collector or company.

**Environmental protection:**

Do not pour into drains and waterways.

Dilutable in water (20g/l – 30°C). Soluble in standard organic solvents.

Easily biodegradable (84% after 28 days). Not potentially bio accumulable.

This preparation does not present any particular risk to the environment.

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For further information, please refer to the **Material Safety Data Sheets (MSDS)**.

European MSDS available in the website QuickFDS.

Please find in this link guidelines to consult them:

<https://plm.adisseo.com/share/s/81qzVtlwTQ54GtFL9Usm5w>

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If needed:

CareChem 24: 24 hours International emergency (phone number available in MSDS).

CareChem 24 will provide rapid access to information about the hazards of MetaSmart® Liquid in addition to expert advice on appropriate response actions to protect your employees, the public and the environment.







## 11/ IMPORTANT CONTACT INFORMATION

**CareChem24 International (Emergency/HAZMAT Services):**  
See the Material Safety Data Sheet (MSDS) for your country



## NOTES:

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# MetaSmart<sup>®</sup>

## USERS' GUIDE

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