

MS Dilufert

OPTIMAL SEMEN DILUENTS FOR PROLIFIC RESULTS



MS Schippers

Passion for Farming





Passion for Farming

At Schippers, we continuously develop products and services which allow the farmer to "improve farming". As a result, Schippers holds an increasingly strong position on the international market with its 350 employees, 10,000 products and 12 offices.

The growth over the past years made us realise that the opportunities are unprecedented. We are more ambitious than ever and deploy every possible method to let our farmers farm even better.

We have had a great "Passion for Farming" for 50 years now. By using the slogan Passion for farming, the Schippers family clearly shows what the firm stands for. We serve livestock farmers and go to great lengths for it.

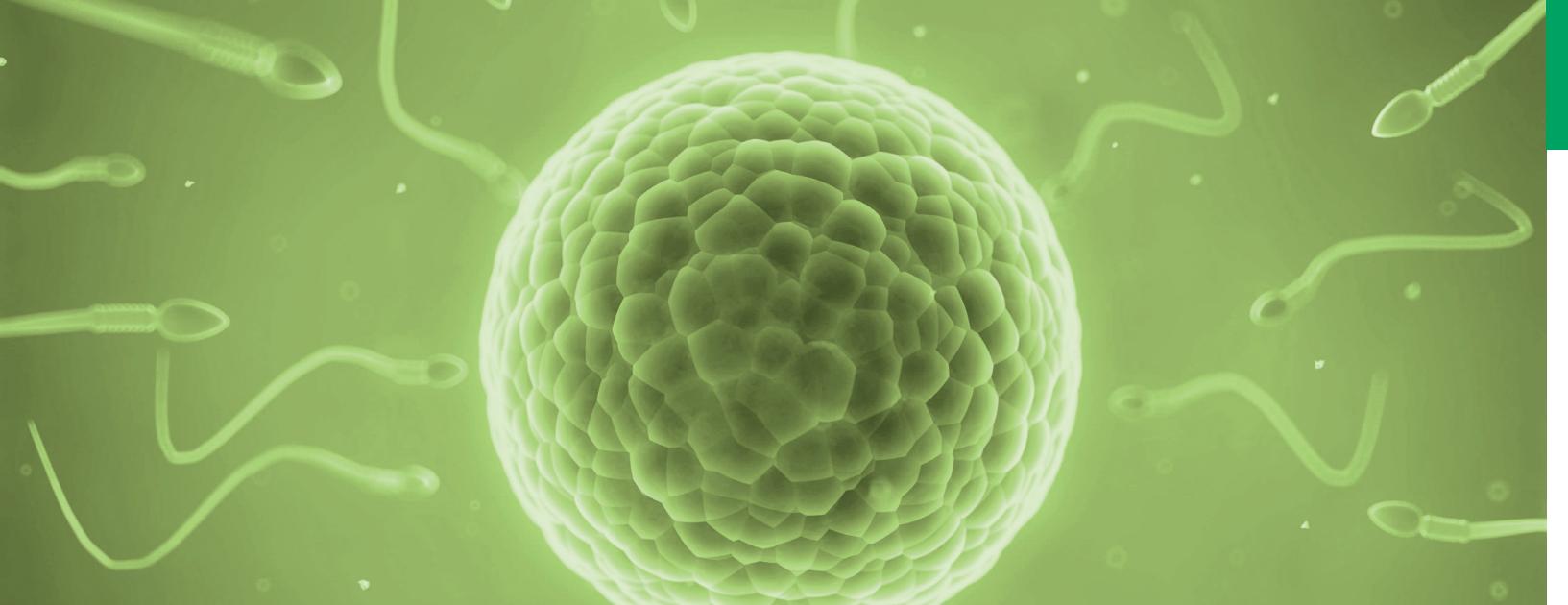
Schippers has a broad and deep range of products. Our field organisation talks to livestock farmers on a daily basis and is supported by several product specialists. There is much exchange of information, both on a national and an international level. In addition, various partnerships with institutes and universities ensure that the current lead in knowledge is maintained.

Quality systems such as GMP, ISO, QS, as well as other recognitions form a guarantee for clients that equals good and uniform quality. Traceability is crucial in that respect.



MS Dilufert is developed in cooperation with





BOAR SEMEN | BIOLOGICAL DATA

Boar semen is composed of spermatozoa and seminal plasma.

Spermatozoa are male reproductive cells, whereas seminal plasma allows transport of spermatozoa. Its components protect spermatozoa metabolism and motility. Some substances in seminal plasma play an essential role in preparing sperm for insemination. Seminal plasma serves as a buffer, and is an optimal osmotic and nutritive medium for spermatozoa.



Spermatozoa:

The sperm cell membrane

Seminal Plasma:

The proteins in seminal plasma are responsible for:

- Protecting sperm from damage
- Maintaining sperm longevity
- Sperm capacitation and fertilization

The sperm cell membrane provides boar semen with its unique structure

Boar semen is characterized by the following parameters which are important for boar fertility:

- Sperm volume: mean sperm volume is 250 ml with wide variations (100-1200 ml)
- Sperm concentration: average 100-300 mln / ml
- Sperm pH: Slightly alkaline at 6,7-7,6 (depending on the boar) within this pH range, most enzymes in sperm have the highest level of activity
- Osmotic pressure: near 300 mOsm; under these conditions, maximum metabolic activity is observed.

Boar semen cell membrane

The cell membrane of a boar's spermatozoon is unique due to its specific lipid composition. High content of unsaturated fatty acids makes them very susceptible to oxidation processes. That is why the best storage temperature of extended boar semen is about 15-17°C. Storage at lower temperatures is harmful and freezing of boar semen is impossible in the absence of special cryoprotectants.



BASIC COMPOSITION OF EXTENDERS

Each extender is composed of:

- A nutrient medium for sperm
- An osmotic pressure regulator
- A buffering agent
- A pH regulator
- A metal ion chelator
- Antibiotics

This basic composition of extenders maintains viability of spermatozoa (which are stored outside the male reproductive tract) by maintaining critical parameters like pH, osmolarity, and conductivity.



The ideal environment for spermatozoa

pH

Ensuring that the extender has a suitable pH is vital for the survival of sperm. The pH of fresh boar semen is about 6,9-7,6. the pH of our extenders is guaranteed to fall within the natural pH range of boar semen. In the recipe, we use appropriate extender buffer systems: this allows the pH to be maintained within the appropriate limits, with no toxic effect on sperm during their storage and metabolization (there is no acidification of the solvent). Ensuring that the appropriate pH is maintained for as long as possible is for the survival of sperm.

Osmolarity

Boar semen is characterized by the osmolarity of 290-300 mOsm and shows a fairly wide tolerance on changes (240-380 mOsm). Our extenders provide adequate and optimal osmolarity for survival and functionality of sperm cells - about 300 mOsm. This osmotic pressure is provided by the relevant share of the spermatozoa and removes toxins.

Conductivity

This is a parameter that allows assessment of the appropriate ion content in the solution. Changing the solution's conductivity is related to changes in solute concentration. Measuring the conductivity therefore enables the extender quality to be assessed.

Functionality

Functionality tests are carried out at an insemination station for every batch of extender. Our extenders are compared directly with competing products on the market. Results indicate that our extenders fulfil the highest biological quality.

PROTECTING THE SPERM CELL MEMBRANE

Boar sperm viability decreases with increasing storage time in all types of extender. During storage, boar semen may incur several changes including reduced motility, reduced viability and changes in the cell membrane's permeability. Boar sperm seems to be particularly sensitive to oxidative damage due to the relatively high content of polyunsaturated fatty acids in membrane phospholipids, and low antioxidant capacity of boar seminal plasma.

Excessive formation of reactive oxygen species by sperm during storage (after dissolution) is associated with the decrease in their functionality. The consequences of lipid peroxidation are:

- Sperm membrane damage
- Inhibition of respiration
- Leakage of intracellular enzymes

Boar sperm sensitivity to oxidative damage

High content of polyunsaturated fatty acids in membrane phospholipids

Low antioxidant capacity of boar seminal plasma

Protecting the genetic material

The task of spermatozoa is to fertilize ovum. For effective fertilization the genetic material must be intact. Free radicals can damage the sperm cell membrane and its DNA. Using antioxidants is therefore important to ensure the integrity of DNA. Sperm DNA damage occurs very frequently during the freezing / thawing of semen.

Therefore, our extenders are designed to protect the sperm at the optimum temperature of 15-17°C and thereby ensure the highest genetic quality of semen.

The consequences of sperm DNA damage:

- Reduced capability to bind to the oviduct epithelium
- Male subfertility
- Very low fertilization potential
- Hyperstability



Why is it important to use antibiotics?

Antibiotics are necessary in extenders because factors such as storage temperature (15-17°C), and components such as glucose contribute to the growth of bacteria (including *E. coli*, *Salmonella* and *Pseudomonas* species). In fact, the main source of bacteria is the boar itself. Broad-spectrum antibiotics provide protection against infection. It is important for the survival of spermatozoa, since bacteria growing in the extender can significantly shorten the life of reproductive cells: the toxin they produce can change the parameters of the extender (pH, osmolarity). Scientists have also observed a greater degree of sperm agglutination correlated with bacterial infections. Using antibiotics is therefore necessary, especially because the diluted semen is usually stored in 17°C, and this temperature is high enough to promote the growth of microorganisms.

Our extenders use different antibiotics to prevent the bacteria's immunization.



MS DILUFERT

MS Dilufert is a high quality boar Semen Diluent with excellent properties for optimal insemination under various circumstances.

MS Dilufert is available in two versions and a range of pack sizes. Both versions and their specific properties are shown in the table below.

The main differences between boar Semen Diluents are:

- The presence of **antioxidants**. These protect the cell membranes against oxidation.
- The **protective substance**. This makes the nutrients in the Diluent more readily available for spermatozoa.
- The quantity and the spectrum of **antibiotics**. These prevent bacterial growth.

	Storage period: (days)	Anti-bacterial function: Antibiotics	Optimal storage temperature (°C)	Dissolution rate	Anti-oxidation	Stability
MS Dilufert SILVER	3-4	+	16-18	+++	+	++
MS Dilufert GOLD	6-7	+++	15-20	++	+++	+++

- The Storage Period is the number of days the diluted semen maintains optimum fertility. It is recommended to inseminate within this period.
- The improved fertility level can result in between 0.2 and 1 piglets born.
- The recommended storage temperature for diluted boar semen is 17 degrees Celsius although Dilufert Gold contains proteins that protect the sperms against temperature shock.
- Protein Protection is a mix of proteins which surround the sperm cells. It contains a metal ion binder which protects against metal, toxins and various other harmful substances.
- During storage, sperm cells have a tendency to clump together. Dilufert's added protection prevents this from happening to a large extent.



MS DILUFERT SILVER

High-quality diluter for the dilution and conservation of boar sperm for up to 4 days

- Excellent solubility
- Optimum nutrition for semen
- Balanced mix of 2 types of antibiotics
- Can be kept for up to 4 days
- Storage temperature dilution 16-18°C
- Contains NO animal products
- Prevent agglutination of the sperm cells

By using balanced ingredients, Dilufert Silver forms a nutritional base for the semen. By adding anhydrous glucose, the sperm retains its high quality and is kept very stable. This can be observed well under the microscope.

Dilufert Silver is available in packages of 1, 5, 25 and 100 litres



For an optimum result

- store Dilufert dry and out of direct sunlight at a temperature of 6-25°C
- use MS Dilufert Silver only in optimum hygiene and with the best health conditions

5 REASONS TO TRY DILUFERT SILVER



- STEP 1**
MS Dilufert Silver is the perfect nutritional base to conserve diluted semen for up to 4 days.
- STEP 2**
Dilufert Silver is tested and produced under very high-quality conditions. Dilufert Silver complies with the EC 90/429/EEC standard. Each batch is carefully checked using Computer Assisted Sperm Analyzer (CASA).
- STEP 3**
MS Dilufert creates an ideal environment for spermatozoa:
 - A medium for the preservation of spermatozoa (high quality sugars)
 - An osmotic pressure regulator (salts)
 - A pH buffer system
 - A pH regulator
 - A metal ion binder
 - Antibiotics
- STEP 4**
In the composition of MS Dilufert, particular attention was paid to keeping the female reproductive tract safe and hygienic. MS Dilufert does not contain any animal proteins (for example BSA) which are potential sources of infectious diseases.
- STEP 5**
Prevents agglutination

In the composition of MS Dilufert, particular attention was paid to keeping the female reproductive tract safe and hygienic. MS Dilufert does not contain any animal proteins (for example BSA) which are potential sources of infectious diseases.



MS DILUFERT GOLD

High-quality diluter for the dilution and conservation of boar semen for up to 7 days

- Excellent solubility
- Optimum nutrition for semen
- Balanced mix of 3 types of antibiotics
- Can be kept up to 7 days
- Contains Antioxidant to retain sperm quality
- Storage temperature dilution 15-20°C
- Contains NO animal products
- Prevents agglutination of the sperm cells
- Antioxidants protect the cell membrane against oxidation

MS Dilufert Gold is
the ideal nutritional base
to conserve diluted sperm
for up to 7 days

By using balanced ingredients, Dilufert Gold forms a nutritional base for the semen. By adding anhydrous glucose, the sperm retains its high quality and is kept very stable. This can be observed well under the microscope.

Dilufert Gold is available in packages of 1, 5, 25 and 100 litres



For optimal result ...

- store Dilufert dry and out of direct sunlight at a temperature of 6-25°C
- use MS Dilufert Gold only in optimum hygiene and with the best health conditions

MOTILITY OF THE DIFFERENT SPERM DILUTERS

Boar semen undergoes a number of changes during storage, namely:

- Reduced sperm motility
- Reduced viability
- Change in permeability of the cell membrane

The graph below shows motility of the different sperm diluters shown at a storage time of 1 to 10 days:



Boar semen is very sensitive to oxidative stress due to a high level of polyunsaturated fatty acids in the cell membranes and the low anti-oxidative capacity of its plasma.

Some consequences of oxidative stress are:

- Damage to the sperm membranes; the absorption or abstraction of water caused by changes in osmotic pressure can result in the sperm cells exploding or imploding.
- Inhibition of breathing. Deoxidation through the formation of reactive oxides.
- Damage to proteins, fats and the DNA.
- Oxidative stress to the mitochondrial membrane structure disrupts the motility and consequently the fertilization capacity.

Prevent any possible damage to the sperm with MS Dilufert!



HOW TO USE DILUTERS

Dosage: Use one liter of demineralized water per bag of Dilufert

- 1 STEP
- 2 STEP
- 3 STEP
- 4 STEP
- 5 STEP

Prepare a pre-solution of 400 ml with heated demineralized water (**32°C**)

Add the bag contents

Now add the remaining 600 ml of heated demineralized water (**32°C**)

Stir again after 5 minutes

After 45 minutes you will achieve a full chemical solution





QUALITY CONTROL

Dilufert is tested and produced under very high quality conditions. Dilufert Silver complies with the EC 90/429/EEC standard. Each batch is carefully checked using Computer Assisted Sperm Analyzer (CASA).

Diluents perform the vital function of ensuring that the spermatozoa remain alive outside of the male reproductive system. This is consistently achieved by monitoring the following critical parameters:

Temperature

Boars have a unique sperm cell membrane, which is very sensitive to oxidation because of its high content of unsaturated fatty acids. That's why diluted semen is best stored at a temperature of 15-17 °C. Storage at lower temperatures is harmful for the diluted semen.

pH level

The correct pH level is crucial for spermatozoa. MS Dilufert's Buffer System provides the natural pH level of fresh boar semen (6.9 to 7.6, dependant on the boar) whilst avoiding any toxic effects on the spermatozoa during storage.

Osmolarity

Boar sperm has an osmolarity of 290 - 300 mOsm, with a fairly high tolerance of 240 to 380 mOsm. The osmotic pressure is brought to the desired level with the addition of just the right quantity of ions. Additionally, these ions take care of the transport of nutrients and the removal of toxins.

Conductivity

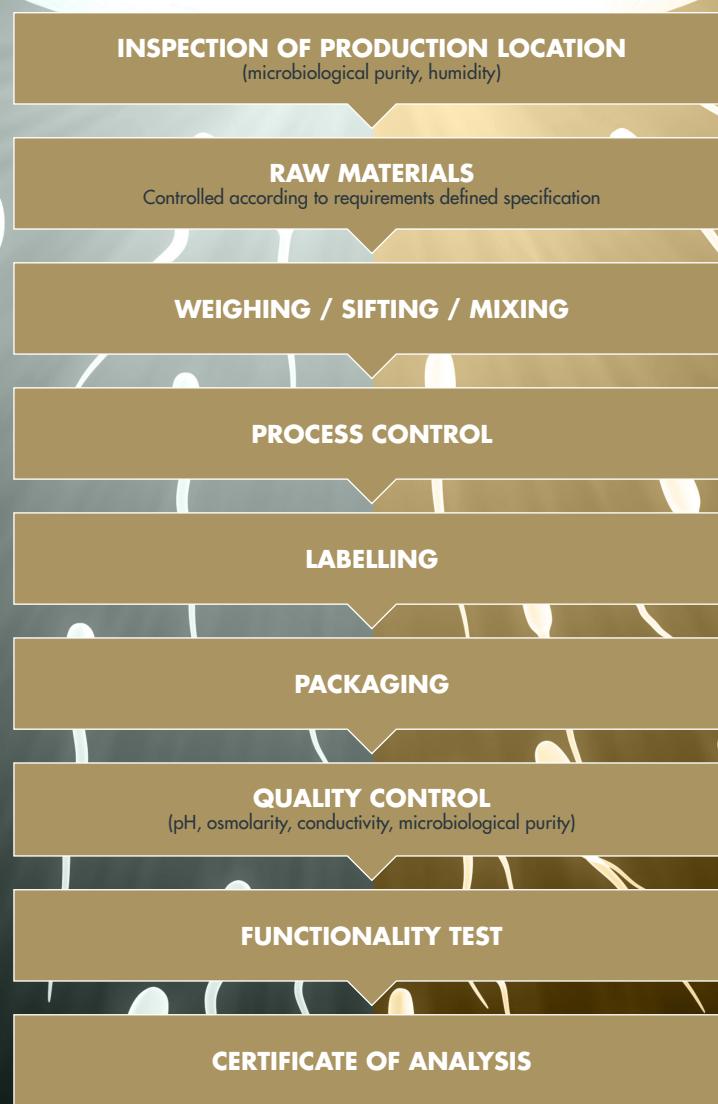
The conductivity, assessed using an accurate conductivity meter, is a measure of the number of ions in the solution. On average, one millilitre of solution contains 100-300 million ions.

Each delivered batch will be checked against these parameters, so that the highest possible quality can be guaranteed. Results show that MS Dilufert complies with the highest biological quality.

PRODUCTION AND CONTROL PROCESS

- Dilufert is carried out according to pharmaceutical GMP principles;
- We meticulously control microbiological purity;
- Qualified personnel are responsible for production and quality control of the final product;
- Raw materials are checked according to defined specification requirements to ensure the highest quality;
- Quality is assessed according to:
 - Packaging: visual appearance, weight, lot number, expiry date,
 - Physico-chemical tests: appearance of powder and solution, pH, osmolarity, conductivity, microbiological purity,
 - Functionality, which is tested for every batch and carried out at an insemination station,
 - Archived samples from each batch.
- New formulations are developed based on the latest scientific studies.

MANUFACTURING SCHEDULE



MS Dilufert

The Dilufert range is developed and produced in the Netherlands!





MS Dilufert

GOLD

SILVER

Storage period: (days)	6-7 days	3-4 days
Optimal storage temperature	15-20°C	16-18 °C
Anti-bacterial function: Antibiotics	+++	+
Anti-oxidation	+++	+
Dissolution rate	++	+++
Stability	+++	++
Number of different antibiotics mixed	3	2

MS Schippers
Passion for Farming

MS Schippers Export

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