

## **SUMMARY OF PRODUCT CHARACTERISTICS**

## 1. NAME OF THE VETERINARY MEDICINAL PRODUCT

**ANESKETIN** 100 mg/ml solution for injection for dogs, cats and horses (DE, ES, NL, UK(NI))

Anesketin (DK)

Anesketin 100 mg/ml solution for injection (FR)

**NIMATEK** 100 mg/ml solution for injection for dogs, cats and horses (BE)

## 2. QUALITATIVE AND QUANTITATIVE COMPOSITION

1 ml contains:

### Active substance:

100 mg ketamine equivalent to 115.4 mg ketamine hydrochloride

### Excipients:

Qualitative composition of excipients and other constituents	Quantitative composition if that information is essential for proper administration of the veterinary medicinal product
Chlorocresol	1 mg
Sodium hydroxide	
Hydrochloric acid	
Water for injections	

Clear, colourless solution free from visible particles.

## 3. CLINICAL INFORMATION

### 3.1 Target species

Dogs, cats and horses.

### 3.2 Indications for use for each target species

To be used as a sole agent for restraint and minor surgical procedures in the cat, where muscle relaxation is not required.

To be used to induce anaesthesia:

- a) in combination with butorphanol and medetomidine in the dog and cat,
- b) in combination with xylazine in the horse, dog and cat,
- c) in combination with detomidine in the horse,
- d) in combination with romifidine in the horse.

### 3.3 Contraindications

Do not use:

- in animals with hepatic or renal failure.
- ketamine as a sole agent in the horse or the dog.
- in animals with severe cardiac de-compensation, suspected pulmonary disease, apparent high blood pressure or cerebrovascular insults.
- in animals with eclampsia, pre-eclampsia, glaucoma and seizure disorders (e.g. epilepsy).
- for surgical intervention on pharynx, larynx, trachea or bronchial tree, if sufficient relaxation is not ensured by administration of a muscle relaxant (intubation obligatory).
- in animals undergoing a myelogram procedure.

- in cases of head trauma and increased intracerebral pressure.

Do not use in cases of hypersensitivity to the active substance or to any of the excipients.

### **3.4 Special warnings**

For very painful and major surgical interventions, as well as for maintenance of anaesthesia, a combination with injectable or inhalation anaesthetics is necessary. As muscle relaxation required for surgical procedures cannot be achieved with ketamine alone, additional muscle relaxants should be used concomitantly. For improvement of anaesthesia or prolongation of effect ketamine can be combined with  $\alpha_2$ -receptor-agonists, anaesthetics, neuroleptanalgesics, tranquillisers and inhalational anaesthetic agents. It should be noted that time-to-full-effect may be prolonged when using the subcutaneous administration route in cats. A small proportion of animals have been reported to be unresponsive to ketamine as an anaesthetic agent at normal dosages.

### **3.5 Special precautions for use**

#### Special precautions for safe use in the target species:

Use of premedicants should be followed by a suitable reduction in dosage.

Induction and recovery should be allowed to occur in quiet and calm surroundings.

As for all anaesthetics, animals should be fasted for 12 hours before ketamine anaesthesia.

Atropine premedication may reduce salivation in cats.

In the cat and dog, the eyes remain open and the pupils dilated. The eyes may be protected by covering with a damp gauze swab or using appropriate ointments.

When used in combination with other products, consult the contraindications and warnings that appear on the Summaries of Product Characteristics.

Ketamine may exhibit pro-convulsant or anti-convulsant properties and should therefore be used with caution in epileptic animals.

#### Special precautions to be taken by the person administering the veterinary medicinal product to animals:

This is a potent drug. Particular care should be taken to avoid accidental self-administration.

People with known hypersensitivity to ketamine or any of the excipients should avoid contact with the veterinary medicinal product.

Avoid contact with the skin and eyes. Wash any splashes from skin and eyes immediately with large amounts of water.

Adverse effects on the foetus cannot be excluded. The veterinary medicinal product should not be administered by pregnant women.

In case of accidental self-injection, or if symptoms occur after ocular/oral contact, seek medical advice immediately and show the package leaflet or the label to the physician, but DO NOT DRIVE.

Advice to doctors:

Do not leave patient unattended. Maintain airways and give symptomatic and supportive treatment.

#### Special precautions for the protection of the environment:

Not applicable.

### 3.6 Adverse events

Dogs:

Rare (1 to 10 animals / 10,000 animals treated):	Hypertonia (of skeletal muscles). Ataxia, hyperaesthesia, excitation (as emergence reactions during recovery). Pulmonary oedema.
Very rare (<1 animal / 10,000 animals treated, including isolated reports):	Hyperthermia.
Undetermined frequency (cannot be estimated from the available data):	Increased heart rate, increased arterial blood pressure/hypertension (with concurrent increased bleeding tendency). Eyes remain open with mydriasis and nystagmus. Injection site pain (on intramuscular injection). Respiratory depression <sup>a</sup>

<sup>a</sup> Dose-related, may lead to respiratory arrest particularly in cats. Combination with respiratory depressant products may increase this respiratory effect.

Cats:

Rare (1 to 10 animals / 10,000 animals treated):	Hypertonia (of skeletal muscles). Ataxia, hyperaesthesia, excitation (as emergence reactions during recovery). Pulmonary oedema.
Very rare (<1 animal / 10,000 animals treated, including isolated reports):	Hyperthermia. Hypersalivation.
Undetermined frequency (cannot be estimated from the available data):	Increased heart rate, increased arterial blood pressure/hypertension (with concurrent increased bleeding tendency). Eyes remain open with mydriasis and nystagmus. Injection site pain (on intramuscular injection). Respiratory depression <sup>a</sup> Twitching (muscle tremor), tonic seizures (mild) <sup>b</sup> .

<sup>a</sup> Dose-related, may lead to respiratory arrest particularly in cats. Combination with respiratory depressant products may increase this respiratory effect.

<sup>b</sup> These subside spontaneously but may be prevented by use of acepromazine or xylazine premedication, or controlled by use of acepromazine or ultra-short acting barbiturates in low doses.

## Horses:

Rare (1 to 10 animals / 10,000 animals treated):	Hypertonia (of skeletal muscles). Ataxia, hyperaesthesia, excitation (as emergence reactions during recovery). Pulmonary oedema.
Undetermined frequency (cannot be estimated from the available data):	Increased heart rate, increased arterial blood pressure/hypertension (with concurrent increased bleeding tendency). Injection site pain (on intramuscular injection). Respiratory depression <sup>a</sup>

<sup>a</sup> Dose-related, may lead to respiratory arrest particularly in cats. Combination with respiratory depressant products may increase this respiratory effect.

Reporting adverse events is important. It allows continuous safety monitoring of a veterinary medicinal product. Reports should be sent, preferably via a veterinarian, to either the marketing authorisation holder or its local representative or the national competent authority via the national reporting system. See also the last section of the package leaflet for respective contact details.

### 3.7 Use during pregnancy, lactation or lay

#### Pregnancy and lactation:

Ketamine passes the blood placenta barrier very well, entering the foetal blood circulation by which 75 to 100% of the maternal blood levels can be reached; this partially anaesthetises neonates when delivered by Caesarean section. The use of ketamine prior to caesarean section is recommended only according to risk/benefit analysis of the responsible veterinary surgeon.

The safety of the veterinary medicinal product has not been established during pregnancy and lactation. Use only according to the benefit/risk assessment by the responsible veterinarian.

### 3.8 Interaction with other medicinal products and other forms of interaction

Care should be taken when using ketamine-halothane combinations since the half-life of ketamine is prolonged by halothane.

Potential for increased risk for arrhythmias when used in combination with thiopental or halothane.

Simultaneously administered intravenous spasmolytics can provoke a collapse.

Theophylline, when given with ketamine, can cause an increased incidence of seizures.

Neuroleptanalgesics, tranquillisers, morphine analogues, cimetidine and chloramphenicol potentiate ketamine anaesthesia. Barbiturates and opiates or diazepam can prolong the recovery period. Effects may be cumulative; dosage reduction of one or both agents may be required.

The use of detomidine in combination with ketamine gives a slow recuperation.

Ketamine has been reported to enhance the occurrence of tachycardia and hypertension when used in human patients receiving thyroid hormones.

### 3.9 Administration routes and dosage

For administration by intramuscular, subcutaneous or intravenous injection.

For combination use: before ketamine is administered, please ensure that the animals are adequately sedated. It should be noted that dosages and routes of administration vary widely between species.

Furthermore, the effect of ketamine may show large inter-individual differences and therefore, individual dosage accommodation is recommended.

To ensure a correct dosage, body weight should be determined as accurately as possible.

### DOG:

Ketamine cannot be used as a mono-anaesthetic in dogs, as it causes an increased muscle tone and uncoordinated muscle contractions.

### Xylazine/ketamine:

Administer xylazine at a dose rate of 1 mg/kg by intramuscular injection (corresponding to 0.5 ml/10 kg body weight of xylazine 2% solution). Immediately administer ketamine at a dose rate of 15 mg/kg by intramuscular injection (corresponding to 1.5 ml/10 kg body weight).

Dogs become recumbent in approximately 3 minutes and lose their pedal reflex in approximately 7 minutes. Duration of anaesthesia is approximately 24 minutes, the pedal reflex returning about 30 minutes following administration of the ketamine injection.

**Table 1: Xylazine and ketamine 100 mg/ml canine anaesthesia (IM)**

Weight of dog (kg)	1	3	5	10	15	20	25	30	40
Xylazine 2% dose (ml)*	0.05	0.15	0.25	0.50	0.75	1.00	1.25	1.50	2.00
Ketamine (100 mg/ml) dose (ml)**	0.15	0.45	0.75	1.50	2.25	3.00	3.75	4.50	6.00

\* based on a dose rate of 1 mg xylazine/kg body weight

\*\* based on a dose rate of 15 mg ketamine/kg body weight

### Medetomidine/ketamine:

Administer medetomidine at a dose rate of 40 µg/kg (corresponding to 0.40 ml/10 kg body weight of medetomidine 1 mg/ml solution) and ketamine at 5.0-7.5 mg/kg (corresponding to 0.5-0.75 ml/10 kg body weight), depending on duration of anaesthesia required, by intramuscular injection.

Loss of pedal reflex occurs approximately 11 minutes following injection at 5 mg ketamine/kg and 7 minutes following injection at 7.5 mg ketamine/kg. Duration of anaesthesia is approximately 30 and 50 minutes respectively.

**It is NOT advisable to reverse this combination in the dog with atipamezole.**

**Table 2: Medetomidine and ketamine canine anaesthesia (IM): Dosage chart for 5 mg ketamine/kg (duration of anaesthesia approximately 30 minutes)**

Weight of dog (kg)	1	3	5	10	15	20	25	30	40
Medetomidine (1 mg/ml) dose (ml)*	0.04	0.12	0.20	0.40	0.60	0.80	1.00	1.20	1.60
Ketamine (100 mg/ml) dose (ml)**	0.05	0.15	0.25	0.50	0.75	1.00	1.25	1.50	2.00

\* based on a dose rate of 40 µg medetomidine/kg body weight

\*\* based on a dose rate of 5 mg ketamine/kg body weight

**Table 3: Medetomidine and ketamine canine anaesthesia (IM): Dosage chart for 7.5 mg ketamine/kg (duration of anaesthesia approximately 50 minutes)**

Weight of dog (kg)	1	3	5	10	15	20	25	30	40
Medetomidine (1 mg/ml) dose (ml)*	0.04	0.12	0.20	0.40	0.60	0.80	1.00	1.20	1.60
Ketamine (100 mg/ml) dose (ml)**	0.08	0.23	0.38	0.75	1.13	1.50	1.88	2.25	3.00

\* based on a dose rate of 40 µg medetomidine/kg body weight

\*\* based on a dose rate of 7.5 mg ketamine/kg body weight

### Butorphanol/medetomidine/ketamine:

Administer butorphanol at 0.1 mg/kg and medetomidine at 25 µg/kg by intramuscular injection.

Dogs become recumbent in approximately 6 minutes and lose their pedal reflex in approximately 14 minutes.

Ketamine injection should be administered 15 minutes following the first injection at a dose rate of 5 mg/kg by intramuscular injection (corresponding to 0.5 ml/10 kg body weight). The pedal reflex returns approximately 53 minutes following administration of the ketamine 100 mg/ml injection. Sternal recumbency is attained approximately 35 minutes later followed by standing a further 36 minutes later.

**It is NOT advisable to reverse this combination in the dog with atipamezole.**

**Table 4: Butorphanol, medetomidine and ketamine canine anaesthesia (IM)**

Weight of dog (kg)	1	3	5	10	15	20	25	30	40
Butorphanol (10 mg/ml) dose (ml)*	0.01	0.03	0.05	0.10	0.15	0.20	0.25	0.30	0.40
Medetomidine (1 mg/ml) dose (ml)**	0.03	0.08	0.13	0.25	0.38	0.50	0.63	0.75	1.00
<b>Administer butorphanol and medetomidine by intramuscular injection at the above dose rates</b>									
<b>Wait 15 minutes before administering ketamine by intramuscular injection at the dose rates below</b>									
Ketamine (100 mg/ml) dose (ml)***	0.05	0.15	0.25	0.50	0.75	1.00	1.25	1.50	2.00

\* based on a dose rate of 0.1 mg butorphanol/kg body weight

\*\* based on a dose rate of 25 µg medetomidine/kg body weight

\*\*\* based on a dose rate of 5 mg ketamine/kg body weight

#### CAT:

##### Ketamine as a sole agent:

Mono-anaesthetic use of ketamine is possible, but to avoid undesired psychomotoric effects combined anaesthesia is recommended. Ketamine on its own may be used by intravenous or subcutaneous injection, but intramuscular injection is the recommended route. The dose is 11-33 mg ketamine/kg depending on the degree of restraint or surgical interference that is intended. The following dosages are indicated as a guide but may need to be adjusted depending on the physical condition of the patient and the usage of sedatives and premedicants.

<i>Dose (mg/kg)</i>	<i>Clinical procedures</i>
11 (0.11 ml/kg)	Minor restraint
22-33 (0.22-0.33 ml/kg)	Minor surgery and restraint of fractious cats

Duration of ketamine anaesthesia is 20-40 minutes and recovery takes place over a 1-4 hour period. For major surgery, ketamine should be used in conjunction with supplemental sedatives or anaesthetics. Dosage varies from 1.25-22 mg/kg (0.06-1.1 ml/5 kg) depending on the combination and route of administration used.

Vomiting is unlikely to occur when ketamine is used alone, however, cats should be starved for several hours prior to anaesthesia where possible.

##### Ketamine supplementary combinations in the cat:

Atropine premedication is generally recommended at 0.05 mg/kg to reduce salivation. In addition, acepromazine (0.2% solution) at a dose rate of 0.11 mg/kg (corresponding to 0.28 ml/5 kg body weight) can be administered by intramuscular injection, as premedicant. Endotracheal intubation can be achieved during ketamine anaesthesia. Inhalation anaesthesia may be maintained by suitable combinations of methoxyflurane, halothane, nitrous oxide and oxygen.

##### Xylazine/ketamine:

Administer xylazine at a dose rate of 1.1 mg/kg (corresponding to 0.28 ml/5 kg body weight of xylazine 2% solution) and atropine at a dose rate of 0.03 mg/kg (corresponding to 0.25 ml/5 kg body weight of atropine 0.06% solution) by intramuscular injection. Wait 20 minutes and then administer ketamine at a dose rate of 22 mg/kg (corresponding to 1.1 ml/5 kg body weight) by intramuscular injection.

Xylazine may induce vomiting up to 20 minutes after administration. Onset of anaesthesia after intramuscular injection of ketamine takes some 3-6 minutes.

**A xylazine/ketamine combination produces a deeper anaesthesia with more pronounced respiratory and cardiac effects and a longer recovery period than acepromazine/ketamine combinations.**

**Table 5: Xylazine and ketamine feline anaesthesia (IM)**

Weight of cat (kg)	1.5	2	2.5	3	3.5	4	4.5	5
Xylazine 2% dose (ml)*	0.08	0.11	0.14	0.17	0.19	0.22	0.25	0.28
Atropine (600 µg/ml) dose (ml)**	0.08	0.10	0.13	0.15	0.18	0.20	0.23	0.25
<b>Wait 20 minutes</b>								
Ketamine (100 mg/ml) dose (ml)***	0.33	0.44	0.55	0.66	0.77	0.88	0.99	1.10

\* based on a dose rate of 1.1 mg xylazine/kg body weight

\*\* based on a dose rate of 0.03 mg atropine/kg body weight

\*\*\* based on a dose rate of 22 mg ketamine/kg body weight

#### Medetomidine/ketamine:

##### Intramuscular:

Administer medetomidine at a dose rate of 80 µg/kg by intramuscular injection. This should be followed immediately by the intramuscular injection of ketamine at a dose rate of 2.5-7.5 mg/kg (corresponding to 0.12-0.38 ml/5 kg body weight).

Onset of anaesthesia is 3-4 minutes. The duration of surgical anaesthesia varies between 30-60 minutes and is related to the dose of ketamine used. If required, anaesthesia may be prolonged with halothane and oxygen with or without nitrous oxide.

**Table 6: Medetomidine and ketamine feline anaesthesia (IM)**

Weight of cat (kg)	1.5	2	2.5	3	3.5	4	4.5	5
Medetomidine (1 mg/ml) dose (ml)*	0.12	0.16	0.20	0.24	0.28	0.32	0.36	0.40
Ketamine (100 mg/ml) dose (ml)**	0.08	0.10	0.13	0.15	0.18	0.20	0.23	0.25

\* based on a dose rate of 80 µg medetomidine/kg body weight

\*\* based on a dose rate of 5 mg ketamine/kg body weight

##### Intravenous:

Medetomidine and ketamine may be administered by intravenous injection at the following dose rates: 40 µg medetomidine/kg and 1.25 mg ketamine/kg.

Clinical experience has shown that when ketamine and medetomidine have been used intravenously in cats and the need for anaesthesia has passed, administration of 100 µg atipamezole/kg by intramuscular injection results in recovery to sternal recumbency in approximately 10 minutes and to standing in approximately 14 minutes.

**Table 7: Medetomidine and ketamine feline anaesthesia (IV)**

Weight of cat (kg)	1.5	2	2.5	3	3.5	4	4.5	5
Medetomidine (1 mg/ml) dose (ml)*	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20
Ketamine (100 mg/ml) dose (ml)**	0.02	0.03	0.03	0.04	0.05	0.05	0.06	0.06

\* based on a dose rate of 40 µg medetomidine/kg body weight

\*\* based on a dose rate of 1.25 mg ketamine/kg body weight

Atropine is not normally necessary when using a medetomidine/ketamine combination.

Use of either insulin syringes or 1 ml graduated syringes is recommended to ensure accurate dosing.

#### Butorphanol/medetomidine/ketamine:

##### Intramuscular:

Administer butorphanol at a dose rate of 0.4 mg/kg, medetomidine at a dose rate of 80 µg/kg and ketamine at a dose rate of 5 mg/kg (corresponding to 0.25 ml/5 kg body weight) by intramuscular injection.



Cats become recumbent in 2-3 minutes following injection. Loss of pedal reflex occurs 3 minutes post injection. At 45 minutes post induction, reversal with 200 µg atipamezole/kg results in return of pedal reflex 2 minutes later, sternal recumbency 6 minutes later and standing 31 minutes later.

**Table 8: Butorphanol, medetomidine and ketamine feline anaesthesia (IM)**

Weight of cat (kg)	1.5	2	2.5	3	3.5	4	4.5	5
Butorphanol (10 mg/ml) dose (ml)*	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20
Medetomidine (1 mg/ml) dose (ml)**	0.12	0.16	0.20	0.24	0.28	0.32	0.36	0.40
Ketamine (100 mg/ml) dose (ml)***	0.08	0.10	0.13	0.15	0.18	0.20	0.23	0.25

\* based on a dose rate of 0.4 mg butorphanol/kg body weight

\*\* based on a dose rate of 80 µg medetomidine/kg body weight

\*\*\* based on a dose rate of 5 mg ketamine/kg body weight

#### Intravenous:

Administer butorphanol at a dose rate of 0.1 mg/kg, medetomidine at a dose rate of 40 µg/kg and ketamine, depending on depth of anaesthesia required, at a dose rate of 1.25-2.5 mg/kg (corresponding to 0.06-0.13 ml/5 kg body weight) by intravenous injection.

Approximate time scales when using the triple combination intravenously:

<i>Ketamine dose (mg/kg)*</i>	<i>Time to recumbency</i>	<i>Time to loss of pedal reflex</i>	<i>Time to return of pedal reflex</i>	<i>Time to sternal recumbency</i>	<i>Time to standing</i>
1.25	32 sec	62 sec	26 min	54 min	74 min
2.50	22 sec	39 sec	28 min	62 min	83 min

\* in conjunction with butorphanol at 0.1 mg/kg and medetomidine at 40 µg/kg

Clinical experience has shown that reversal, at any stage, with 100 µg atipamezole/kg results in return of the pedal reflex 4 minutes later, sternal recumbency 7 minutes later and standing 18 minutes later.

**Table 9: Butorphanol, medetomidine and ketamine feline anaesthesia (IV): Dosage chart for 2.5 mg/kg ketamine (duration of anaesthesia approximately 28 minutes)**

Weight of cat (kg)	1.5	2	2.5	3	3.5	4	4.5	5
Butorphanol (10 mg/ml) dose (ml)*	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.05
Medetomidine (1 mg/ml) dose (ml)**	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20
Ketamine (100 mg/ml) dose (ml)***	0.04	0.05	0.06	0.08	0.09	0.10	0.11	0.13

\* based on a dose rate of 0.1 mg butorphanol/kg body weight

\*\* based on a dose rate of 40 µg medetomidine/kg body weight

\*\*\* based on a dose rate of 2.5 mg ketamine/kg body weight

#### HORSE:

For the production of short term anaesthesia suitable for minor surgical interferences or for induction prior to inhalation anaesthesia. When romifidine or detomidine are used as the premedicant, anaesthesia may also be maintained with a 'top-up' combination of either romifidine and ketamine 100 mg/ml or detomidine and ketamine at regular 8-10 minute intervals. Ketamine should never be used as a sole anaesthetic agent.

It is generally accepted as good anaesthetic practice to starve animals for a period prior to anaesthesia where possible.

To achieve the best results, it is important that horses are not stressed before the anaesthetic. It is equally important that the whole procedure, from induction to recovery, should take place in quiet and calm surroundings.

For horses that are stressed before the procedure, the use of 0.03 mg/kg acepromazine 45 minutes prior to administration of either detomidine or romifidine facilitates handling and placement of an intravenous catheter.

If the horse fails to become sedated following the injection of either xylazine, detomidine or romifidine, then ketamine should not be injected and the anaesthetic procedure should be abandoned. The situation should be assessed to establish why the horse failed to respond, and then the environment and/or the drugs should be adjusted as necessary, before trying again the following day. When using a total intravenous technique and for safe and effective use of a top-up regime, the use of an intravenous catheter is strongly advised.

During castration it has been noted that the use of 10 ml lidocaine divided between the testicles eliminates the possible response to ligation of the testicular cord and minimises the number of top-ups required.

#### Xylazine/ketamine:

Xylazine should be administered by slow intravenous injection at a dose rate of 1.1 mg/kg (corresponding to 1.1 ml/100 kg body weight of xylazine 10% solution). The horse should appear sedated within 2 minutes post injection. Injection of ketamine should be administered at this stage. It is recommended not to delay the ketamine injection longer than 5 minutes after xylazine administration. Ketamine should be administered as an intravenous bolus at a dose rate of 2.2 mg/kg (corresponding to 2.2 ml/100 kg body weight).

Induction and recumbency take some 1-2 minutes. Muscle jerking may occur in the first minutes, but this usually subsides.

Anaesthesia is variable in duration, lasting between 10 and 30 minutes, but usually less than 20 minutes. Horses invariably stand 25-45 minutes after induction. Recovery is generally quiet, but may occur suddenly. It is important therefore that short duration interferences only are attempted, or arrangements to prolong anaesthesia are made. For longer periods of anaesthesia, intubation and maintenance by inhalation anaesthesia can be used.

**Table 10: Xylazine and ketamine equine anaesthesia (IV)**

Weight of horse (kg)	50	100	150	200	250	300	400	500	600
Xylazine 10% dose (ml)*	0.60	1.10	1.70	2.20	2.80	3.30	4.40	5.50	6.60
<b>Wait 2 minutes</b>									
Ketamine (100 mg/ml) dose (ml)**	1.10	2.20	3.30	4.40	5.50	6.60	8.80	11.00	13.20

\* based on a dose rate of 1.1 mg xylazine/kg body weight

\*\* based on a dose rate of 2.2 mg ketamine/kg body weight

#### Detomidine/ketamine:

Detomidine should be administered by intravenous injection at a dose rate of 20 µg/kg. The horse should appear sedated within five minutes post injection. At this stage ketamine should be administered at a dose rate of 2.2 mg/kg (corresponding to 2.2 ml/100 kg body weight) as an intravenous bolus.

Onset of anaesthesia is gradual; most horses take approximately 1 minute to become recumbent. Large, fit horses may take up to 3 minutes for recumbency. Anaesthesia continues to deepen for a further 1-2 minutes and during this time the horse should be left quietly. Horses regain sternal recumbency approximately 20 minutes post ketamine injection giving a surgical anaesthesia duration of 10-15 minutes.

#### Maintenance of surgical anaesthesia:

Should it become necessary to prolong anaesthesia, either of the following regimes may be used:

##### a) Thiopental sodium

Thiopental sodium may be administered intravenously in boluses of 1 mg/kg as required. Total doses of 5 mg/kg (five 1 mg/kg increments) have been given. Total doses greater than this may reduce the quality of recovery. Thiopental sodium can also be administered in increments if sufficient depth of anaesthesia is not achieved. The horse may be ataxic if encouraged to stand prematurely and so should be left to stand in its own time.

##### b) Detomidine/ketamine

Administer 10 µg detomidine/kg, i.e. ½ the initial premedication dose by intravenous injection, followed immediately by 1.1 mg ketamine/kg, i.e. ½ the initial induction dose by intravenous

injection. This will provide approximately 10 minutes additional surgical anaesthesia, which can be repeated at regular 10 minute intervals (up to 5 times) without compromising recovery.

**Table 11: Detomidine and ketamine equine anaesthesia (IV): Premedication and induction of anaesthesia**

Weight of horse (kg)	50	100	150	200	250	300	400	500	600
Detomidine (10 mg/ml) dose (ml)*	0.10	0.20	0.30	0.40	0.50	0.60	0.80	1.00	1.20
<b>Wait 5 minutes</b>									
Ketamine (100 mg/ml) dose (ml)**	1.10	2.20	3.30	4.40	5.50	6.60	8.80	11.00	13.20

\* based on a dose rate of 20 µg detomidine/kg body weight

\*\* based on a dose rate of 2.2 mg ketamine/kg body weight

**Table 12: Detomidine and ketamine equine anaesthesia (IV): Maintenance (top-up) dose at 10 minute intervals**

Weight of horse (kg)	50	100	150	200	250	300	400	500	600
Detomidine (10 mg/ml) dose (ml)*	0.05	0.10	0.15	0.20	0.25	0.30	0.40	0.50	0.60
Ketamine (100 mg/ml) dose (ml)**	0.55	1.10	1.65	2.20	2.75	3.30	4.40	5.50	6.60

\* based on a dose rate of 10 µg detomidine/kg body weight

\*\* based on a dose rate of 1.1 mg ketamine/kg body weight

#### Romifidine/ketamine:

Romifidine should be administered by intravenous injection at a dose rate of 100 µg/kg. The horse should appear sedated by five to ten minutes post injection. At this stage ketamine should be administered at a dose rate of 2.2 mg/kg (corresponding to 2.2 ml/100 kg) as an intravenous bolus. Sedation should be apparent before the induction of anaesthesia.

Maintenance of surgical anaesthesia:

Should it become necessary to prolong anaesthesia, either of the following regimes may be used:

a) Thiopental sodium

Thiopental sodium may be administered intravenously in boluses of 2.5 mg/kg when signs of returning consciousness appear. This can be repeated up to 3 times after induction. Total doses greater than this may reduce the quality of recovery. The horse may be ataxic if encouraged to stand prematurely and so should be left to stand in its own time.

b) Romifidine/ketamine

Depending on depth and duration of anaesthesia required, administer romifidine intravenously within the dose range of 25-50 µg/kg body weight, i.e. ¼-½ the initial premedication dose followed immediately by ketamine intravenously at a dose rate of 1.1 mg/kg body weight, i.e. ½ the initial induction dose). Each top-up lasts approximately 8-10 minutes and can be repeated at regular 8-10 minute intervals (up to 5 times) without compromising recovery.

**Table 13: Romifidine and ketamine equine anaesthesia (IV): Premedication and induction of anaesthesia**

Weight of horse (kg)	50	100	150	200	250	300	400	500	600
Romifidine (10 mg/ml) dose (ml)*	0.50	1.00	1.50	2.00	2.50	3.00	4.00	5.00	6.00
<b>Wait 5-10 minutes</b>									
Ketamine (100 mg/ml) dose (ml)**	1.10	2.20	3.30	4.40	5.50	6.60	8.80	11.00	13.20

\* based on a dose rate of 100 µg romifidine/kg body weight

\*\* based on a dose rate of 2.2 mg ketamine/kg body weight

**Table 14: Romifidine and ketamine equine anaesthesia (IV): Maintenance (top-up) dose at 8-10 minute intervals**

Weight of horse (kg)	50	100	150	200	250	300	400	500	600
Romifidine (10 mg/ml) dose (ml)*	0.25	0.50	0.75	1.00	1.25	1.50	2.00	2.50	3.00
Ketamine (100 mg/ml) dose (ml)**	0.55	1.10	1.65	2.20	2.75	3.30	4.40	5.50	6.60

\* based on a dose rate of 50 µg romifidine/kg body weight  
\*\* based on a dose rate of 1.1 mg ketamine/kg body weight

### **3.10 Symptoms of overdose (and where applicable, emergency procedures and antidotes)**

In excessive doses, significant respiratory depression may occur. If necessary, suitable artificial aids to maintain ventilation and cardiac output should be used until sufficient detoxification has taken place to enable a return to adequate spontaneous ventilation and cardiac activity. Pharmacological cardiac stimulants are not recommended, unless no other supportive measures are available.

### **3.11 Special restrictions for use and special conditions for use, including restrictions on the use of antimicrobial and antiparasitic veterinary medicinal products in order to limit the risk of development of resistance**

*(To be completed in accordance with national requirements after conclusion of the MRP/DCP/SRP.)*

### **3.12 Withdrawal periods**

Horses  
Meat and offal: 1 day  
Milk: 24 hours

## **4. PHARMACOLOGICAL INFORMATION**

### **4.1 ATC vet code: QN01AX03**

### **4.2 Pharmacodynamics**

Ketamine blocks nerve impulses in the cerebral cortex while activating subjacent brain regions. Hence, a dissociative anaesthesia is obtained, on the one hand narcosis and superficial analgesia and, on the other hand no bulbar depression, continued muscle tone and maintenance of certain reflexes (e.g. swallowing reflex).

At anaesthetic doses, ketamine is a bronchodilator (sympathomimetic effect), increases heart rate and blood pressure, and increases cerebral circulation and intraocular pressure.

These characteristics can be modified if the medicinal product is used in association with other anaesthetics.

### **4.3 Pharmacokinetics**

Ketamine undergoes extensive hepatic biotransformation in dogs, horses and primates. Some hepatic metabolism occurs in cats, but normally the majority of the drug is excreted via the kidney. Recovery of ketamine after intravenous bolus is by rapid redistribution from the CNS to other tissues, primarily fat, lung, liver and kidney.

## **5. PHARMACEUTICAL PARTICULARS**

### **5.1 Major incompatibilities**

Do not mix with any other veterinary medicinal product, except for the infusion fluids 0.9% sodium chloride, Ringer's solution and lactated Ringer's solution.

### **5.2 Shelf life**

Shelf life of the veterinary medicinal product as packaged for sale: 3 years.  
Shelf life after first opening the immediate packaging: 28 days.

### **5.3 Special precautions for storage**

Keep the vial in the outer carton in order to protect from light.  
This veterinary medicinal product does not require any special temperature storage conditions.

### **5.4 Nature and composition of immediate packaging**

Clear colourless type I glass vials with bromobutyl rubber stoppers and aluminium caps filled with 5 ml, 10 ml, 20 ml, 25 ml, 30 ml and 50 ml.

1 vial in a cardboard box.

Not all pack sizes may be marketed.

### **5.5 Special precautions for the disposal of unused veterinary medicinal products or waste materials derived from the use of such products**

Medicines should not be disposed of via wastewater <or household waste>.

Use take-back schemes for the disposal of any unused veterinary medicinal product or waste materials derived thereof in accordance with local requirements and with any national collection systems applicable to the veterinary medicinal product concerned.

## **6. NAME OF THE MARKETING AUTHORISATION HOLDER**

Eurovet Animal Health B.V.

BE:

Dechra Regulatory B.V.

## **7. MARKETING AUTHORISATION NUMBER(S)**

XXXXXXXXXX

## **8. DATE OF FIRST AUTHORISATION**

Date of first authorisation: <{DD/MM/YYYY}> <{DD month YYYY}>

## **9. DATE OF THE LAST REVISION OF THE SUMMARY OF THE PRODUCT CHARACTERISTICS**

<{MM/YYYY}> or <{DD/MM/YYYY}> or <{DD month YYYY}>

## **10. CLASSIFICATION OF VETERINARY MEDICINAL PRODUCTS**

Veterinary medicinal product subject to prescription.

Detailed information on this veterinary medicinal product is available in the [Union Product Database \(https://medicines.health.europa.eu/veterinary\)](https://medicines.health.europa.eu/veterinary).

**LABELLING AND PACKAGE LEAFLET**

## **A. LABELLING**

**PARTICULARS TO APPEAR ON THE OUTER PACKAGE**

{Outer carton 5/10/20/25/30/50 ml}

**1. NAME OF THE VETERINARY MEDICINAL PRODUCT**

ANESKETIN 100 mg/ml solution for injection

[Belgium:]NIMATEK 100 mg/ml solution for injection

**2. STATEMENT OF ACTIVE SUBSTANCES**

1 ml contains:

100 mg ketamine equivalent to 115.4 mg ketamine hydrochloride

**3. PACKAGE SIZE**

5/10/20/25/30/50 ml

**4. TARGET SPECIES**

Dogs, cats and horses

**5. INDICATIONS**

**6. ROUTES OF ADMINISTRATION**

Solution for injection.

For administration by intramuscular, subcutaneous or intravenous injection.

**7. WITHDRAWAL PERIODS**

Withdrawal period for horses:

Meat and offal: 1 day

Milk: 24 hours.

**8. EXPIRY DATE**

Exp. {mm/yyyy}

Once opened, use within 28 days. Use by \_\_/\_\_/\_\_

**9. SPECIAL STORAGE PRECAUTIONS**

Keep the vial in the outer carton in order to protect from light.

This veterinary medicinal product does not require any special temperature storage conditions.

**10. THE WORDS “READ THE PACKAGE LEAFLET BEFORE USE”**

Read the package leaflet before use.



**11. THE WORDS “FOR ANIMAL TREATMENT ONLY”**

For animal treatment only.

**12. THE WORDS “KEEP OUT OF THE SIGHT AND REACH OF CHILDREN”**

Keep out of the sight and reach of children.

**13. NAME OF THE MARKETING AUTHORISATION HOLDER**

Eurovet Animal Health B.V.

BE:

Dechra Regulatory B.V.

**14. MARKETING AUTHORISATION NUMBERS**

-----

**15. BATCH NUMBER**

Lot {number}

**PARTICULARS TO APPEAR ON THE IMMEDIATE PACKAGE**

{Label 50 ml}

**1. NAME OF THE VETERINARY MEDICINAL PRODUCT**

ANESKETIN 100 mg/ml solution for injection

[Belgium:]

NIMATEK 100 mg/ml solution for injection

**2. STATEMENT OF ACTIVE SUBSTANCES**

1 ml contains:

100 mg ketamine equivalent to 115.4 mg ketamine hydrochloride

**3. TARGET SPECIES**

Dogs, cats and horses

**4. ROUTES OF ADMINISTRATION**

Solution for injection.

Read the package leaflet before use.

For administration by intramuscular, subcutaneous or intravenous injection.

**5. WITHDRAWAL PERIODS**

Withdrawal period for horses:

Meat and offal: 1 day

Milk: 24 hours.

**6. EXPIRY DATE**

Exp. {mm/ yyyy}

Once opened, use within 28 days. Use by \_\_/\_\_/\_\_

**7. SPECIAL STORAGE PRECAUTIONS**

Keep the vial in the outer carton in order to protect from light.

**8. NAME OF THE MARKETING AUTHORISATION HOLDER**

Eurovet Animal Health B.V.

BE:

Dechra Regulatory B.V.

**9. BATCH NUMBER**

Lot {number}



**MINIMUM PARTICULARS TO APPEAR ON SMALL IMMEDIATE PACKAGING UNITS**

{LABEL 5/10/20/25/30 ml}

**1. NAME OF THE VETERINARY MEDICINAL PRODUCT**

ANESKETIN

[Belgium:]

NIMATEK

**2. QUANTITATIVE PARTICULARS OF THE ACTIVE SUBSTANCES**

100 mg/ml ketamine

**3. BATCH NUMBER**

Lot {number}

**4. EXPIRY DATE**

Exp. {mm/yyyy}

Once opened, use within 28 days. Use by \_\_/\_\_/\_\_

**B. PACKAGE LEAFLET**

## PACKAGE LEAFLET

### 1. Name of the veterinary medicinal product

Anesketin 100 mg/ml solution for injection for dogs, cats and horses (DE, ES, NL, UK(NI))

Anesketin (DK)

Anesketin 100 mg/ml solution for injection (FR)

Nimatek 100 mg/ml solution for injection for dogs, cats and horses (BE)

### 2. Composition

1 ml contains:

**Active substance:**

100 mg ketamine equivalent to 115.4 mg ketamine hydrochloride

**Excipient:**

Chlorocresol 1 mg

Clear, colourless solution free from visible particles.

### 3. Target species

Dogs, cats and horses

### 4. Indications for use

To be used as a sole agent for restraint and minor surgical procedures in the cat, where muscle relaxation is not required.

To be used to induce anaesthesia:

- a) in combination with butorphanol and medetomidine in the dog and cat,
- b) in combination with xylazine in the horse, dog and cat,
- c) in combination with detomidine in the horse,
- d) in combination with romifidine in the horse.

### 5. Contraindications

Do not use:

- in animals with hepatic or renal failure.
- ketamine as a sole agent in the horse or the dog.
- in animals with severe cardiac de-compensation, suspected pulmonary disease, apparent high blood pressure or cerebrovascular insults.
- in animals with eclampsia, pre-eclampsia, glaucoma and seizure disorders (e.g. epilepsy).
- for surgical intervention on pharynx, larynx, trachea or bronchial tree, if sufficient relaxation is not ensured by administration of a muscle relaxant (intubation obligatory).
- in animals undergoing a myelogram procedure.
- Do not use in cases of head trauma and increased intracerebral pressure.

Do not use in cases of hypersensitivity to the active substance or to any of the excipients.

See also 'Pregnancy and lactation' and 'Interactions with other medicinal products and other forms of interaction'.

### 6. Special warnings

Special warnings:

For very painful and major surgical interventions, as well as for maintenance of anaesthesia, a combination with injectable or inhalation anaesthetics is necessary. As muscle relaxation required for surgical procedures cannot be achieved with ketamine alone, additional muscle relaxants should be

used concomitantly. For improvement of anaesthesia or prolongation of effect ketamine can be combined with  $\alpha_2$ -receptor-agonists, anaesthetics, neuroleptanalgesics, tranquillisers and inhalational anaesthetic agents. It should be noted that time-to-full-effect may be prolonged when using the subcutaneous administration route in cats. A small proportion of animals have been reported to be unresponsive to ketamine as an anaesthetic agent at normal dosages.

Special precautions for safe use in the target species:

Use of premedication should be followed by a suitable reduction in dosage.

Induction and recovery should be allowed to occur in quiet and calm surroundings.

As for all anaesthetics, animals should be fasted for 12 hours before ketamine anaesthesia.

Atropine premedication may reduce salivation in cats.

In the cat and dog, the eyes remain open and the pupils dilated. The eyes may be protected by covering with a damp gauze swab or using appropriate ointments.

When used in combination with other products, consult the contraindications and warnings that appear on the Summaries of Product Characteristics.

Ketamine may exhibit pro-convulsant or anti-convulsant properties and should therefore be used with caution in epileptic animals.

Special precautions to be taken by the person administering the veterinary medicinal product to animals:

This is a potent drug. Particular care should be taken to avoid accidental self-administration.

People with known hypersensitivity to ketamine or any of the excipients should avoid contact with the veterinary medicinal product.

Avoid contact with the skin and eyes. Wash any splashes from skin and eyes immediately with large amounts of water.

Adverse effects on the foetus cannot be excluded. The veterinary medicinal product should not be administered by pregnant women.

In case of accidental self-injection, or if symptoms occur after ocular/oral contact, seek medical advice immediately and show the package leaflet or the label to the physician, but DO NOT DRIVE.

Advice to doctors:

Do not leave patient unattended. Maintain airways and give symptomatic and supportive treatment.

Pregnancy and lactation:

Ketamine passes the blood placenta barrier very well, entering the foetal blood circulation by which 75 to 100% of the maternal blood levels can be reached; this partially anaesthetises neonates when delivered by Caesarean section. The use of ketamine prior to caesarean section is recommended only according to risk/benefit analysis of the responsible veterinary surgeon.

The safety of the veterinary medicinal product has not been established during pregnancy and lactation. Use only according to the benefit/risk assessment by the responsible veterinarian.

Interaction with other medicinal products and other forms of interaction:

Care should be taken when using ketamine-halothane combinations since the half-life of ketamine is prolonged by halothane.

Potential for increased risk for arrhythmias when used in combination with thiopental or halothane.

Simultaneously administered intravenous spasmolytics can provoke a collapse.

Theophylline, when given with ketamine, can cause an increased incidence of seizures.

Neuroleptanalgesics, tranquillisers, morphine analogues, cimetidine and chloramphenicol potentiate ketamine anaesthesia. Barbiturates and opiates or diazepam can prolong the recovery period. Effects may be cumulative; dosage reduction of one or both agents may be required.

The use of detomidine in combination with ketamine gives a slow recuperation.

Ketamine has been reported to enhance the occurrence of tachycardia and hypertension when used in human patients receiving thyroid hormones.

### Overdose:

In excessive doses, significant respiratory depression may occur. If necessary, suitable artificial aids to maintain ventilation and cardiac output should be used until sufficient detoxification has taken place to enable a return to adequate spontaneous ventilation and cardiac activity. Pharmacological cardiac stimulants are not recommended, unless no other supportive measures are available.

### Special restrictions for use and special conditions for use:

*(To be completed in accordance with national requirements after conclusion of the MRP/DCP/SRP.)*

### Major incompatibilities:

Do not mix with any other veterinary medicinal product, except for the infusion fluids 0.9% sodium chloride, Ringer's solution and lactated Ringer's solution.

## **7. Adverse events**

### Dogs:

Rare (1 to 10 animals / 10,000 animals treated): Hypertonia (of skeletal muscles). Ataxia, hyperaesthesia, excitation (as emergence reactions during recovery). Pulmonary oedema.  
Very rare (<1 animal / 10,000 animals treated, including isolated reports): Hyperthermia.  
Undetermined frequency (cannot be estimated from the available data): Increased heart rate, increased arterial blood pressure/hypertension (with concurrent increased bleeding tendency). Eyes remain open with mydriasis and nystagmus. Injection site pain (on intramuscular injection). Respiratory depression<sup>a</sup>.

<sup>a</sup> Dose-related, may lead to respiratory arrest particularly in cats. Combination with respiratory depressant products may increase this respiratory effect.

### Cats:

Rare (1 to 10 animals / 10,000 animals treated): Hypertonia (of skeletal muscles). Ataxia, hyperaesthesia, excitation (as emergence reactions during recovery). Pulmonary oedema.  
Very rare (<1 animal / 10,000 animals treated, including isolated reports): Hyperthermia.  
Hypersalivation.  
Undetermined frequency (cannot be estimated from the available data): Increased heart rate, increased arterial blood pressure/hypertension (with concurrent increased bleeding tendency). Eyes remain open with mydriasis and nystagmus. Injection site pain (on intramuscular injection). Respiratory depression<sup>a</sup>. Twitching (muscle tremor), tonic seizures (mild)<sup>b</sup>.

<sup>a</sup> Dose-related, may lead to respiratory arrest particularly in cats. Combination with respiratory depressant products may increase this respiratory effect.

<sup>b</sup> These subside spontaneously but may be prevented by use of acepromazine or xylazine premedication, or controlled by use of acepromazine or ultra-short acting barbiturates in low doses.

### Horses:

Rare (1 to 10 animals / 10,000 animals treated): Hypertonia (of skeletal muscles). Ataxia, hyperaesthesia, excitation (as emergence reactions during recovery). Pulmonary oedema.  
Undetermined frequency (cannot be estimated from the available data): Increased heart rate, increased arterial blood pressure/hypertension (with concurrent increased bleeding tendency). Injection site pain (on intramuscular injection). Respiratory depression<sup>a</sup>.

<sup>a</sup> Dose-related, may lead to respiratory arrest particularly in cats. Combination with respiratory depressant products may increase this respiratory effect.

Reporting adverse events is important. It allows continuous safety monitoring of a product. If you notice any side effects, even those not already listed in this package leaflet, or you think that the medicine has not worked, please contact, in the first instance, your veterinarian. You can also report any adverse events to (the local representative of) the marketing authorisation holder using the contact details at the end of this leaflet, or via your national reporting system: {national system details}.

## **8. Dosage for each species, routes and method of administration**



For administration by intramuscular, subcutaneous or intravenous injection.

For combination use: before ketamine is administered, please ensure that the animals are adequately sedated.

It should be noted that dosages and routes of administration vary widely between species.

Furthermore, the effect of ketamine may show large inter-individual differences and therefore, individual dosage accommodation is recommended.

To ensure a correct dosage, body weight should be determined as accurately as possible.

#### DOG:

Ketamine cannot be used as a mono-anaesthetic in dogs, as it causes an increased muscle tone and uncoordinated muscle contractions.

#### Xylazine/ketamine:

Administer xylazine at a dose rate of 1 mg/kg by intramuscular injection (corresponding to 0.5 ml/10 kg body weight of xylazine 2% solution). Immediately administer ketamine at a dose rate of 15 mg/kg by intramuscular injection (corresponding to 1.5 ml/10 kg body weight).

Dogs become recumbent in approximately 3 minutes and lose their pedal reflex in approximately 7 minutes. Duration of anaesthesia is approximately 24 minutes, the pedal reflex returning about 30 minutes following administration of the ketamine injection.

**Table 1: Xylazine and ketamine 100 mg/ml canine anaesthesia (IM)**

Weight of dog (kg)	1	3	5	10	15	20	25	30	40
Xylazine 2% dose (ml)*	0.05	0.15	0.25	0.50	0.75	1.00	1.25	1.50	2.00
Ketamine (100 mg/ml) dose (ml)**	0.15	0.45	0.75	1.50	2.25	3.00	3.75	4.50	6.00

\* based on a dose rate of 1 mg xylazine/kg body weight

\*\* based on a dose rate of 15 mg ketamine/kg body weight

#### Medetomidine/ketamine:

Administer medetomidine at a dose rate of 40 µg/kg (corresponding to 0.40 ml/10 kg body weight of medetomidine 1 mg/ml solution) and ketamine at 5.0-7.5 mg/kg (corresponding to 0.5-0.75 ml/10 kg body weight), depending on duration of anaesthesia required, by intramuscular injection.

Loss of pedal reflex occurs approximately 11 minutes following injection at 5 mg ketamine/kg and 7 minutes following injection at 7.5 mg ketamine/kg. Duration of anaesthesia is approximately 30 and 50 minutes respectively.

**It is NOT advisable to reverse this combination in the dog with atipamezole.**

**Table 2: Medetomidine and ketamine canine anaesthesia (IM): Dosage chart for 5 mg ketamine/kg (duration of anaesthesia approximately 30 minutes)**

Weight of dog (kg)	1	3	5	10	15	20	25	30	40
Medetomidine (1 mg/ml) dose (ml)*	0.04	0.12	0.20	0.40	0.60	0.80	1.00	1.20	1.60
Ketamine (100 mg/ml) dose(ml)**	0.05	0.15	0.25	0.50	0.75	1.00	1.25	1.50	2.00

\* based on a dose rate of 40 µg medetomidine/kg body weight

\*\* based on a dose rate of 5 mg ketamine/kg body weight

**Table 3: Medetomidine and ketamine canine anaesthesia (IM): Dosage chart for 7.5 mg ketamine/kg (duration of anaesthesia approximately 50 minutes)**

Weight of dog (kg)	1	3	5	10	15	20	25	30	40
Medetomidine (1 mg/ml) dose (ml)*	0.04	0.12	0.20	0.40	0.60	0.80	1.00	1.20	1.60
Ketamine (100 mg/ml) dose(ml)**	0.08	0.23	0.38	0.75	1.13	1.50	1.88	2.25	3.00

\* based on a dose rate of 40 µg medetomidine/kg body weight

\*\* based on a dose rate of 7.5 mg ketamine/kg body weight

#### Butorphanol/medetomidine/ketamine:

Administer butorphanol at 0.1 mg/kg and medetomidine at 25 µg/kg by intramuscular injection.

Dogs become recumbent in approximately 6 minutes and lose their pedal reflex in approximately 14 minutes.

Ketamine injection should be administered 15 minutes following the first injection at a dose rate of 5 mg/kg by intramuscular injection (corresponding to 0.5 ml/10 kg body weight).

The pedal reflex returns approximately 53 minutes following administration of the ketamine 100 mg/ml injection. Sternal recumbency is attained approximately 35 minutes later followed by standing a further 36 minutes later.

**It is NOT advisable to reverse this combination in the dog with atipamezole.**

**Table 4: Butorphanol, medetomidine and ketamine canine anaesthesia (IM)**

Weight of dog (kg)	1	3	5	10	15	20	25	30	40
Butorphanol (10 mg/ml) dose (ml)*	0.01	0.03	0.05	0.10	0.15	0.20	0.25	0.30	0.40
Medetomidine (1 mg/ml) dose (ml)**	0.03	0.08	0.13	0.25	0.38	0.50	0.63	0.75	1.00
<b>Administer butorphanol and medetomidine by intramuscular injection at the above dose rates</b>									
<b>Wait 15 minutes before administering ketamine by intramuscular injection at the dose rates below</b>									
Ketamine (100 mg/ml) dose (ml)***	0.05	0.15	0.25	0.50	0.75	1.00	1.25	1.50	2.00

\* based on a dose rate of 0.1 mg butorphanol/kg body weight

\*\* based on a dose rate of 25 µg medetomidine/kg body weight

\*\*\* based on a dose rate of 5 mg ketamine/kg body weight

### CAT:

#### Ketamine as a sole agent:

Mono-anaesthetic use of ketamine is possible, but to avoid undesired psychomotoric effects combined anaesthesia is recommended. Ketamine on its own may be used by intravenous or subcutaneous injection, but intramuscular injection is the recommended route. The dose is 11-33 mg ketamine/kg depending on the degree of restraint or surgical interference that is intended. The following dosages are indicated as a guide but may need to be adjusted depending on the physical condition of the patient and the usage of sedatives and premedicants.

<i>Dose (mg/kg)</i>	<i>Clinical procedures</i>
11 (0.11 ml/kg)	Minor restraint
22-33 (0.22-0.33 ml/kg)	Minor surgery and restraint of fractious cats

Duration of ketamine anaesthesia is 20-40 minutes and recovery takes place over a 1-4 hour period. For major surgery, ketamine should be used in conjunction with supplemental sedatives or anaesthetics. Dosage varies from 1.25-22 mg/kg (0.06-1.1 ml/5 kg) depending on the combination and route of administration used.

Vomiting is unlikely to occur when ketamine is used alone, however, cats should be starved for several hours prior to anaesthesia where possible.

#### Ketamine supplementary combinations in the cat:

Atropine premedication is generally recommended at 0.05 mg/kg to reduce salivation. In addition, acepromazine (0.2% solution) at a dose rate of 0.11 mg/kg (corresponding to 0.28 ml/5 kg body weight) can be administered by intramuscular injection, as premedicant. Endotracheal intubation can be achieved during ketamine anaesthesia. Inhalation anaesthesia may be maintained by suitable combinations of methoxyflurane, halothane, nitrous oxide and oxygen.

#### Xylazine/ketamine:

Administer xylazine at a dose rate of 1.1 mg/kg (corresponding to 0.28 ml/5 kg body weight of xylazine 2% solution) and atropine at a dose rate of 0.03 mg/kg (corresponding to 0.25 ml/5 kg body weight of atropine 0.06% solution) by intramuscular injection. Wait 20 minutes and then administer ketamine at a dose rate of 22 mg/kg (corresponding to 1.1 ml/5 kg body weight) by intramuscular injection.

Xylazine may induce vomiting up to 20 minutes after administration. Onset of anaesthesia after intramuscular injection of ketamine takes some 3-6 minutes.

A xylazine/ketamine combination produces a deeper anaesthesia with more pronounced respiratory and cardiac effects and a longer recovery period than acepromazine/ketamine combinations.

**Table 5: Xylazine and ketamine feline anaesthesia (IM)**

Weight of cat (kg)	1.5	2	2.5	3	3.5	4	4.5	5
Xylazine 2% dose (ml)*	0.08	0.11	0.14	0.17	0.19	0.22	0.25	0.28

Atropine (600 µg/ml) dose (ml)**	0.08	0.10	0.13	0.15	0.18	0.20	0.23	0.25
<b>Wait 20 minutes</b>								
Ketamine (100 mg/ml) dose (ml)***	0.33	0.44	0.55	0.66	0.77	0.88	0.99	1.10

\* based on a dose rate of 1.1 mg xylazine/kg body weight

\*\* based on a dose rate of 0.03 mg atropine/kg body weight

\*\*\* based on a dose rate of 22 mg ketamine/kg body weight

#### Medetomidine/ketamine:

##### Intramuscular:

Administer medetomidine at a dose rate of 80 µg/kg by intramuscular injection. This should be followed immediately by the intramuscular injection of ketamine at a dose rate of 2.5-7.5 mg/kg (corresponding to 0.12-0.38 ml/5 kg body weight).

Onset of anaesthesia is 3-4 minutes. The duration of surgical anaesthesia varies between 30-60 minutes and is related to the dose of ketamine used. If required, anaesthesia may be prolonged with halothane and oxygen with or without nitrous oxide.

**Table 6: Medetomidine and ketamine feline anaesthesia (IM)**

Weight of cat (kg)	1.5	2	2.5	3	3.5	4	4.5	5
Medetomidine (1 mg/ml) dose (ml)*	0.12	0.16	0.20	0.24	0.28	0.32	0.36	0.40
Ketamine (100 mg/ml) dose (ml)**	0.08	0.10	0.13	0.15	0.18	0.20	0.23	0.25

\* based on a dose rate of 80 µg medetomidine/kg body weight

\*\* based on a dose rate of 5 mg ketamine/kg body weight

##### Intravenous:

Medetomidine and ketamine may be administered together by intravenous injection at the following dose rates: 40 µg medetomidine/kg and 1.25 mg ketamine/kg.

Clinical experience has shown that when ketamine and medetomidine have been used intravenously in cats and the need for anaesthesia has passed, administration of 100 µg atipamezole/kg by intramuscular injection results in recovery to sternal recumbency in approximately 10 minutes and to standing in approximately 14 minutes.

**Table 7: Medetomidine and ketamine feline anaesthesia (IV)**

Weight of cat (kg)	1.5	2	2.5	3	3.5	4	4.5	5
Medetomidine (1 mg/ml) dose (ml)*	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20
Ketamine (100 mg/ml) dose (ml)**	0.02	0.03	0.03	0.04	0.05	0.05	0.06	0.06

\* based on a dose rate of 40 µg medetomidine/kg body weight

\*\* based on a dose rate of 1.25 mg ketamine/kg body weight

Atropine is not normally necessary when using a medetomidine/ketamine combination.

#### Butorphanol/medetomidine/ketamine:

##### Intramuscular:

Administer butorphanol at a dose rate of 0.4 mg/kg, medetomidine at a dose rate of 80 µg/kg and ketamine at a dose rate of 5 mg/kg (corresponding to 0.25 ml/5 kg body weight) by intramuscular injection.

Cats become recumbent in 2-3 minutes following injection. Loss of pedal reflex occurs 3 minutes post injection. At 45 minutes post induction, reversal with 200 µg atipamezole/kg results in return of pedal reflex 2 minutes later, sternal recumbency 6 minutes later and standing 31 minutes later.

**Table 8: Butorphanol, medetomidine and ketamine feline anaesthesia (IM)**

Weight of cat (kg)	1.5	2	2.5	3	3.5	4	4.5	5
Butorphanol (10 mg/ml) dose (ml)*	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20
Medetomidine (1 mg/ml) dose (ml)**	0.12	0.16	0.20	0.24	0.28	0.32	0.36	0.40
Ketamine (100 mg/ml) dose (ml)***	0.08	0.10	0.13	0.15	0.18	0.20	0.23	0.25

\* based on a dose rate of 0.4 mg butorphanol/kg body weight

\*\* based on a dose rate of 80 µg medetomidine/kg body weight

\*\*\* based on a dose rate of 5 mg ketamine/kg body weight

##### Intravenous:

Administer butorphanol at a dose rate of 0.1 mg/kg, medetomidine at a dose rate of 40 µg/kg and ketamine, depending on depth of anaesthesia required, at a dose rate of 1.25-2.5 mg/kg (corresponding to 0.06-0.13 ml/5 kg body weight) by intravenous injection.

Approximate time scales when using the triple combination intravenously:

<i>Ketamine dose (mg/kg)*</i>	<i>Time to recumbency</i>	<i>Time to loss of pedal reflex</i>	<i>Time to return of pedal reflex</i>	<i>Time to sternal recumbency</i>	<i>Time to standing</i>
1.25	32 sec	62 sec	26 min	54 min	74 min
2.50	22 sec	39 sec	28 min	62 min	83 min

\* in conjunction with butorphanol at 0.1 mg/kg and medetomidine at 40 µg/kg

Clinical experience has shown that reversal, at any stage, with 100 µg atipamezole/kg results in return of the pedal reflex 4 minutes later, sternal recumbency 7 minutes later and standing 18 minutes later.

**Table 9: Butorphanol, medetomidine and ketamine feline anaesthesia (IV): Dosage chart for 2.5 mg/kg ketamine (duration of anaesthesia approximately 28 minutes)**

Weight of cat (kg)	1.5	2	2.5	3	3.5	4	4.5	5
Butorphanol (10 mg/ml) dose (ml)*	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.05
Medetomidine (1 mg/ml) dose (ml)**	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20
Ketamine (100 mg/ml) dose (ml)***	0.04	0.05	0.06	0.08	0.09	0.10	0.11	0.13

\* based on a dose rate of 0.1 mg butorphanol/kg body weight

\*\* based on a dose rate of 40 µg medetomidine/kg body weight

\*\*\* based on a dose rate of 2.5 mg ketamine/kg body weight

### HORSE:

For the production of short term anaesthesia suitable for minor surgical interferences or for induction prior to inhalation anaesthesia. When romifidine or detomidine are used as the premedicant, anaesthesia may also be maintained with a 'top-up' combination of either romifidine and ketamine 100 mg/ml or detomidine and ketamine at regular 8-10 minute intervals. Ketamine should never be used as a sole anaesthetic agent.

It is generally accepted as good anaesthetic practice to starve animals for a period prior to anaesthesia where possible.

To achieve the best results, it is important that horses are not stressed before the anaesthetic. It is equally important that the whole procedure, from induction to recovery, should take place in quiet and calm surroundings.

For horses that are stressed before the procedure, the use of 0.03 mg/kg acepromazine 45 minutes prior to administration of either detomidine or romifidine facilitates handling and placement of an intravenous catheter.

If the horse fails to become sedated following the injection of either xylazine, detomidine or romifidine, then ketamine should not be injected and the anaesthetic procedure should be abandoned.

The situation should be assessed to establish why the horse failed to respond, and then the environment and/or the drugs should be adjusted as necessary, before trying again the following day.

When using a total intravenous technique and for safe and effective use of a top-up regime, the use of an intravenous catheter is strongly advised.

During castration it has been noted that the use of 10 ml lidocaine divided between the testicles eliminates the possible response to ligation of the testicular cord and minimises the number of top-ups required.

### Xylazine/ketamine:

Xylazine should be administered by slow intravenous injection at a dose rate of 1.1 mg/kg (corresponding to 1.1 ml/100 kg body weight of xylazine 10% solution). The horse should appear sedated within 2 minutes post injection. Injection of ketamine should be administered at this stage. It is recommended not to delay the ketamine injection longer than 5 minutes after xylazine administration. Ketamine should be administered as an intravenous bolus at a dose rate of 2.2 mg/kg (corresponding to 2.2 ml/100 kg body weight).

Induction and recumbency take some 1-2 minutes. Muscle jerking may occur in the first minutes, but this usually subsides.

Anaesthesia is variable in duration, lasting between 10 and 30 minutes, but usually less than 20 minutes. Horses invariably stand 25-45 minutes after induction. Recovery is generally quiet, but may

occur suddenly. It is important therefore that short duration interferences only are attempted, or arrangements to prolong anaesthesia are made. For longer periods of anaesthesia, intubation and maintenance by inhalation anaesthesia can be used.

**Table 10: Xylazine and ketamine equine anaesthesia (IV)**

Weight of horse (kg)	50	100	150	200	250	300	400	500	600
Xylazine 10% dose (ml)*	0.60	1.10	1.70	2.20	2.80	3.30	4.40	5.50	6.60
<b>Wait 2 minutes</b>									
Ketamine (100 mg/ml) dose (ml)**	1.10	2.20	3.30	4.40	5.50	6.60	8.80	11.00	13.20

\* based on a dose rate of 1.1 mg xylazine/kg body weight

\*\* based on a dose rate of 2.2 mg ketamine/kg body weight

#### Detomidine/ketamine:

Detomidine should be administered by intravenous injection at a dose rate of 20 µg/kg. The horse should appear sedated within five minutes post injection. At this stage ketamine should be administered at a dose rate of 2.2 mg/kg (corresponding to 2.2 ml/100 kg body weight) as an intravenous bolus.

Onset of anaesthesia is gradual; most horses take approximately 1 minute to become recumbent. Large, fit horses may take up to 3 minutes for recumbency. Anaesthesia continues to deepen for a further 1-2 minutes and during this time the horse should be left quietly. Horses regain sternal recumbency approximately 20 minutes post ketamine injection giving a surgical anaesthesia duration of 10-15 minutes.

Maintenance of surgical anaesthesia:

Should it become necessary to prolong anaesthesia, either of the following regimes may be used:

#### c) Thiopental sodium

Thiopental sodium may be administered intravenously in boluses of 1 mg/kg as required. Total doses of 5 mg/kg (five 1 mg/kg increments) have been given. Total doses greater than this may reduce the quality of recovery. Thiopental sodium can also be administered in increments if sufficient depth of anaesthesia is not achieved. The horse may be ataxic if encouraged to stand prematurely and so should be left to stand in its own time.

#### d) Detomidine/ketamine

Administer 10 µg detomidine/kg, i.e. ½ the initial premedication dose by intravenous injection, followed immediately by 1.1 mg ketamine/kg, i.e. ½ the initial induction dose by intravenous injection. This will provide approximately 10 minutes additional surgical anaesthesia, which can be repeated at regular 10 minute intervals (up to 5 times) without compromising recovery.

**Table 11: Detomidine and ketamine equine anaesthesia (IV): Premedication and induction of anaesthesia**

Weight of horse (kg)	50	100	150	200	250	300	400	500	600
Detomidine (10 mg/ml) dose (ml)*	0.10	0.20	0.30	0.40	0.50	0.60	0.80	1.00	1.20
<b>Wait 5 minutes</b>									
Ketamine (100 mg/ml) dose (ml)**	1.10	2.20	3.30	4.40	5.50	6.60	8.80	11.00	13.20

\* based on a dose rate of 20 µg detomidine/kg body weight

\*\* based on a dose rate of 2.2 mg ketamine/kg body weight

**Table 12: Detomidine and ketamine equine anaesthesia (IV): Maintenance (top-up) dose at 10 minute intervals**

Weight of horse (kg)	50	100	150	200	250	300	400	500	600
Detomidine (10 mg/ml) dose (ml)*	0.05	0.10	0.15	0.20	0.25	0.30	0.40	0.50	0.60
Ketamine (100 mg/ml) dose (ml)**	0.55	1.10	1.65	2.20	2.75	3.30	4.40	5.50	6.60

\* based on a dose rate of 10 µg detomidine/kg body weight

\*\* based on a dose rate of 1.1 mg ketamine/kg body weight

#### Romifidine/ketamine:

Romifidine should be administered by intravenous injection at a dose rate of 100 µg/kg. The horse should appear sedated by five to ten minutes post injection. At this stage ketamine should be administered at a dose rate of 2.2 mg/kg (corresponding to 2.2 ml/100 kg) as an intravenous bolus. Sedation should be apparent before the induction of anaesthesia.

Maintenance of surgical anaesthesia:

Should it become necessary to prolong anaesthesia, either of the following regimes may be used:

c) Thiopental sodium

Thiopental sodium may be administered intravenously in boluses of 2.5 mg/kg when signs of returning consciousness appear. This can be repeated up to 3 times after induction. Total doses greater than this may reduce the quality of recovery. The horse may be ataxic if encouraged to stand prematurely and so should be left to stand in its own time.

d) Romifidine/ketamine

Depending on depth and duration of anaesthesia required, administer romifidine intravenously within the dose range of 25-50 µg/kg body weight, i.e. ¼-½ the initial premedication dose followed immediately by ketamine intravenously at a dose rate of 1.1 mg/kg body weight, i.e. ½ the initial induction dose). Each top-up lasts approximately 8-10 minutes and can be repeated at regular 8-10 minute intervals (up to 5 times) without compromising recovery.

**Table 13: Romifidine and ketamine equine anaesthesia (IV): Premedication and induction of anaesthesia**

Weight of horse (kg)	50	100	150	200	250	300	400	500	600
Romifidine (10 mg/ml) dose (ml)*	0.50	1.00	1.50	2.00	2.50	3.00	4.00	5.00	6.00
<b>Wait 5-10 minutes</b>									
Ketamine (100 mg/ml) dose (ml)**	1.10	2.20	3.30	4.40	5.50	6.60	8.80	11.00	13.20

\* based on a dose rate of 100 µg romifidine/kg body weight

\*\* based on a dose rate of 2.2 mg ketamine/kg body weight

**Table 14: Romifidine and ketamine equine anaesthesia (IV): Maintenance (top-up) dose at 8-10 minute intervals**

Weight of horse (kg)	50	100	150	200	250	300	400	500	600
Romifidine (10 mg/ml) dose (ml)*	0.25	0.50	0.75	1.00	1.25	1.50	2.00	2.50	3.00
Ketamine (100 mg/ml) dose (ml)**	0.55	1.10	1.65	2.20	2.75	3.30	4.40	5.50	6.60

\* based on a dose rate of 50 µg romifidine/kg body weight

\*\* based on a dose rate of 1.1 mg ketamine/kg body weight

## 9. Advice on correct administration

Use of either insulin syringes or 1 ml graduated syringes is recommended to ensure accurate dosing when (very) small volumes are to be injected.

## 10. Withdrawal periods

Horses

Meat and offal: 1 day

Milk: 24 hours

## 11. Special storage precautions

Keep out of the sight and reach of children.

Keep the vial in the outer carton in order to protect from light.

This veterinary medicinal product does not require any special temperature storage conditions.

Do not use this veterinary medicinal product after the expiry date which is stated on the label/carton after Exp. The expiry date refers to the last day of that month.

Shelf life after first opening the immediate packaging: 28 days.

## 12. Special precautions for disposal

Medicines should not be disposed of via wastewater <or household waste>.

Use take-back schemes for the disposal of any unused veterinary medicinal product or waste materials derived thereof in accordance with local requirements and with any applicable national collection systems. These measures should help to protect the environment.

### **13. Classification of veterinary medicinal products**

Veterinary medicinal product subject to prescription.

### **14. Marketing authorisation numbers and pack sizes**

*MA numbers to be completed nationally*

5 ml, 10 ml, 20 ml, 25 ml, 30 ml and 50 ml.  
1 vial in a cardboard box.

Not all pack sizes may be marketed.

### **15. Date on which the package leaflet was last revised**

<{MM/YYYY} or <{DD/MM/YYYY}> or <{DD month YYYY}>

Detailed information on this veterinary medicinal product is available in the Union Product Database (<https://medicines.health.europa.eu/veterinary>).

### **16. Contact details**

Marketing authorisation holder and contact details to report suspected adverse reactions:

Eurovet Animal Health B.V.  
Handelsweg 25  
5531 AE Bladel  
The Netherlands  
Tel: +31 (0)348-563434

**BE:**

Dechra Regulatory B.V.  
Handelsweg 25  
5531 AE Bladel  
The Netherlands  
Tel: +31 (0)348-563434

Marketing authorisation holder:

Eurovet Animal Health B.V.  
Handelsweg 25  
5531 AE Bladel  
The Netherlands

Manufacturer responsible for batch release:

Eurovet Animal Health B.V.  
Handelsweg 25  
5531 AE Bladel  
The Netherlands

Local representative and contact details to report suspected adverse reactions:

For any information about this veterinary medicinal product, please contact the local representative of the marketing authorisation holder.

**17. Other information**

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