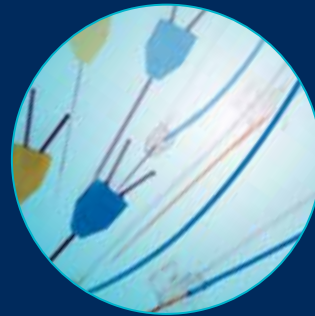


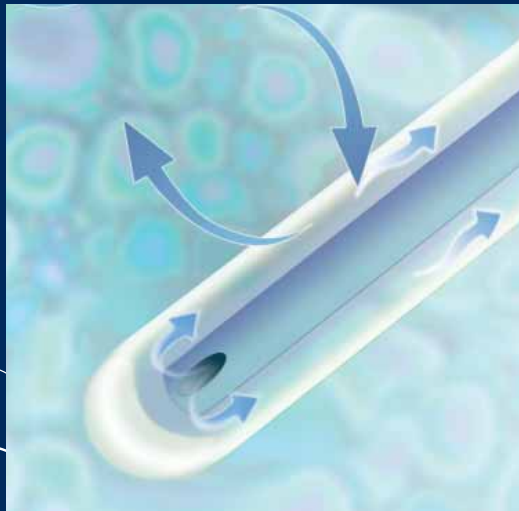
products for  
**MICRODIALYSIS**  
research



 **cma**

A Harvard Apparatus Company

products for **MICRODIALYSIS**  
research



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## Introduction

### Our Vision

*Exploring Tissue Chemistry!*

### The Company

CMA Microdialysis is a Swedish life science research tools company devoted to the development, manufacturing, and marketing of the microdialysis technique. The company was formed in 1984 as the first company in the world to market microdialysis products and know-how. Instruments and consumables are sold globally to universities and pharmaceutical companies as unique tools for *in vivo* sampling and monitoring of organs and tissues.

CMA is the market leader in the development and distribution of microdialysis products for scientific research.

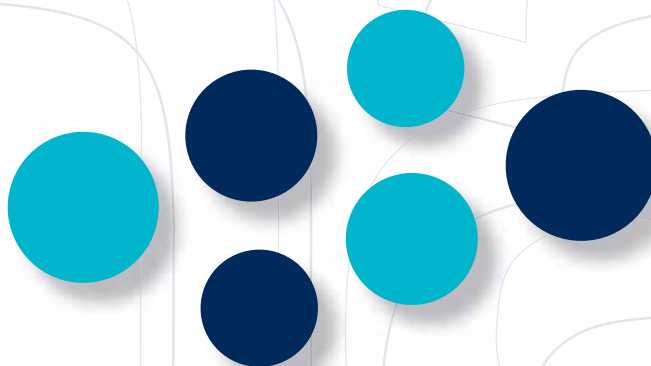
With a highly specialized and skilled staff, consumables are manufactured in a clean room environment. The head office is located outside Stockholm, Sweden. CMA has distributors across the globe, responsible for local sales, service and support.

### History

The concept of microdialysis was born in the early 1970's. While examining the cross-section of a blood vessel among fluorescent nerve endings, Professor Urban Ungerstedt of the Karolinska Institute in Stockholm had the idea of using a dialysis tube as "an artificial blood capillary", in order to monitor chemical events in the tissue. The first paper on microdialysis was published in 1974. Since then, more than 13,000 scientific papers have been published on the technique, among them some 3,000 clinical investigations.

The CMA 10 Microdialysis Probe, the first commercially produced microdialysis probe in the world, was probably the most significant contribution toward the boom in the use of microdialysis in neurobiological research. The CMA 10 Probe has since been followed by several modifications directed toward improved spatial resolution and ease of use, as well as the addition of several new lines of probes to suit many different applications.

CMA's business concept is to develop microdialysis as a standard research tool in academic and industrial laboratories. CMA works in close cooperation with scientists all over the world with particular emphasis on scientific support, method development, offering of courses, literature, and more. The many applications of microdialysis are rapidly increasing with the spread of the technique throughout the world, placing CMA Microdialysis at the forefront both in terms of research and development and as a manufacturer/supplier of microdialysis technology and know-how.



# Introduction

## Products

CMA develops and produces a complete range of microdialysis products. The basic research portfolio includes a broad range of probes, pumps, fraction collectors and complete systems for research.

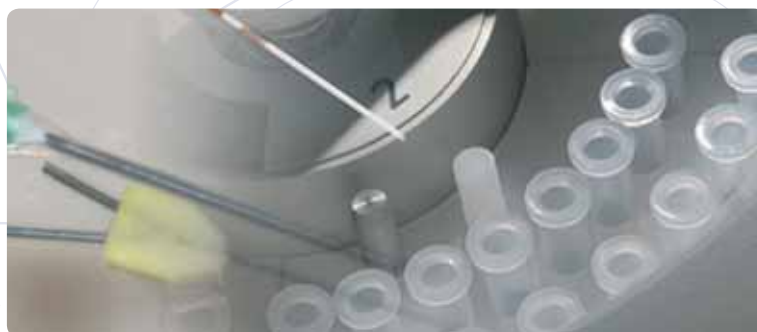
## Research Applications

For more than thirty years, microdialysis has been used to study brain neurophysiology and the release of neurotransmitters, monoamines, and metabolites, amino acids and other small endogenous compounds.

With the introduction of several new microdialysis probes for use in the peripheral organs, microdialysis is seeing widespread use in sampling molecules in tissues such as muscle, liver and adipose tissue, as well as in the spinal cord, synovial fluid, vitreous humour, and blood, to assess the delivery and distribution of parent drug and metabolites and their effects on endogenous compounds.

As global drug development costs continue to escalate, partially because of the high attrition rate of development candidates, there is increasing pressure to improve the predictability of clinical outcomes from preclinical studies.

By understanding the exposure in the appropriate biophase, as well as the effect of a drug candidate at the site of action, selection and optimal doses of the best compound can be improved. Microdialysis is a practical and data-rich *in vivo* method, which is an extremely useful tool to investigate the PK/PD profiles of drug candidates.



## Introduction

CMA's basic research solutions are used by leading pharmaceutical companies in the drug discovery process to assess drug concentrations at the site of drug action. Since the exchange of molecules through the dialysis membrane is in both directions, a microdialysis probe placed in target tissue can be used to continuously:

- Sample unbound drug and/or active metabolites as they arrive to the tissue following systemic administration.
- Deliver drug locally into an organ or tissue through the probe, and simultaneously collect endogenous target compounds to determine pharmacological effect.
- Assess controlled release of drugs from encapsulation *in vivo*, within specific tissues.

In summary, Microdialysis is a valuable tool for *in vivo* evaluation studies on drug delivery, drug metabolism, PK/PD, bioavailability, bioequivalence and pharmacological efficacy. It is the only technique that gives simultaneous *in vivo* temporal information on unbound drug and metabolic levels as well as endogenous compounds in target tissues.

### Sales and Distribution

CMA offers a complete and leading suite of microdialysis solutions to meet the needs of basic research. All products are produced under high quality standards and in a cleanroom environment in Sweden.

User meetings, seminars and courses are held regularly all over the world. Through a constant dialogue with our customers, the application areas of the microdialysis technique are expanding, and continuous development and improvement of our instruments is guaranteed.

Global support comes from the CMA Microdialysis home office located in Stockholm Sweden.







# *Microdialysis for Basic Research*

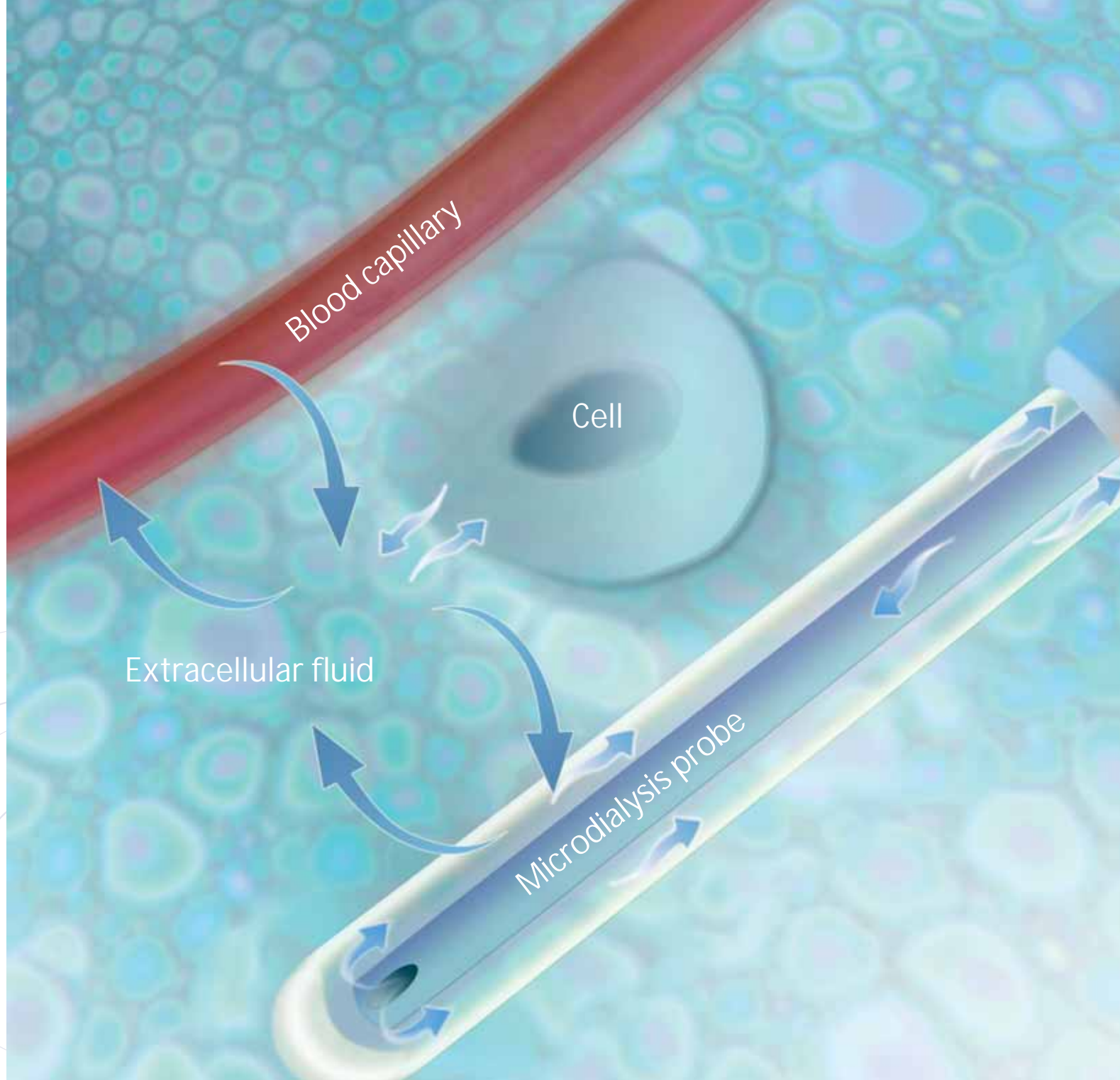


Microdialysis  
Probes

Microdialysis  
Instruments

Surgical  
Instruments





# The Principle of Microdialysis

Microdialysis is a technique used to monitor the chemistry of the extracellular space in living tissue. Microdialysis gives you a preview of what goes on in tissues, before chemical events can be reflected as changes in systemic blood levels. The microdialysis probe is designed to mimic a blood capillary and by keeping this metaphor in mind, it is easy to conceive of the many ways you can use this technique.

Following implantation into a tissue, a physiological salt solution is slowly pumped through the microdialysis probe. In the area of the membrane, this solution equilibrates with the surrounding tissue extracellular fluid such that when collected at the outlet, this microdialysate solution will contain a representative proportion of the tissue fluids molecules. It can then be analyzed for compounds that may have been present in this tissue compartment. A microdialysis probe is usually constructed as a concentric tube where the perfusion fluid enters through an inner tube, flows to its distal end, exits the tube, and enters the space between the inner tube and the outer dialysis membrane. The direction of flow is now reversed and the fluid moves toward the outlet tubing into a collection vial.

The "dialysis", i.e. the diffusion of molecules between the extracellular fluid and the perfusion fluid, takes place while the perfusion fluid passes between the inner tube and the dialysis membrane. It is important to realize that there is an exchange of molecules in both directions. The difference in concentration through the membrane governs the direction of the gradient.

An endogenous compound can be collected at the same time that an exogenous compound is introduced, for example a drug, into the tissue.

Recovery: The gradient of a particular compound depends not only on the difference in concentration between the perfusate and the extracellular fluid, but also on the velocity of flow inside the microdialysis probe.

The absolute recovery (mol/unit time) of a substance from the tissue depends on the cut-off of the dialysis membrane\*, the length of the membrane, the flow of the perfusion fluid, and the diffusion coefficient of the compound through the extracellular fluid.

\* Usually defined as the molecular weight in Daltons at which 80% of the molecules are prevented from passing through the membrane.



# Microdialysis Academy

## Design your own microdialysis experiment

The following is a simple checklist to help you design your own microdialysis experiment:

### 1. PROPERTIES OF THE PROBE MEMBRANE

A membrane with a low molecular weight cut off purifies your sample by excluding large molecules, while a high molecular cut off recovers some larger substances, such as peptides or proteins.

### 2. LENGTH OF THE MEMBRANE

A longer membrane yields a better recovery of the substances of interest, however, the choice may be limited by the size of the structure you want to study.

### 3. PERFUSION FLOW

Use a high flow if you want to remove or introduce as many molecules as possible per unit time or a low flow if you want to obtain a more concentrated dialysate. It is worth considering that a high flow is liable to disturb the physiology simply because more substances are removed.

### 4. COMPOSITION OF THE PERFUSION FLUID

Ideally, it should be as close as possible to the composition of the extracellular fluid. However, you may want to change the concentration of sodium, potassium, or calcium in order to influence the cell membrane function in the region you are studying.

### 5. TYPE OF PROBE

A stiff probe is suitable for a stereotaxic experiment on the brain while a flexible probe may be better suited for dialysis in a peripheral organ such as adipose tissue, muscle, liver, or kidney. A brain probe may require a pre-implanted guide cannula while a subcutaneous probe may be implanted an hour or so before the start of the experiment.

### 6. TIME NEEDED TO OBTAIN STEADY STATE CONDITIONS

The introduction of a probe into the tissue will always cause damage and the recovery of function will take a certain period of time. An hour or two is often used to reach "baseline conditions".



### 7. DOES THE ANIMAL HAVE TO BE AWAKE OR CAN IT BE KEPT UNDER ANAESTHESIA?

Using awake animals does not necessarily mean that the conditions are more "normal". An awake animal is subject to pain and stress that may influence the results as much as the anaesthesia.

### 8. DESIGN OF A CONTROL EXPERIMENT

This is certainly one of the most important parts of any experimental design. One may have difficulty in determining the influence of a great number of known or unknown variables in your experiment, however, a well designed control experiment will take care of many of these problems.

### 9. DOSE RESPONSE EXPERIMENTS

Microdialysis is a wonderful technique for studying drug actions. The ease by which one can follow the time course of local drug concentrations in tissue and drug effects on local physiology is one of the really strong points of the technique. However, it is surprising how few publications include a dose response study, especially as we know that the qualitative action of a drug often changes as the dose changes.

### 10. SAMPLE VOLUME REQUIRED FOR ANALYSIS

Is a small sample volume and a high concentration (e.g. HPLC) or a large sample volume and a high amount of the particular compound (e.g. RIA -Radio Immuno Assay) required? You may want to choose a low or a high perfusion flow, respectively.

### 11. TEMPORAL RESOLUTION NEEDED IN YOUR EXPERIMENT

Frequent sampling usually means higher perfusion flow in order to get enough sample volume for the analysis.

### 12. INSTRUMENT SET UP

For example, do you need to change the perfusion fluid during the experiment in order to introduce a drug or change the ionic composition of the fluid? In that case you may need a liquid switch or a pump with syringes that can be individually controlled.

# Microdialysis Systems and Configurations

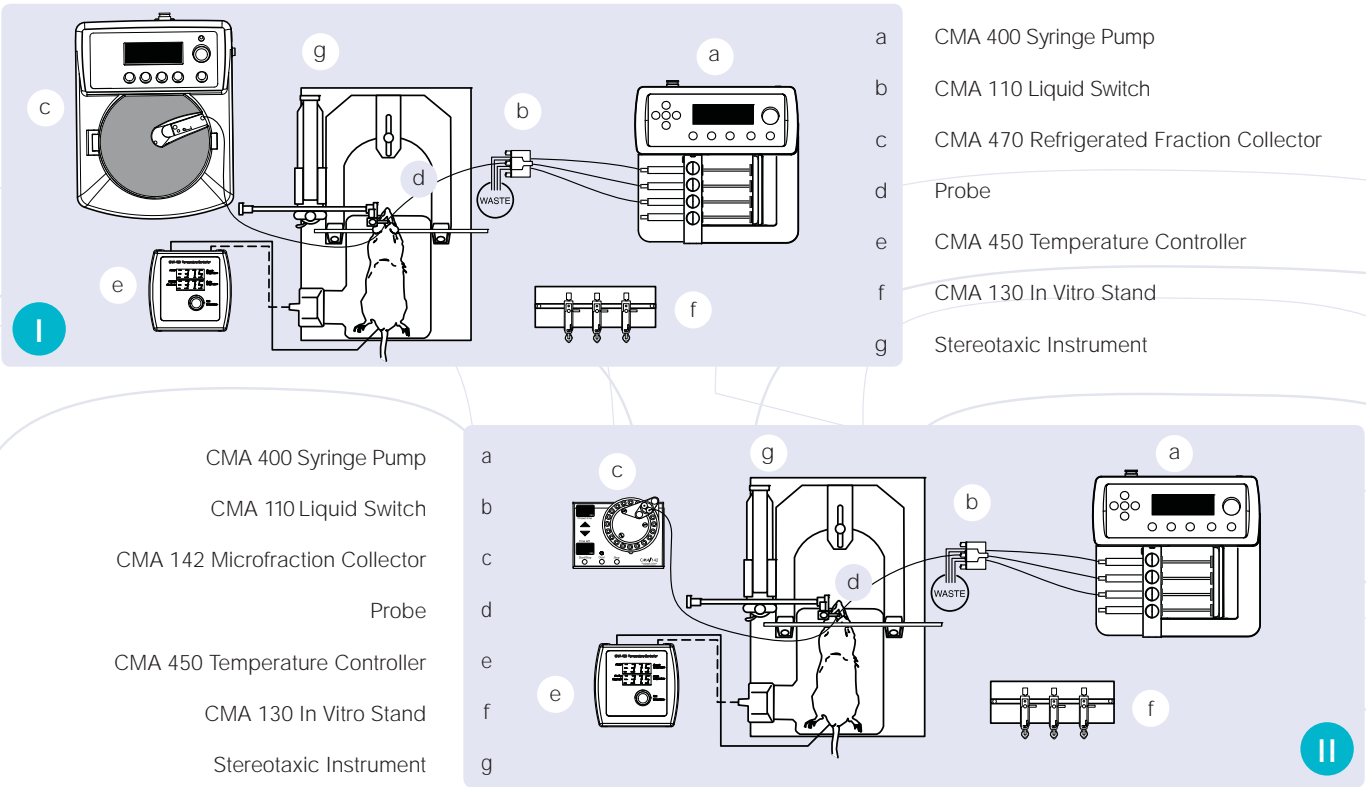
## Overview

**THERE ARE A FEW DIFFERENT MODELS** of each component in the Microdialysis system and each is described in this catalog. Your choice of components, or system configuration, should be based on the application and the experimental requirements. After deciding to work with anesthetized or freely moving animals, take a look at a few of the more common configurations below, from the basic system with a two-syringe pump and 20-sample fraction collector, to the four-syringe pump with 64-sample refrigerated fraction collector. If you don't see the system that is right for you, design your own. Your CMA Representative will be glad to help you. Just don't forget the small surgical supplies and accessories such as the syringes, perfusion fluid, tubing and adapters, trephine drills, anchor screws, probes, and guide cannulae, as well as probe clips, vials, and caps which complete the system.

**A microdialysis system may include the following:**

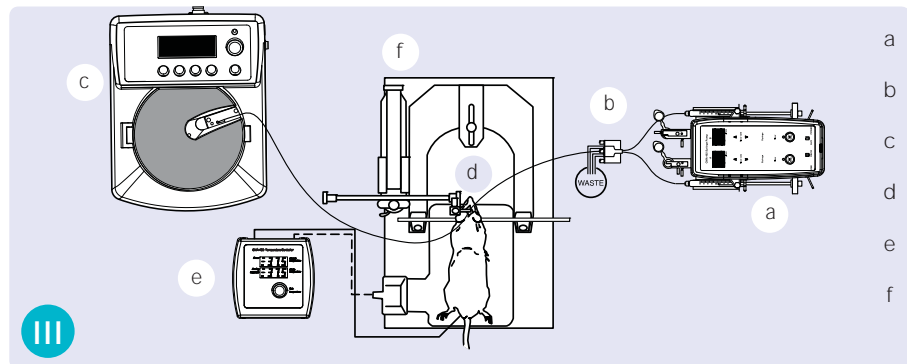
- ★ Syringe pump ★ Syringes, perfusion fluid ★ Liquid switch ★ *In Vitro* storage stand ★ Microdialysis probes and guide cannula
- ★ Fraction collector ★ Temperature controller ★ Tubing and tubing adapters ★ Surgical supplies and accessories

### Microdialysis Systems for Anesthetized Animals



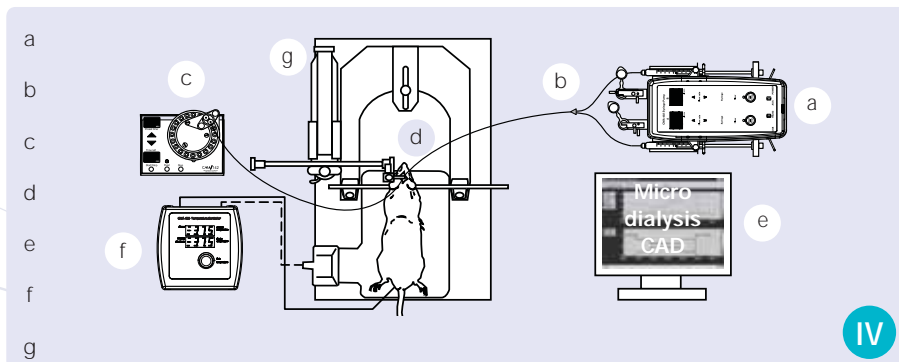
# Microdialysis Systems and Configurations

## Overview

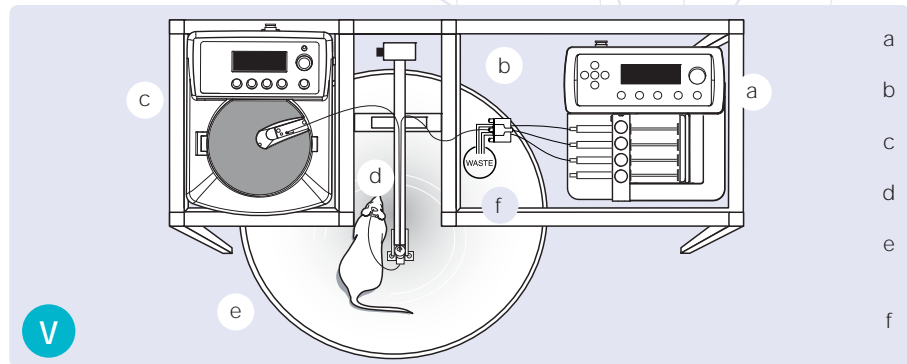


- a CMA 402 Syringe Pump
- b CMA 110 Liquid Switch
- c CMA 470 Refrigerated Fraction Collector
- d Probe
- e CMA 450 Temperature Controller
- f Stereotaxic Instrument

- CMA 402 Syringe Pump
- Micro T
- CMA 142 Microfraction Collector
- Probe
- MdCAD software
- CMA 450 Temperature Controller
- Stereotaxic Instrument



## Microdialysis Systems for Freely Moving Animals



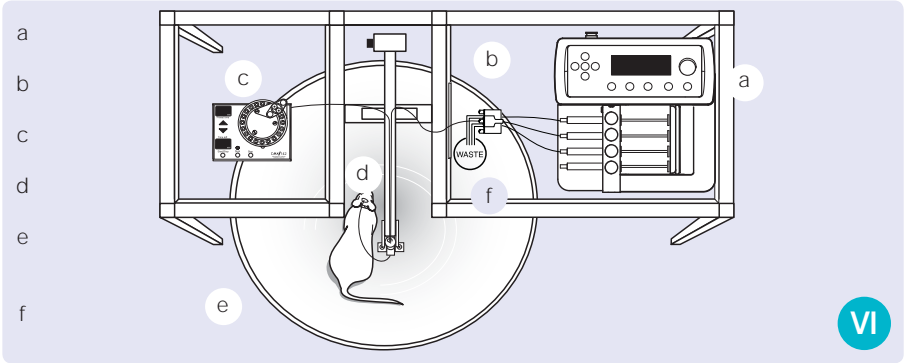
- a CMA 400 Syringe Pump
- b CMA 110 Liquid Switch
- c CMA 470 Refrigerated Fraction Collector
- d Probe
- e CMA 120 System for Freely Moving Animals (incl. Bowl, Swivel Assembly and Balance Arm)
- f Instrument Table



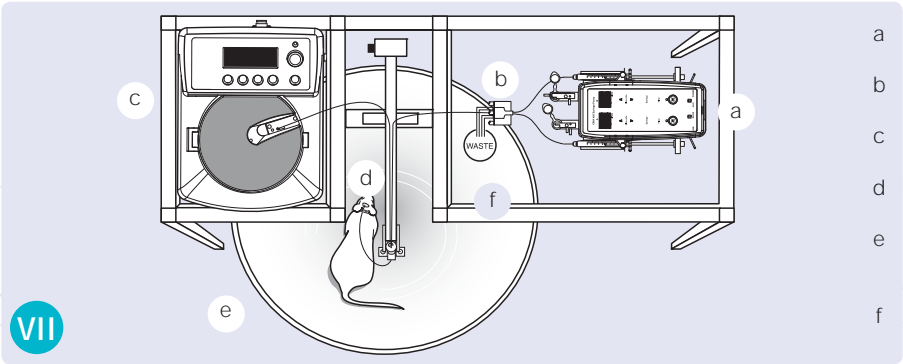
# Microdialysis Systems and Configurations

## Overview

- CMA 400 Syringe Pump
- CMA 110 Liquid Switch
- CMA 142 Microfraction Collector
- Probe
- CMA 120 System for Freely Moving Animals (incl. Bowl, Swivel Assembly and Balance Arm)
- Instrument Table



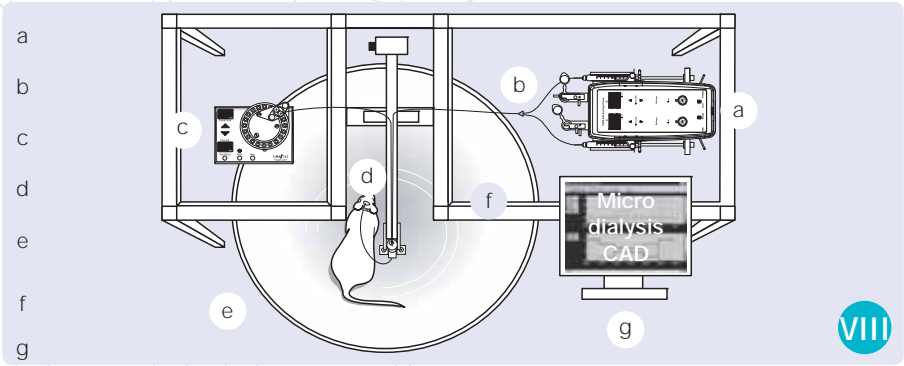
VI



VII

- CMA 402 Syringe Pump
- CMA 110 Liquid Switch
- CMA 470 Refrigerated Fraction Collector
- Probe
- CMA 120 System for Freely Moving Animals (incl. Bowl, Swivel Assembly and Balance Arm)
- Instrument Table

- CMA 402 Syringe Pump
- Micro T
- CMA 142 Microfraction Collector
- Probe
- CMA 120 System for Freely Moving Animals (incl. Bowl, Swivel Assembly and Balance Arm)
- Instrument Table
- Md CAD Software



VIII



# Microdialysis Probes

## Overview

### CMA 7 Probe + Guide Cannula



- Ideal for CNS studies in small animals
- Designed for dialysis in transgenic mice, available  $\beta$ -irradiated
- Low internal volume
- Available membrane: Cuprophane, 6 kDa MWCO
- Membrane lengths - 1 and 2 mm
- Membrane diameter - 0.24 mm
- Coordinating guide cannula

### CMA 11 Probe + Guide Cannula



- For use in discrete brain regions
- High spatial resolution, available  $\beta$ -irradiated
- Causes minimal tissue damage
- Available membrane: Cuprophane, 6 kDa MWCO
- Membrane lengths - 1, 2, 3 or 4 mm
- Membrane diameter - 0.24 mm
- Coordinating guide cannula

### CMA 12 Probe + Guide Cannula

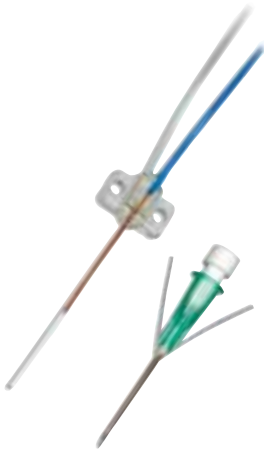


- Optimized for CNS use
- Ideal for chronic implantation
- Range of different lengths
- Available membranes: PAES, 20 kDa MWCO; PES, 100 kDa MWCO
- Membrane lengths - 1, 2, 3 or 4 mm
- Membrane diameter - 0.5 mm
- Coordinating guide cannula

**ALL CMA MICRODIALYSIS PROBES** have the same concentric construction except the linear probes. An inner cannula leads the perfusion fluid from the inlet to the tip of the probe where it comes in contact with the semi-permeable membrane. The fluid then continues up through the outer shaft on its way to the outlet. All metal parts are treated to prevent oxidation of labile compounds in the perfusate. A variety of probe types, sizes, and membranes are described over the next few pages. Probes are delivered in vacuum-sealed packages, 3 pcs/pkg, or 4 pcs/pkg, and each probe is guaranteed for a single use. Flexible probes are packaged with introducers and split tubing guides. The linear probes consist of a tubing in which the middle part has a window with a membrane, where microdialysis takes place. Complete instructions are included in each package.

# Microdialysis Probes

## Overview

**CMA 20 Probe + Introducer****CMA 30 Linear Probe****CMA 31 Linear Probe****Custom Made Probes**

- Tailored for dialysis in peripheral tissues and blood vessels
- Inlet and outlet tubing is attached
- Soft, non-metallic construction
- Available membranes: PAES, 20 kDa MWCO  
PES, 100 kDa MWCO
- Membrane lengths - 4 or 10 mm
- Ideal for peripheral tissues as well as for spinal cord and tumors
- Soft and flexible construction
- Can be sterilized with ethylene oxide
- Available membrane: Cuprophane, 6 kDa MWCO
- Membrane lengths - 10 mm
- Ideal for peripheral tissues as well as for spinal cord and tumors
- Soft and flexible construction
- Can be sterilized with ethylene oxide
- Available membrane: PAES, 55 kDa MWCO
- Membrane lengths - 10 mm
- For all occasions when standard probes are not appropriate
- Variety of styles and sizes according to the physio-chemical characteristics of recovered molecules, various organs, and biological species
- Customer specified style, shaft length, membrane type, membrane length and cut-off
- Coordinating guide cannula

# CMA 7 Microdialysis Probe

Specially suited for CNS in mice

## ORDERING INFORMATION

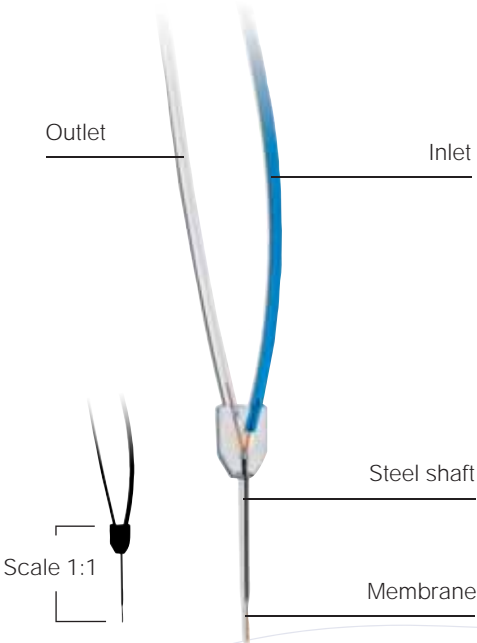
CMA 7 Microdialysis Probe  
3/pkg

Available membrane:  
Cuprophane, 6000 Daltons cut-off

	Ref. No.
Membrane length	
1 mm	CMA 000082
2 mm	CMA P000083
β-irradiated	
1 mm	CMA 8010681
2 mm	CMA 8010682

## TECHNICAL INFORMATION

Stainless-steel shaft diameter	0.38 mm
Shaft length	7 mm
Membrane diameter	0.24 mm
Inlet internal volume	negligible
Outlet internal volume	0.3 µL
200 mm Inlet tubing (blue)	3.6 µL
200 mm Outlet tubing (transp.)	3.6 µL



- \* Extremely small
- \* Optimized for CNS use
- \* Ideal for chronical implantation
- \* Inlet and outlet tubing directly mounted
- \* Available β-irradiated

**THE CMA 7 MICRODIALYSIS PROBE** is ideal for use in small areas of the brain or spinal cord of small animals. It is especially suitable for studies in transgenic mice. A β-irradiated version of this product is available for use in experiments where it is essential to minimize contamination by pathogens.

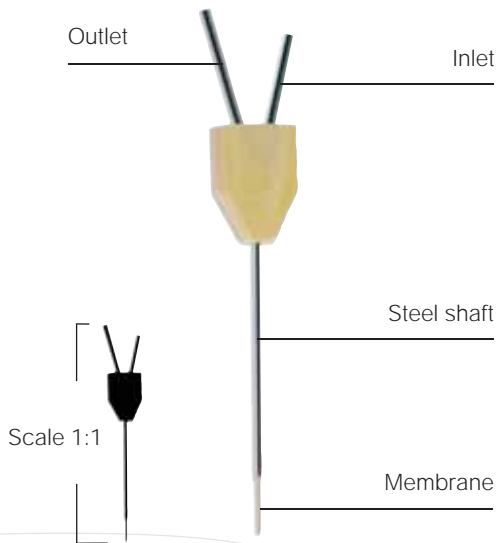
The construction and geometry of the probe tip is exactly the same as in the CMA 11. The outer diameter of the CMA 7 Microdialysis Probe is 0.24 mm and the shaft length is 7 mm. The steel shaft is treated to prevent oxidation of labile compounds in the perfusate.

An extremely small plastic body where the inlet and outlet tubing are directly mounted makes the probe easy to implant and light for a small animal to carry. A coordinating small and lightweight guide cannula is available (see probe guides, page 20).

CMA 7 Microdialysis Probes are guaranteed for single use. Complete instructions are included in each package.

# CMA 11 Microdialysis Probe

for discrete areas in the CNS



- \* Small diameter
- \* High spatial resolution
- \* Minimal tissue damage
- \* Low internal volume
- \* Available  $\beta$ -irradiated

**THE CMA 11 MICRODIALYSIS PROBE** is ideal for use in small areas of the brain or spinal cord, possesses greater spatial resolution, and causes less tissue damage due to its reduced size. The probe has a cuprophane membrane with an outside diameter of 0.24 mm. The outer steel shaft diameter is 0.38 mm. The inner cannula is constructed of fused silica coated with polyimide. The inlet/outlet capillaries are mounted in a yellow plastic body matched to the size of a corresponding guide cannula. Once implanted, the probe sits tightly in the guide cannula's capsule without the need for screwing or cementing. FEP tubing is connected to the probe using tubing adapters (see accessories, page 22-23).  $\beta$ -irradiated CMA 11 probes are available for use in experiments where it is essential to minimize contamination by pathogens. Note: not for use in humans.

The CMA 11 Microdialysis Probes are guaranteed for single use. Complete instructions are included in each package.

## ORDERING INFORMATION

CMA 11 Microdialysis Probe  
3/pkg

Available membrane:  
Cuprophane, 6000 Daltons cut-off

	Ref. No.
Membrane length	
1 mm	CMA 8309581
2 mm	CMA 8309582
3 mm	CMA 8309583
4 mm	CMA 8309584
$\beta$ -irradiated	
1 mm	CMA 8011001
2 mm	CMA 8011002
3 mm	CMA 8011003
4 mm	CMA 8011004

## TECHNICAL INFORMATION

Stainless-steel shaft diameter	0.38 mm
Shaft length	14 mm
Membrane diameter	0.24 mm
Inlet internal volume	negligible
Outlet internal volume	1 $\mu$ L

# CMA 12 Microdialysis Probe

for regular use in the CNS

## ORDERING INFORMATION

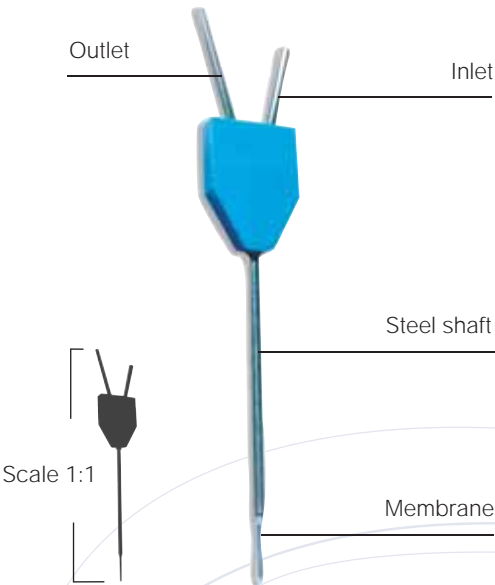
CMA 12 Microdialysis Probe  
3/pkg

Available membranes:  
Polyarylethersulfone (PAES), 20 000 Daltons cut-off  
Polyethersulfone (PES), 100 000 Daltons cut-off

Membrane length	Ref. No.
<b>CMA 12 Elite</b>	
1 mm	CMA 8010431
2 mm	CMA 8010432
3 mm	CMA 8010433
4 mm	CMA 8010434
<b>CMA 12 High cut-off</b>	
2 mm	CMA 8309662
3 mm	CMA 8309663
4 mm	CMA 8309664

## TECHNICAL INFORMATION

Stainless-steel shaft diameter	0.64 mm
Shaft length	14 mm
Membrane diameter	0.5 mm
Inlet internal volume	negligible
Outlet internal volume	3 µL



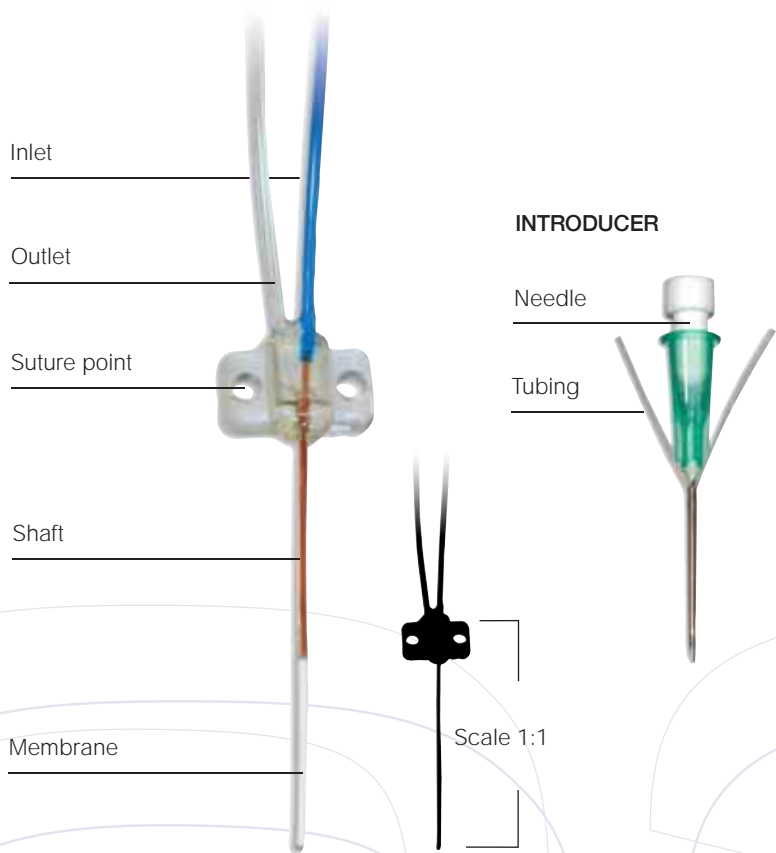
- ★ Optimized for CNS use
- ★ Easily reusable
- ★ Ideal for chronic implantation
- ★ 20 000 and 100 000 Daltons cut-off

**THE CMA 12 MICRODIALYSIS PROBE** is ideal for stereotaxic work in the CNS of anesthetized or conscious animals. A semi-permeable membrane is glued between the tip of the inner steel cannula and the outer steel shaft. The perfusion fluid enters the membrane space through the inner cannula and flows into the shaft to the outlet. All metal parts are treated to prevent oxidation of labile compounds in the perfusate. The membrane is available in both 20 000 and 100 000 Daltons cut-off.

The inlet and outlet are mounted in a plastic body matched to the size of a corresponding CMA 12 guide cannula. Once implanted, the probe sits tightly in the guide cannula's capsule without the need for screwing or cementing. FEP tubing can be connected to the probe using tubing adapters (see accessories, page 22-23).

# CMA 20 Microdialysis Probe

## A flexible probe for peripheral tissues



- \* Soft, non-metallic construction
- \* Easy implantation procedure
- \* Ideal for cell metabolism studies
- \* 20 000 and 100 000 Daltons cut-off

**THE CMA 20 MICRODIALYSIS PROBE** is designed for dialysis experiments in moving soft tissues such as muscle, heart, skin and adipose tissue, as well as in blood, vitreous fluid of the eye, synovial fluid etc. As with the other models, the probe is constructed in a concentric design, but is made completely from plastic materials. Due to its flexibility, the probe must be implanted in the tissue with the help of a steel needle and split tubing, the Introducer. The membrane is available in both 20,000 and 100,000 Daltons cut-off.

The CMA 20 Microdialysis Probes are guaranteed for single use. Complete instructions are included in each package.

### ORDERING INFORMATION

#### CMA 20 Microdialysis Probe

Includes:  
3 Probes/pkg  
3 Introducers/pkg  
9 Split Tubing/pkg

Available membranes:  
Elite: Polyarylethersulfone (PAES)  
20,000 Daltons cut-off  
High cut-off: Polyethersulfone (PES)  
100,000 Daltons cut-off

Membrane length

**CMA 20 Elite**

4 mm

10 mm

**CMA 20 High cut-off**

4 mm

10 mm

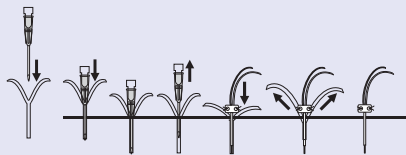
Ref. No.

**CMA 8010435**

**CMA 8010436**

**CMA 8309670**

**CMA 8309671**



Implantation of the CMA 20 Microdialysis Probe, step by step.

### TECHNICAL INFORMATION

Probe length (shaft+membrane)	24 mm
Polyurethane shaft diameter	0.77 mm
Membrane diameter	0.5 mm
Inlet internal volume	1.4 µL
Outlet internal volume:	
4 mm membrane	3.2 µL
10 mm membrane	2.6 µL
200 mm Inlet tubing (blue)	3.6 µL
200 mm Outlet tubing (transparent)	3.6 µL

# CMA 30 Linear Microdialysis Probe

Ideal for peripheral tissues

## ORDERING INFORMATION

### CMA 30 Linear Microdialysis Probe 4/pkg

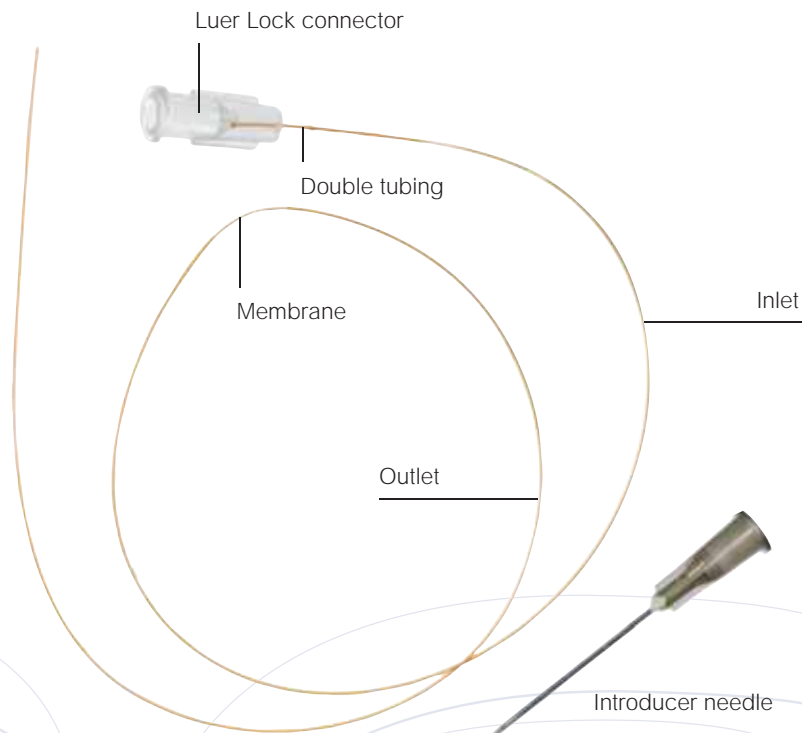
Available membranes:  
Cuprophane, 6,000 Daltons cut-off

Membrane length  
10 mm

Ref. No.  
**CMA 8010460**

## TECHNICAL INFORMATION

Membrane material	<b>Cuprophane</b>
Membrane diameter	<b>0.24 mm</b>
Membrane length	<b>10 mm</b>
Tubing material	<b>Polyimide</b>
Tubing ID	<b>0.28 mm</b>
Tubing OD	<b>0.38 mm</b>
Inlet and outlet lengths	<b>250 mm</b>
Double tubing material	<b>Polyurethane</b>
Double tubing OD	<b>0.63 mm</b>
Double tubing length	<b>12 mm</b>



- \* Ideal for peripheral tissues as well as for tumors
- \* Soft and flexible construction
- \* Easy implantation
- \* Can be sterilized with ethylene oxide

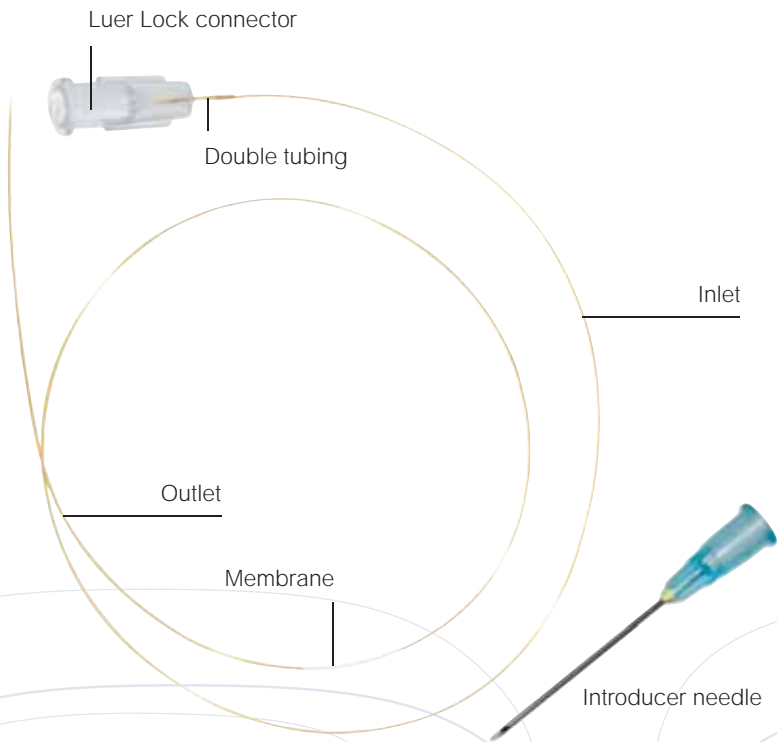
**THE CMA 30 LINEAR MICRODIALYSIS PROBE** is ideal for peripheral tissues such as skin, muscle, heart, adipose tissue, liver, eye, pancreas, as well as spinal cord and tumors.

The probe consists of tubing, in which the middle part has a window where the membrane is located. Along the membrane, a thin part of the tubing remains to increase the stability and also to support the membrane during withdrawal from the tissue. The inlet of the probe has a Luer Lock connector that can be attached to a single use syringe, or can be cut off in order to use a glass syringe with a fixed needle and a tubing adapter.

One package contains 4 probes, each in an individual pouch that includes an introducer. The probe can be sterilized in its package with ethylene oxide and each is guaranteed for single use.

# CMA 31 Linear Microdialysis Probe

Ideal for peripheral tissues



- \* Ideal for peripheral tissues as well as for tumors
- \* Soft and flexible construction
- \* Easy implantation
- \* Can be sterilized with ethylene oxide

**THE CMA 31 LINEAR MICRODIALYSIS PROBE** is ideal for peripheral tissues such as skin, muscle, heart, adipose tissue, liver, eye, pancreas as well as spinal cord and tumors. The unique patented probe is very thin and has a 10 mm membrane with a 55,000 Daltons cut-off. This membrane allows studies on a wide range of substances.

The probe is easy to implant, using an introducer needle that is included. The inlet of the probe has a Luer Lock connector, which can be attached to a single-use syringe, or removed in order to use a glass syringe with a fixed needle and a tubing adapter.

One package contains 4 probes, each in an individual pouch, and includes an introducer. The probe can be sterilized in its package with ethylene oxide and each is guaranteed for single use.

## ORDERING INFORMATION

### CMA 31 Linear Microdialysis Probe 4/pkg

Available membrane:  
Polyethersulfone, 55 000 Daltons cut-off

Membrane length  
10 mm

Ref. No.

**CMA 8010631**

## TECHNICAL INFORMATION

Membrane material	<b>Polyethersulfone</b>
Membrane diameter	<b>0.26 mm</b>
Membrane length	<b>10 mm</b>
Tubing material	<b>Polyimide</b>
Tubing ID / OD	<b>0.12/0.19 mm</b>
Inlet lengths	<b>350 mm</b>
outlet lengths	<b>100 mm</b>
Double tubing OD	<b>0.63 mm</b>
Double tubing length	<b>12 mm</b>



## Probe Guide Cannulae for Intracerebral Implantation

### ORDERING INFORMATION

#### Probe Guides

##### CMA 7 Guide Cannula

3/pkg  
30/pkg

Ref. No.

CMA P000137  
CMA P000138

##### CMA 11 Guide Cannula

3/pkg  
30/pkg

CMA 8309017  
CMA 8309018

##### 12 Guide Cannula

3/pkg  
30/pkg

CMA 8309024  
CMA 8309025

#### Custom Made Guides\*

Ref. No.

##### CMA 7 Guide Cannula, Custom Made

3/pkg  
30/pkg

CMA 8010313  
CMA 8010314

##### CMA 7 Guide $\beta$ -irradiated, Custom Made

3/pkg  
30/pkg

CMA 8010683  
CMA 8010684

##### CMA 11 Guide Cannula

3/pkg  
30/pkg

CMA 8309029  
CMA 8309030

##### CMA 11 Guide $\beta$ -irradiated, Custom Made

3/pkg  
30/pkg

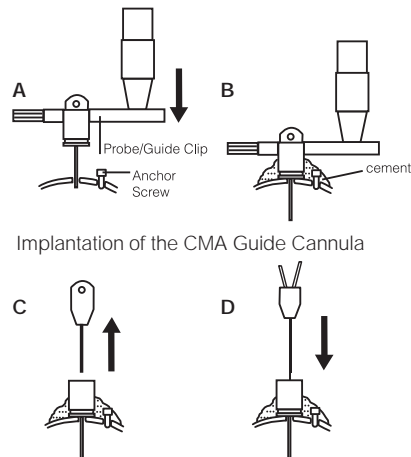
CMA 8011031  
CMA 8011032

##### CMA 12 Guide Cannula

3/pkg  
30/pkg

CMA 8309008  
CMA 8309009

\* Specify shaft length.



- \* Guide use allows longer post-surgical recovery
- \* Made of biocompatible materials
- \* Silicone coating prevents sticking
- \* Simple press-fit design to easily set probe

#### CMA 7, CMA 11, AND CMA 12 GUIDE CANNULA

In many situations the intracerebral probe has to be implanted in a conscious animal or when experiments are performed on chronically implanted animals. In these cases, the implantation is facilitated by using guide cannulae.

These guide cannulae are made of biocompatible polyurethane. The cannulae are coated with silicone on the inside in order to prevent sticking of a dummy or probe. The guide cannula can be mounted to the stereotaxic instrument using a standard probe clip. Other small items such as trephine drill bits and anchor screws (see accessories, page 22-23) are necessary for proper fixation of the guide cannula to the skull.

Always consult CMA Microdialysis headquarters before ordering custom-made guides.

\* Customer specified shaft length.

# Custom Made Probes for Special Applications



- ★ Customer specified shaft length
- ★ Different membrane materials
- ★ Customer specified membrane length
- ★ Non-metallic probes

**A VARIETY OF DIFFERENT** constructions and sizes of microdialysis probes are available for various organs and biological species. Similarly, the length, the molecular weight cut-off, and the type of membrane should be optimized according to the physio-chemical characteristics of recovered molecules. Besides the standard types and lengths of microdialysis probes, CMA Microdialysis also offers custom-made probes of specific materials and in various geometries.

Always consult CMA Microdialysis headquarters before ordering custom-made probes.

## ORDERING INFORMATION

### Custom Made Probes

	Ref. No.
<b>CMA 7 Custom Made 3/pkg</b>	
3 pkg	CMA 8010391
4-10 pkg	CMA 8010392
>10 pkg	CMA 8010393
<b>CMA 11 Custom Made 3/pkg</b>	
3 pkg	CMA 8010394
4-10 pkg	CMA 8010395
>10 pkg	CMA 8010396
<b>CMA 12 Custom Made 3/pkg</b>	
3 pkg	CMA 8010397
4-10 pkg	CMA 8010398
>10 pkg	CMA 8010399
<b>CMA 20 Custom Made 3/pkg</b>	
3 pkg	CMA 8010400
4-10 pkg	CMA 8010401
>10 pkg	CMA 8010402
<b>CMA 30 Linear Custom Made 4/pkg</b>	
3 pkg	CMA 8010498
4-10 pkg	CMA 8010499
>10 pkg	CMA 8010500

Specify: Probe type, shaft material and length and membrane material and length.

Accessories

ORDERING INFORMATION

	Ref. No.
CMA 11 + 12 Clip	CMA 8309013
CMA 7 Clip	CMA P000136
CMA Probe Shaft Clip	CMA 8309003
FEP Tubing 1 m	CMA 3409501
FEP Tubing 1 m x 10/pkg	CMA 8409501
Tubing Adapters 10/pkg	CMA 3409500
Trephine Drill Bits, 3/pkg	CMA 7431058
Anchor Screw Drill Bits, 3/pkg	CMA 8003264
Anchor Screws, 100/pkg	CMA 7431021
Screw Driver Kit	CMA 8003267
Perfusion Fluid T1 5 mL, 10/pkg	CMA P000034
Perfusion Fluid CNS 5 mL, 10/pkg	CMA P000151
CMA 20 Split Tubing, 10/pkg	CMA 8309019
Glass Ionomer Cement Kit for Headblocks, supplied individually	CMA 72-9168
Replacement Glass Ionomer Cement Capsules, pkg. of 5	CMA 72-9169

Perfusion Fluid T1  
5 mL glass ampoules, 10/pkg

Contents:

NaCl	147 mmol/L
KCl	4 mmol/L
CaCl <sub>2</sub>	2.3 mmol/L

Total chloride content:  
155.6 mmol/L

Perfusion Fluid CNS  
5 mL glass ampoules, 10/pkg

Contents:

NaCl	147 mmol/L
KCl	2.7 mmol/L
CaCl <sub>2</sub>	1.2 mmol/L
MgCl <sub>2</sub>	0.85 mmol/L

Total chloride content:  
153.8 mmol/L

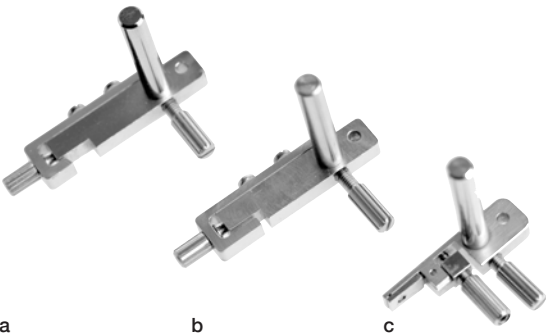
CMA PROBE CLIPS

These clips are used in conjunction with a connecting rod and adapter in stereotaxic work to place the probe or guide in an exact position in the tissue. The clips are also used separately when preparing and testing the probe.

There are three types of clips (FIG. 1):

The CMA 11+12 Clip holds the flat body of the CMA 11 or CMA 12 Probes or the CMA 11 and CMA 12 Guide Cannulae. The CMA 7 Clip holds the body of a CMA 7 Probe or Guide Cannula and the CMA Probe Shaft Clip holds the shaft of a probe.

FIG. 1



Probe/Guide Clips:  
a) CMA 11+12 Clip, b) CMA 7 Clip, c) CMA Probe Shaft Clip

FEP TUBING (FIG. 2)

This precise tubing with 0.12 mm inner diameter (internal volume of 1.2 µL/100 mm length) is, together with the Tubing Adapters, ideal for use in microdialysis experiments.

FIG. 2



TUBING ADAPTERS (FIG. 3)

These simple but secure connectors, which swell in 70% alcohol and shrink back in air, ensure tight, zero internal volume connections between FEP Tubing and the probe, swivel, liquid switch and syringes.

FIG. 3



FIG. 4

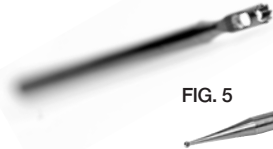
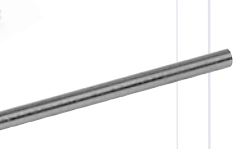


FIG. 5



## Accessories

**TREPHINE DRILL BITS (FIG. 4), SCREW DRILL BITS (FIG. 5), ANCHOR SCREWS (FIG. 6) AND SCREW DRIVER SET (FIG. 7)**

The use of a trephine drill in the skull bone gives a clean 2 mm hole that makes the implantation of a probe easier with less risk of tearing the membrane. Anchor screws are placed in the skull plates before cementing the guide cannula to provide extra stability to the mount. Suitable Screw Drill Bits and Screw Driver Kit for the Anchor Screws are available.

FIG. 6



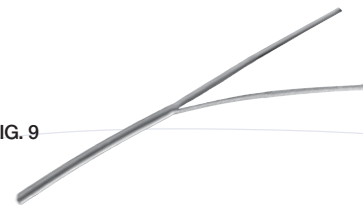
FIG. 7



FIG. 8



FIG. 9

**PERFUSION FLUID (FIG. 8)**

This isotonic sterile perfusion fluid is specially developed for microdialysis use.

T1 fluid is for use in peripheral tissues and CNS fluid is used in studies of the Central Nervous System.

**SPLIT TUBING (FIG. 9)**

Extra split tubing for CMA 20 probes, to be used when re-using the probes

**GLASS IONOMER CEMENT (FIG. 10)**

This resin-based glass ionomer cement is ideal for permanent head attachment of microdialysis probes and head block tethers in rats and mice. It has significant advantages over the more commonly used methylmethacrylate cements. It bonds to bone, eliminating the need for bone screws in most cases. It has a lower temperature increase during polymerization. And it hardens more quickly with no noxious fumes.

The starter kit includes an applicator, five capsules and an SOP for rodent head attachment. Sold for laboratory animal research applications only.

FIG. 10



# CMA 120 System for Freely Moving Animals

## ORDERING INFORMATION

### CMA 120 System for Freely Moving Animals

Ref. No.

**CMA 8309049**

## Includes:

CMA 120 Plastic Bowl  
CMA 120 Swivel Assembly  
CMA 120 Balance arm  
Plastic Collar 100 pcs  
Tubing Adapters 10 pcs  
FEP tubing 1 m  
Vial, Plastic 300  $\mu$ L, 25 pcs  
Caps, Plastic, 25 pcs

CMA 120 Plastic Bowl with Food  
and Water Containers

**CMA 8309672**

CMA 120 System for  
Freely Moving Animals



CMA 120 Plastic Bowl with  
Food and Water Containers

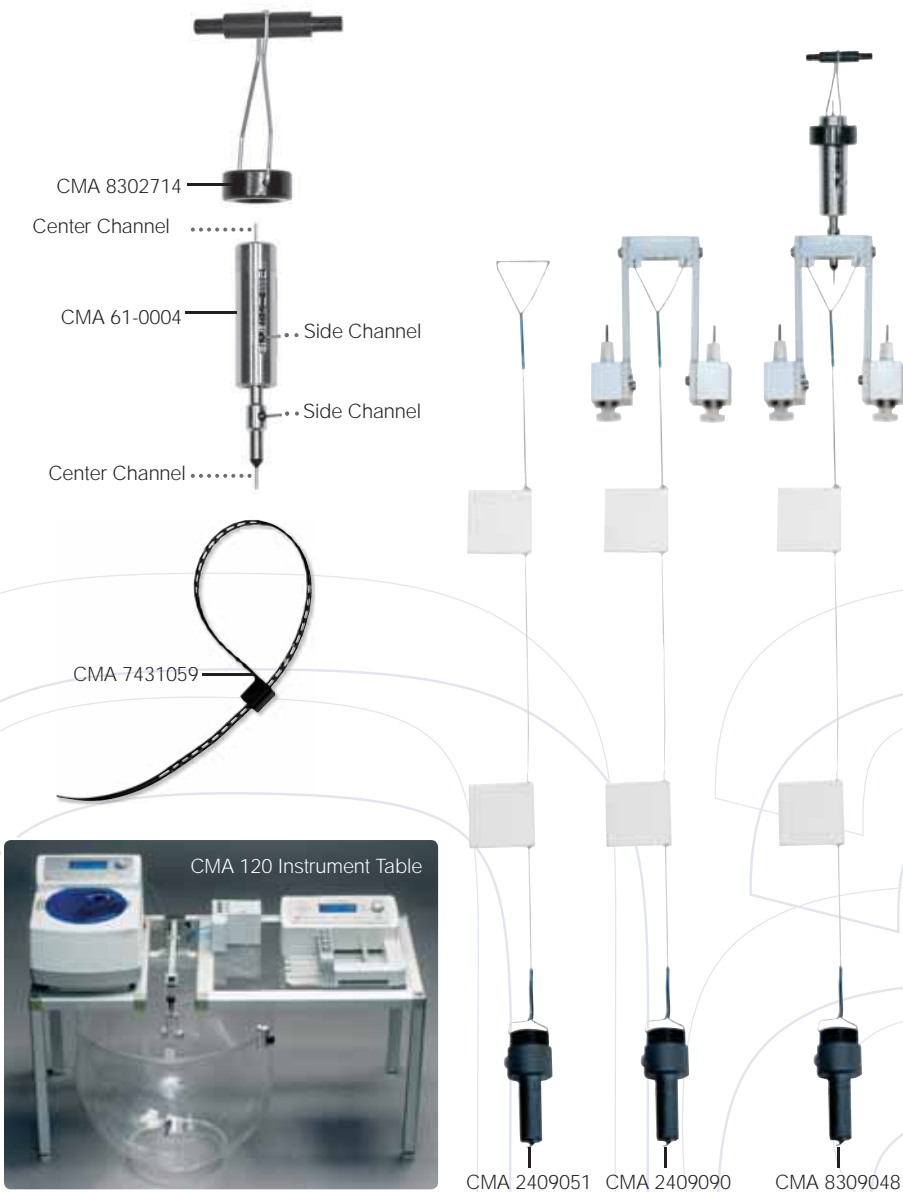
- ★ Balance arm with dual channel swivel
- ★ Secures tubing away from the animal and prevents twisting

**THE CMA 120 SYSTEM FOR FREELY MOVING ANIMALS** enables Microdialysis studies on conscious, small laboratory animals over long periods of time. The CMA 120 instrument can be used in combination with any one of the microdialysis systems (see pages 9-11). The microdialysis probe is attached to a CMA Syringe Pump, the CMA 110 Liquid Switch, and to any of the CMA 142 or CMA 470 collection devices via a dual channel swivel. The swivel is mounted on the balancing arm allowing free movement of the animal. The swivel brace holds a wire with a collar connector and two holders for 300  $\mu$ L plastic vials. The wire attached to the animal collar turns the swivel and supports the tubing. Manual fraction collection is used when two microdialysis probes are implanted, or when microdialysis is combined with local injection via one channel of the swivel.

**THE NEW CMA 120 BOWL WITH FOOD & WATER CONTAINERS** is used in studies where a freely moving animal will be contained for longer periods of time. The additions of these containers allow the animal to feed and drink ad libitum. The food container and water bottle are arranged on the outside of the bowl so as not to disturb the movement of the tethered animal when inside the bowl. Both containers are easily removed for cleaning and refilling.

# CMA 120 System for Freely Moving Animals

Accessories



## ORDERING INFORMATION

### CMA 120 System for Freely Moving Animals, accessories

	Ref. No.
CMA 120 System without Bowl	CMA 8409029
CMA 120 Plastic Bowl	CMA 8309031
CMA 120 Swivel Assembly	CMA 8309048
CMA 120 Swivel Assembly without Swivel	CMA 2409090
CMA 120 Wire Set with Collar Connector	CMA 2409051
CMA 120 Balance arm	CMA 8309032
Gimbal for Swivel	CMA 8002714
Dual Channel Swivel	CMA 61-0004
Dual Channel Swivel for mouse	CMA 8001346
Clamp for In Vitro Holder	CMA 8409033
Plastic Collar 100/pkg	CMA 7431059
Tubing Adaptors 10/pkg	CMA 3409500
FEP tubing, 1 m	CMA 3409501
FEP tubing, 10 x 1m/pkg	CMA 8409501

**CMA 120 Instrument Table**  
For use in organizing all the components of your microdialysis experiment for ease of operation  
See accessories next page.



CMA 2409051 CMA 2409090 CMA 8309048

## Mouse Infusion Cage

### ORDERING INFORMATION

#### Mouse Infusion Cage

Ref. No.

##### Mouse Infusion Cage

Polycarbonate	CMA 61-0046
(21.6 cm (8.5 in) high)	CMA 72-0014
with Pellet Feeder	CMA 72-0015
with Water Bottle	CMA 72-0016
with Pellet Feeder & Water Bottle	CMA 72-0016

##### Accessories for Mouse Infusion Cage

Cover	CMA 61-0048
Bottom Screen	CMA 61-0047
3.5 in (8.9 cm) Counter-Balanced Lever Arm	CMA 61-0024



- \* No sharp corners
- \* Tethers less likely to tangle
- \* Probes less likely to dislodge
- \* Durable polycarbonate for long life

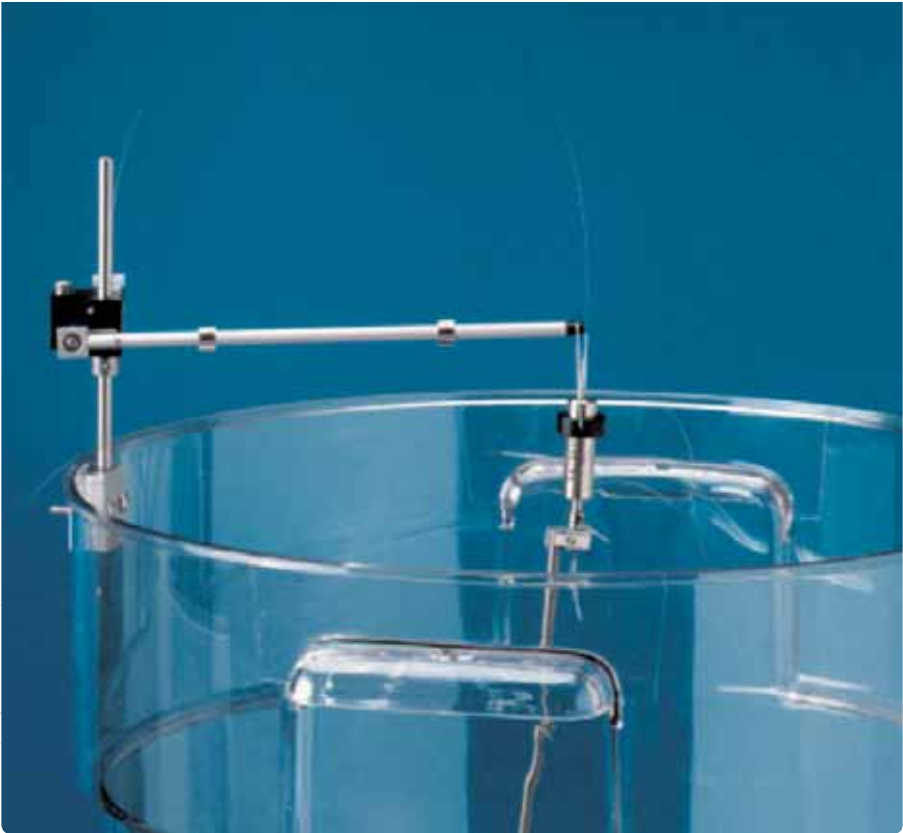
Durable polycarbonate cage designed to house tethered mice during short-term infusion and microdialysis experiments. Since the cage is round, tethers will not tangle as they sometimes can in shoebox-type cages. Also, animals are less likely to dislodge sensitive probes since there are no sharp corners. Handles at the top make it easy to move the cage.

This cage can be supplied with any combination of feeders and water bottles. Pictured below is an animal infusion system featuring our CMA 402 Syringe Pump, Mouse Cage with Water Bottle, Counter-Balanced Lever Arm, and a Stainless Steel Swivel. The pump, swivel and lever arm are sold separately.



# Harvard/Instech Counter Balanced Lever Arms

## Cage Accessories



**THE COUNTER BALANCED LEVER ARM** is designed to minimize stress on microdialysis probes, moves with the animal to prevent slack in the tether. Most other lever arms use a mass as the counter-balance; ours uses an adjustable spring, making it lighter and more responsive.

The mounting plate can be adjusted for mounting to the side or top of many types of cages, including our CMA 61-0046 Animal Container. If you are using a shoebox-type cage, a counter balanced lever arm can prevent the tether from tangling. The CMA 61-0024 is a 3.5 inch arm that is used in studies with mice.

ORDERING INFORMATION

Harvard/Instech Counter  
Balanced Lever Arm

Ref. No.

3.5 in (8.9 cm) Adjustable Spring  
Counter-Balanced Arm

CMA 61-0024

6 in (15.2 cm) Adjustable Spring  
Counter-Balanced Arm

CMA 61-0023



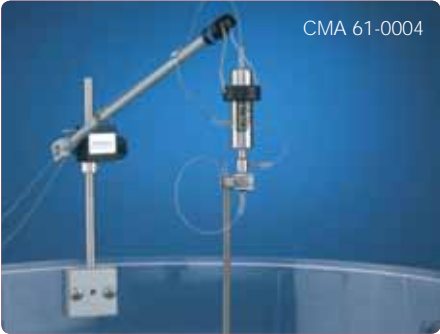
# Harvard/Instech Stainless Steel Swivels

## ORDERING INFORMATION

Stainless Steel Swivel

Dual Channel  
Dual Channel

Ref. No.  
**CMA 61-0004**  
**CMA 72-0000**



CMA 61-0004



CMA 72-0000



## TECHNICAL INFORMATION

Ref. No. for Swivel	CMA 72-0000	CMA 61-0004
Inlet & Outlet		
Tube Gauge	22	22
Center Channel ID	0.006 in	0.006 in
Center Channel		
Dead Volume	1.8 µl	1.4 µl
Side Channel ID	0.006 in	0.016 in
Side Channel		
Dead Volume	2.8 µl	18 µl
Size (OD x L)	0.375 x 2.38 in	

- \* Low torque quartz-lined dual channel swivel truly suited for microdialysis in mice
- \* Setting the industry standard for more than 30 years

For years, the CMA 61-0004 swivel has been the industry standard for awake animal microdialysis. It features quartz lining on the center channel to minimize dead volumes and reactivity with neurotransmitters. It is suitable for microdialysis on rats.

The CMA 72-0000 uses a completely different seal design with two significant improvements: quartz lining on both the center and side channels, and extremely low frictional torque, making it the first dual channel swivel that can be used with mice. However, this model is more fragile than the CMA 61-0004 and often cannot be repaired if clogged or damaged. It is suitable for microdialysis on rats or mice.

# Harvard/Inotech Five Channel Swivels



- \* Five, low dead volume channels for microdialysis
- \* Proportional control for fine continuous movement
- \* Minimal stress on animal

These remarkable swivels feature low-dead-volume channels and rotational torque as low as that of our single channel models.

There are two standard configurations: CMA 72-6134 features four low dead volume channels for microdialysis, plus one 22 gauge channel for sampling or infusion, while the CMA 72-9351 has two low dead volume channels for microdialysis, plus three 22 gauge channels for sampling or infusion. The fluid paths are lined to protect sensitive neurotransmitters. The swivel includes a counter-balanced arm to remove all vertical forces from the animal, but it is not recommended for use with mice. The electronic control unit mounts to the vertical portion of the counter-balanced arm and is powered by a 12 VDC adapter.

The practical limit on the number of lines in a traditional fluid swivel has been two; swivels with three or more channels are typically impossible for a rodent to turn and often have large dead volumes or problems with cross-channel leakage. Harvard/Inotech's Five Channel Swivel senses the rotation demanded by the animal and with a small motor, drives the swivel core to follow the animal. Unlike switch-based systems, this swivel features a proportional control, allowing fine continuous movement to minimize stress on the animal. The torque felt by the animal is similar to that of a single channel swivel.

## ORDERING INFORMATION

### Five Channel Swivels

	Ref. No.
<b>Powered Five Channel Swivel</b>	
5 Channels, 4 Microdialysis and 1 x 22 Gauge Channel, pkg. of 1	<b>CMA 72-6134</b>
5 Channels, 2 Microdialysis and 3 x 22 Gauge Channels, pkg. of 1	<b>CMA 72-9351</b>

## TECHNICAL INFORMATION

Number of Channels	5
Dead Volume:	
Microdialysis Channel	6-7 µl
22 Gauge Channel	15-20 µl
Channel ID:	
Microdialysis Channel	0.009 in (0.2 mm)
22 Gauge Channel	0.015 in (0.4 mm)
Channel OD	0.028 in (22 g)
Materials in Fluid Path	Titanium, Polyimide, Teflon®
Rotational Activity Output	Analog Signal, +/-2V maximum
Lever Arm Length	5.75in (14.6cm)
Swivel Dimensions (L x Dia)	7in x 0.6in (18 x 1.5cm)
Swivel Weight	95g (counterbalanced)

Harvard/Instech Head Block Tethers

ORDERING INFORMATION

Magnetic Head Block Tethers

	Ref. No.
<b>Magnetic Head Block</b>	
Spring Tether, 1 base	<b>CMA 72-4476</b>
Looped Wire Tether, 1 base, slotted clamp	<b>CMA 72-4477</b>
<b>Accessories</b>	
Replacement Magnetic Head Block Bases, sterile, pkg. of 10	<b>CMA 72-4478</b>
Replacement Looped Wire Magnetic Tethers, non-sterile, pkg. of 5	<b>CMA 72-4479</b>

Head Block Tethers

<b>Head Block Tether</b>	
for Rats	<b>CMA 61-0036</b>
for Mice	<b>CMA 61-0037</b>

TECHNICAL INFORMATION

Experiment Duration	1 to 60+ Days	
Specifications:		
Clear Lumen	0.115 in	0.070 in
Tether	Stainless steel	Looped wire
	12 in	12 in
System Weight	10 g	0.3 g
Parts Included:	5 head	5 head
	block screws	block pegs
	Miniture nut	Peg sleeve
	Tether with	Looped wire
	blade	tether
Ref. No.	<b>CMA 61-0036</b>	<b>CMA 61-0037</b>



- ★ Makes microdialysis in awake mice possible
- ★ Ideal for microdialysis in rats
- ★ Little risk of animal infection
- ★ Most frequently used microdialysis tether

Our head block tether assemblies were designed for microdialysis, but also work well for standard infusion applications. In fact, we have found that the head block tether is the best option for all applications when working with mice. It provides a solid attachment to the animal with little risk of infection.

**HEAD BLOCK TETHER FOR RATS** have a large lumen tether can accommodate two standard microdialysis probes allowing it to be set up in a number of configurations. A 3/4 inch slotted screw attaches to the animal's skull with Dental Acrylic as do the CMA 59-7351 Skull Mounting Screws and Probe Guides, see our website. A blade on the end of the stainless steel spring tether slides into the head mount screw and is secured with a knurled tubular nut.

**HEAD BLOCK TETHER FOR MICE** uses a fine 0.010 inch diameter looped wire making it extremely light weight and allowing it to easily transmit torque to the swivel as the mouse moves. A small peg attaches to the animal's skull with dental acrylic (see page 23). The wire tether is easily attached by inserting it into a hole in the peg and sliding a sleeve over it.

**MAGNETIC HEAD BLOCK TETHER FOR RATS AND MICE** uses magnets to connect the tether to a base that is attached to the skull using dental cement. Simply bring the two parts near each other and they will snap together. Tubing exits through a hole in the side of the side of the connector. Designed for rats or mice, tethers are available either with a protective spring or a lightweight looped wire. The CMA 72-4477 tether includes a special slotted clamp for direct attachment to the outlet tube of our swivels, see page 28 for more information. The bases are provided sterile; other components are non-sterile.

# CMA 130 in Vitro Stand



Different probe types mounted in clips:

CMA 7 Clip



CMA 11+12 Clip



CMA Probe Shaft Clip



- \* Lengthens probe life
- \* Facilitates safe storage of probes
- \* Simplifies calibrations, recovery tests

**THE CMA 130 IN VITRO STAND** is used for storage and during testing of microdialysis probes. The stand includes three holders for 1.5 mL Eppendorf tubes and three probe clips. There are three types of clips: The CMA 11+12 Clip holds the flat body of the CMA 11 or CMA 12 Probes or their Guide Cannulae. The CMA Probe Shaft Clip holds the shaft of the CMA 11 or CMA 12 Probe as well as the CMA 20 Probe, and the CMA 7 Clip holds the body of a CMA 7 Probe or Guide Cannula. The CMA 130 can be supplied with three combinations of clips. The clip can be mounted in the stereotaxic instrument using the stereotaxic adapter and the connecting rod.

## ORDERING INFORMATION

### CMA 130 In Vitro Stand

Includes:  
Stand  
In Vitro Holder, 3 pcs  
3 Probe Clips  
Stereotaxic Adapter  
Connecting Rod for Clip  
Eppendorf tubes 1.5 mL, 25 pcs

#### CMA 130 In Vitro Stand

with CMA 11+12 Clips x 3

Ref. No.

**CMA 8309102**

with Mixed Clips:  
CMA 11+12 Clip x 2 and  
CMA Probe Shaft Clip x 1

**CMA 8309103**

with CMA 7 clips x 3

**CMA 8309104**

## Accessories

CMA 7 Clip  
CMA 11 + 12 Clip  
CMA Probe Shaft Clip  
Connecting Rod for Clip  
Stereotaxic Adaptor

**CMA P000136**  
**CMA 8309013**  
**CMA 8309003**  
**CMA 8309004**  
**CMA 8309005**

# CMA 400 Syringe Pump

## Four-syringe liquid delivery

### ORDERING INFORMATION

#### CMA 400 Syringe Pump

Ref. No.

**CMA 8002020**

The pump is delivered without syringes.  
1-10 mL syringes available (see page 35).

### TECHNICAL INFORMATION

Number of syringes: **1 to 4**

Syringe sizes: **Pre-calibrated for piston stroke 60 mm, 10, 25, 50, 100, 250, 500  $\mu$ L, 1, 2.5, 5 and 10 mL. Others can be user defined.**

Flow rate range: **1 nL/min - 1 mL/min**

Injection volume: **1 nL - 10 mL**

Calibration: **Automatic or Self adjusting calibration**

Accuracy:  **$\pm 1\%$**

Reproducibility:  **$\pm 0.1\%$**

(with recommended syringe)

Memory: **Non - volatile. Stores all settings**

External connections: **General purpose digital**

**Input/Output**

Computer connection: **RS 232 serial interface**

Voltage: **100 - 240 VAC, 50 - 60 Hz**

Size: **233 x 226 x 86 mm (W x D x H)**

Weight: **Approx 4 kg**

**Intended use:** Designed for research and industrial applications, the CMA 400 Syringe Pump is not approved for clinical use.



- \* Four syringe carriage    \* Both pull and push options
- \* Pulse-free flow from 1 nL/min to 1 mL/min    \* Injection volumes as small as 1 nL

**THE CMA 400 SYRINGE PUMP** is a multifunctional, easy to use pulse-free pump. It has a broad flow rate range of 1 nL/min to 1 mL/min and can hold up to four syringes. The pump can be used for continuous delivery or withdrawal of liquids or for microinjections of preset volumes from 1 nL to 10 mL. Injections can also be repeated in intervals.

The pump is pre-calibrated for glass syringes from 10  $\mu$ L to 10 mL but other syringes can be used; No recalibration is necessary.

The pump is equipped with RS-232/digital IO interface for connection to the customer's own software.

# CMA 402 Syringe Pump

## Dual syringe perfusions



### ORDERING INFORMATION

#### CMA 402 Syringe Pump

Ref. No.

#### CMA 402 Syringe Pump with Accessory Kit

CMA 8003100

Includes:

Microsyringes 1mL, 2 pcs  
Vial Holders, 2 pcs  
CMA 11+12 Clip  
CMA Probe Shaft Clip  
Micro T  
Eppendorf tubes 1.5 mL 10 pcs  
Microdialysis CAD Software

#### CMA 402 Microdialysis Pump

CMA 8003110

Includes:

Microdialysis CAD Software

### TECHNICAL INFORMATION

Syringes: **Piston stroke** 60 mm, 1, 2.5 or 5 mL

Flow rate range: **0.1  $\mu$ L - 20  $\mu$ L/min**

Flush flow rate: **Approx 20  $\mu$ L/min**

(with 1 mL syringe)

Piston carriage speed: **2.4  $\mu$ m/min- 1.2 mm/min**

Motor: **High resolution step motor system**

Calibration: **Automatic or self-adjusting calibration**

Accuracy:  **$\pm 1.5\%$**

Speed variation:  **$\pm 1.5\%$**

Voltage: **Input 100 - 240 VAC, 50 - 60 Hz, output 12**

**VDC (adapter included)**

Computer connection: **RS-232 and USB interface**

Size: **207 x 135 x 48 mm**

Weight: **1.4 kg**

- \* Dual syringes independently controlled
- \* Flow rates from 0.1 - 20  $\mu$ L/min
- \* Independent flow directions to infuse or withdraw
- \* Microdialysis CAD software included

**THE CMA 402 SYRINGE PUMP** is a compact, flexible, dual syringe pump designed for low pulse-free flow rates suitable for microdialysis experiments and other low flow experiments. Start/Stop and flow rate can be set individually for each syringe. The pump is precalibrated for 1, 2.5 or 5 mL syringes with flow rates between 0.1  $\mu$ L/min and 20  $\mu$ L/min. The flow rates are shown on the LED displays. The CMA 402 Microdialysis Pump is even more flexible when controlled by a computer through the RS-232 interface. For instance, a preset volume can easily be set. A flush feature fills the system at a flow rate of 25  $\mu$ L/min. The CMA 402 is available in two different versions, one of which includes accessories such as vial holders and probe clips, allowing easier handling of the microdialysis probe.



# CMA 402 Microdialysis CAD Software

## to control the microdialysis experiment

### Microdialysis CAD

#### A tool for microdialysis research

- Run a dose response experiment
- Introduce a potassium pulse
- Exclude calcium from the perfusate
- Perfuse your tissue with varying concentrations of a substance in order to determine its extra-cellular concentration (the Lönnroth method) or...
- Determine the tissue concentration by changing the flow and then extrapolating to zero
- Run a "flow response" experiment to find the optimal perfusion flow
- Make a local injection in one area of the brain and record the change in release in another area
- Infuse a drug i.v. and follow the build up of a steady state drug concentration in the brain
- Repeatedly inject a drug and follow the development of tachyphylaxis
- Flush the system to remove air, lower your flow, wait for steady state and then inject your drug
- Run two microdialysis experiments simultaneously
- Lower the pH of the perfusate as soon as it leaves the microdialysis probe to avoid degradation by injecting HCl from the second syringe through a T-connector
- Don't worry about having to remember internal volumes or when to change samples in order to match your drug injection or potassium pulse etc.

For more product information on the CMA 402 Microdialysis Pump, see page 33 and for information on the CMA 142 Microfraction Collector, see page 37.

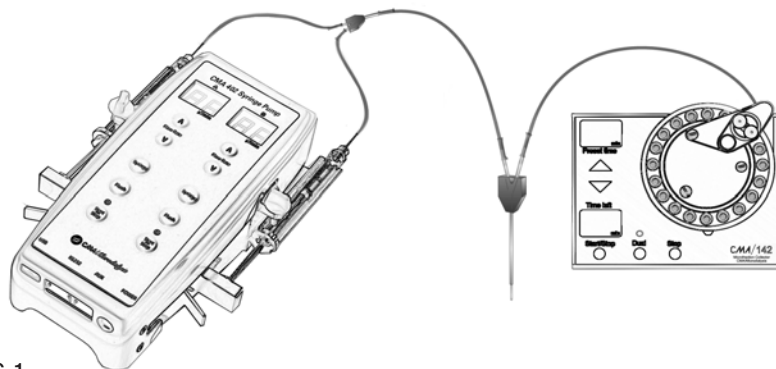


FIG. 1

The CMA 402 Syringe Pump and the CMA 142 Microfraction Collector can be controlled by the Microdialysis CAD Software.

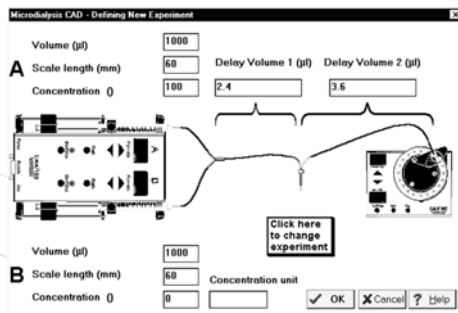


FIG. 2

Simply enter experimental values and choose one of six experimental set ups.

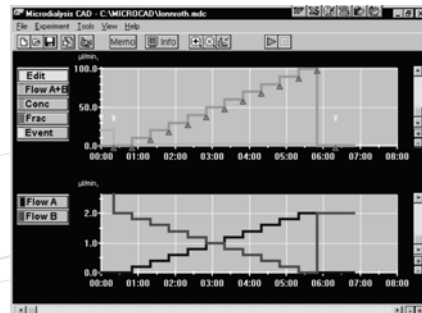


FIG. 3

The Microdialysis CAD screen where the experiment is planned. Simply click on the graph to enter perfusion flow rates, concentration gradients, fraction collection, and experimental events.

**MICRODIALYSIS CAD SOFTWARE**, bundled with the CMA 402 Syringe pump, allows for endless design variations of a Microdialysis experiment. Microdialysis CAD software enables one to plan the experiment, execute it automatically, and save the setup in a report protocol for future use.

Program concentration gradients, pulses, injections, and fraction times, all in the MS Windows® environment. This is especially useful during behavioral experiments when the animal must not be disturbed. Look at the list of possibilities that can be accomplished using this software tool for Microdialysis research.

# CMA 400 and 402 Syringe Pump Accessories



FIG. 1



FIG. 2



FIG. 3

**MICROSYRINGES (FIG. 1)** 1, 2.5, 5 and 10 mL Microsyringes, glass syringes with a 60 mm piston stroke. Syringe Needles are pretreated to reduce degradation of labile molecules, such as catecholamines and their metabolites during a microdialysis experiment.

**SYRINGE CLIP (FIG. 2)** The Syringe Clip enables the withdrawal of liquids when using either the CMA 400 or the CMA 402 Syringe Pumps. The clip fastens the syringe plunger to the carriage of the pump.

**MICRO T (FIG. 3)** The Micro T is a three-way connector. Connected to the syringes in the CMA 402 Syringe Pump and a Microdialysis probe, two different perfusion fluids can be combined, even gradually, without introducing air bubbles into the system.

With the Micro T and the CAD program there are a lot of possibilities. See previous page.

## ORDERING INFORMATION

### CMA 400 and CMA 402 Syringe Pump

#### Accessories

	Ref. No.
Microsyringe 1 mL, glass	CMA 8309020
Microsyringe 2.5 mL, glass	CMA 8309021
Microsyringe 5 mL, glass	CMA 8309022
Microsyringe 10 mL, glass*	CMA 8309023
Syringe Needle, 5/pkg	CMA 7431083
Syringe Clip, Medium 1-2.5 mL syringe	CMA 3408310
Syringe Clip, Large* 5-10 mL syringe	CMA 3408320
Micro T**	CMA P000043

\* For use with CMA 400 Syringe Pump

\*\* For use with CMA 402 Syringe Pump



# CMA 110 Liquid Switch

## Switching perfusion lines

### ORDERING INFORMATION

#### CMA 110 Liquid Switch

Ref. No.

CMA 8308200

Includes:  
Tubing Kit

#### Accessories

CMA 110 Tubing Kit

CMA 3408550

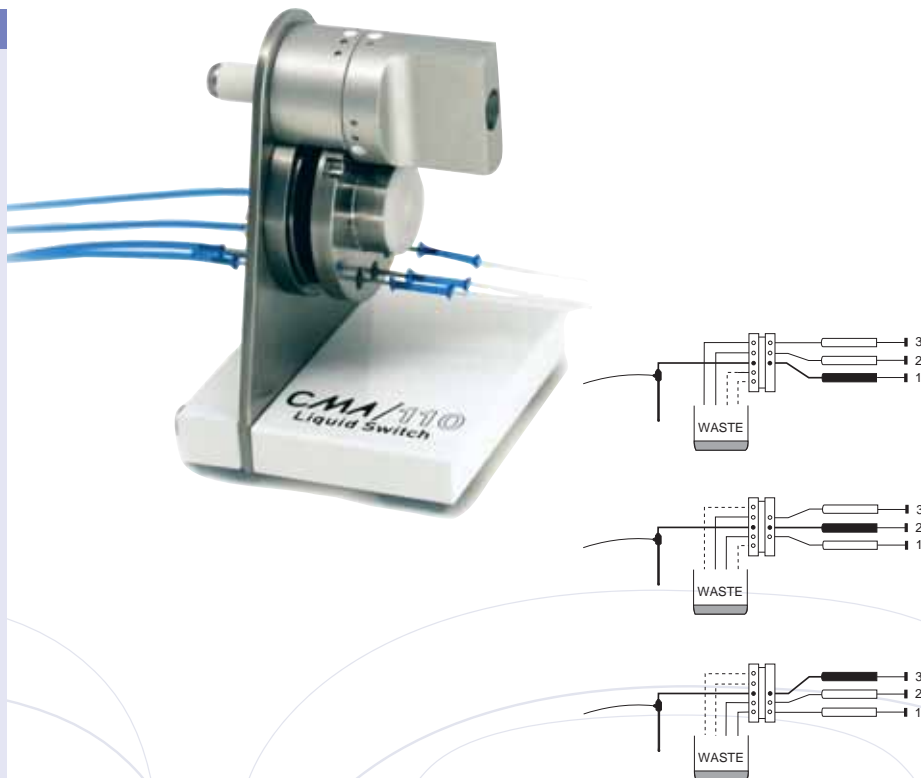
### TECHNICAL INFORMATION

#### CMA 110 Liquid Switch

Size: 66 x 46 x 50 mm

Weight: 0.13 kg

Internal volume: Inlet side 1.7 µL, Outlet side 1.7 µL



- \* Instantly switch between syringes
- \* No interruption of flow
- \* Prevent introduction of air bubble

**THE CMA 110 LIQUID SWITCH** permits manual switching between up to three perfusion lines (syringes) and a microdialysis probe. This makes it possible to change different solutions instantaneously without any risk of introducing air bubbles into the microdialysis probe.

## CMA 142 Microfraction Collector

for single/dual probe sampling



- \* Sampling from one or two probes
- \* Precision and accuracy from 1  $\mu\text{L}$
- \* Compact design
- \* Easy to use

**THE CMA 142 MICROFRACTION COLLECTOR** is a unique, stand-alone instrument dedicated for microdialysis sampling. Fractions ranging from 1 to 50  $\mu\text{L}$  can be collected from one or two microdialysis probes (1 x 20 or 2 x 10 samples respectively). The low noise cassette movement prevents any distress to experimental animals, and the size of the instrument (130W x 80H x 100D mm) permits placement close to the experiment without long connection tubing.

Microdialysis CAD software included, see page 34.

### ORDERING INFORMATION

#### CMA 142 Microfraction Collector

Ref. No.

CMA 142, 230 V  
CMA 142, 115 V

CMA 8381142  
CMA 8381143

#### Accessories

Vials, plastic 300  $\mu\text{L}$ , 1000/pkg  
Caps, plastic 1000/pkg\*  
Vials, glass 300  $\mu\text{L}$ , 500/pkg  
Caps/Seals Non-Reclosing  
Small, 1000/pkg\*

CMA 7431100  
CMA 7431101  
CMA 7431007  
CMA 7432175

\* Not for use in the Fraction Collector.

### TECHNICAL INFORMATION

Minimum fraction volume: 1  $\mu\text{L}$   
Maximum fraction volume: 50  $\mu\text{L}$   
Number of fractions: 1 x 20 or 2 x 10  
Size: 130 x 100 x 80 mm  
Weight: 0.57 kg  
Power: 115/230 V/50/60 Hz

# CMA 470 Refrigerated Fraction Collector

for collecting samples up to four fractions simultaneously

## ORDERING INFORMATION

### CMA 470 Refrigerated Fraction Collector

Ref. No.

Includes:

CMA 8002770

4 Cassettes for Small Vials  
 Holder for Single Cannula  
 Holder for Dual Cannulae  
 Holder for Quadruple Cannulae  
 4 Cannulae for Tubing  
 4 Cannulae for Septa

### Accessories

Vials, Plastic 300 $\mu$ L (1000/pkg)	CMA 7431100
Caps, Plastic (1000/pkg)*	CMA 7431101
Vials, Glass 300 $\mu$ L 500/pkg	CMA 7431007
Caps/Seals Non-Reclosing, Small, 1000/pkg	CMA 7432175
Crimper, Small	CMA 7432017
Cassette, Small Vials, Plastic	CMA 8320010
Cassette, Large Vials, Aluminum	CMA 8320008
Cannula for Tubing	CMA 8002999
Cannula for Septa	CMA 8003000

\* Not for use in the Fraction Collector.

## TECHNICAL INFORMATION

Collection: **1  $\mu$ L - 1.2 mL**  
 Number of vials: **64 x 300  $\mu$ L, 40 x 2.0 mL**  
 Septa: **Non-Reclosing**  
 Cooling: **Down to +6 °C, in steps of 1 °C**  
 Cooling capacity: **- 15 °C from environmental temperature or better**  
 Temperature accuracy:  **$\pm 1.5$  °C**  
 Collection modes: **Time, minutes and seconds**  
 Computer connection: **RS232 Serial Interface and USB**  
 Voltage: **100-240 VAC, 50-60 Hz**  
 Size: **222 x 279 x 142 (167) mm (WxDxH)**  
 Weight: **Approx. 3.8 kg**

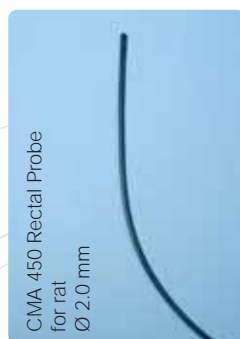


- ★ Fractions cooled down to +6 °C
- ★ Fractions from 1 to 1200  $\mu$ L
- ★ Holds up to 64 vials
- ★ Optional collection into four vials simultaneously

**THE CMA 470 REFRIGERATED FRACTION COLLECTOR** is specifically designed to collect microliter volume fractions typical of microdialysates. It has thermoelectric cooling down to +6 °C and the fractions can be collected in sealed vials. Both of these are important considerations for the prevention of evaporation and chemical degradation. It is possible to collect fractions as small as 1  $\mu$ L at the bottom of each vial. The capacity of the collector is 64 vials of 300  $\mu$ L each or 40 vials of 2 mL each. Equipped with a quadruple assembly, the CMA 470 can collect fractions from up to four probes simultaneously. There is also an option to collect samples into open vials.

The fraction collector is a stand alone instrument, but it is equipped with a digital Input/Output port and an RS-232 interface for connection to the customer's own software.

## CMA 450 Temperature Controller for rat and for mouse



- ★ Automatic cut-out switch prevents overheating
- ★ Maintains constant body temperature
- ★ Accuracy of  $\pm 0.2^{\circ}\text{C}$

**THE CMA 450 TEMPERATURE CONTROLLER** monitors and regulates the body temperature of small animals under anesthesia. The control unit displays actual temperature measured by a rectal thermometer and regulates power to the heating pad which warms the animal. Temperature variation from a preset value lies within a range of  $\pm 0.2^{\circ}\text{C}$ . The controller can maintain body temperature from + 34 to + 43  $^{\circ}\text{C}$ . The dimensions of the heating pad are 200 x 120 cm.

The Temperature Controller is available in two versions. One is suitable for rats and guinea pigs with a rectal probe OD 2 mm, and one is suitable for mice and hamsters with a rectal probe OD 1.3 mm. Both are made of flexible material, gentle on the animal.

### ORDERING INFORMATION

#### CMA 450 Temperature Controller

includes:  
Rectal Probe, Heating Pad, and Insulation Pad

Ref. No.

CMA 450 for Rat	<b>CMA 8003760</b>
CMA 450 for Mouse	<b>CMA 8003770</b>

#### Accessories

CMA 450 Rectal Probe for rat	<b>CMA 8003761</b>
CMA 450 Rectal Probe for mouse	<b>CMA 8003762</b>
CMA 450 Heating Pad	<b>CMA 8003763</b>
CMA 450 Insulation Pad	<b>CMA 8003764</b>

### TECHNICAL INFORMATION

Operating mode: **Power applied to the heating pad.**  
**Pad temperature continuously controlled by rectal probe.**

Heating Pad, max. temp.: **+46  $^{\circ}\text{C}$**

Temperature accuracy:  **$\pm 0.2^{\circ}\text{C}$**

Temperature range: **34 - 43  $^{\circ}\text{C}$**

Size, Control Unit: **145 x 150 x 70 mm**

Pad size: **200 x 120 mm**

Probe size for rat: **2.0 x 95 mm, cable length 1.5 meter**

Probe size for mouse: **1.3 x 50 mm, cable length 1.5 meter**

Weight, control Unit: **0.8 kg**

Voltage: **100 - 240 V, 50/60 Hz**

# Stereotaxic Equipment

## ORDERING INFORMATION

### New Standard Stereotaxic Instruments

	Ref. No.
<b>New Standard Stereotaxic</b> for Rats and Mice, Model 51500	CMA 72-6335
<b>Dual New Standard Stereotaxic</b> for Rats and Mice, Model 51503	CMA 72-6336
<b>Digital New Standard Stereotaxic</b> for Rats and Mice, Model 51500D	CMA 72-6338
<b>Digital Dual New Standard Stereotaxic</b> for Rats and Mice, Model 51503D	CMA 72-6339
<b>Motorized New Standard Stereotaxic</b> for Rats and Mice, Model 51500M	CMA 72-6340
<b>New Standard Stereotaxic</b> for Rats and Mice (no manipulator arm), Model 51500	CMA 72-6337

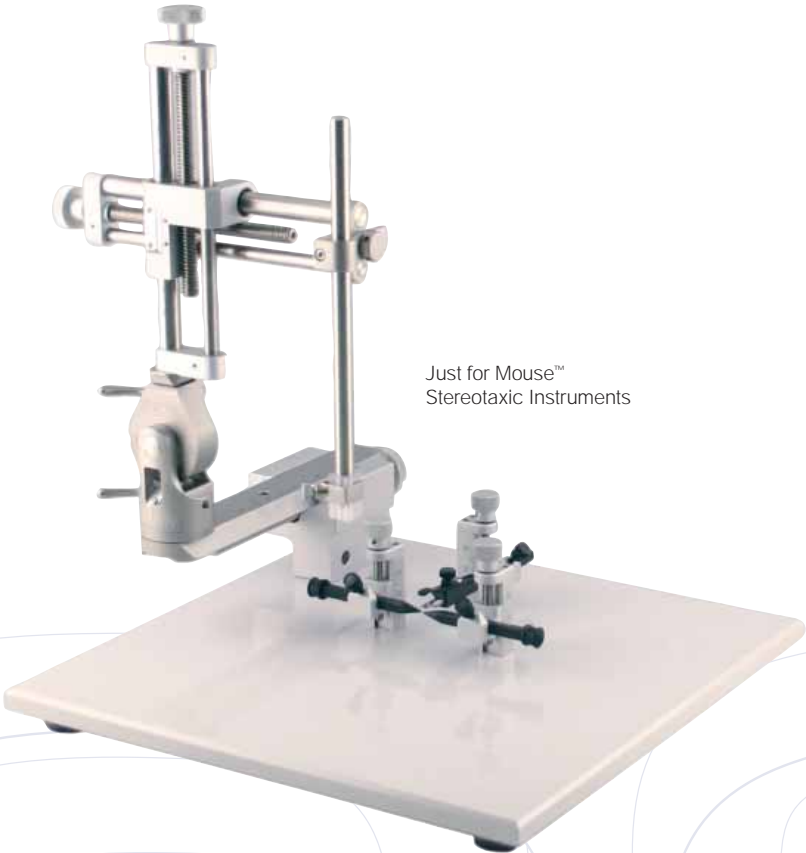


- ★ Revolutionary vertically-adjusted ear and nose bar posts
- ★ Revolutionary horizontally-adjusting ear and nose bar posts
- ★ Designed for both rats and mice all on the same base
- ★ No U-frame, maximizes operating space
- ★ Traditional and non-traumatic rat ear bars

**THE NEW STANDARD STEREOTAXIC INSTRUMENTS** are ideal for researchers working with rats and mice. They have larger laser engraved vernier scales (accurate to 100  $\mu$ m), 80 mm of ventral-dorsal, medial-lateral and anterior-posterior travel, absolute lock at 90° ventral-dorsal and brass-bushings for electrical grounding. The New Standard Stereotaxic Instruments include mouse ear bars, a mouse and rat nose adaptor as well as dual tip rat ear bars; one side is 18° and the other side is 45°.

The New Standard Stereotaxic is available in manual, digital and motorized versions.

# Stereotaxic Equipment



Just for Mouse™  
Stereotaxic Instruments

**THE JUST FOR MOUSE™ STEREOTAXIC INSTRUMENTS** is ideal for researchers working with mice and other small rodents. Precision alignment when using the Just for Mouse™ Stereotaxic ensures accurate placement of electrodes, micropipettes, cannula and other devices.

Advanced digital and motorized versions include a zeroing function allowing the user to target specific coordinates in the brain for injection, implantation, etc. Calculation of distance measurements is thus no longer necessary.

The Just for Mouse™ Stereotaxic Equipment is available in manual, digital and motorized versions.

\* Ear and tooth bar adjustment to accomodate animals between 10 and 75 grams.

ORDERING INFORMATION

Just for Mouse™ Stereotaxic Instruments

	Ref. No.
<b>Just for Mouse™ Stereotaxic</b>	
Model 51730	CMA 72-9564
<b>Dual Just for Mouse™ Stereotaxic</b>	
Model 51733	CMA 72-9565
<b>Digital Just for Mouse™ Stereotaxic</b>	
Model 51730D	CMA 72-9563
<b>Digital Dual Just for Mouse™ Stereotaxic</b>	
Model 51733D	CMA 72-9566
<b>Motorized Just for Mouse™ Stereotaxic</b>	
Model 51730M	CMA 72-9567

\* Delrin® Ear bars with 3 types of head holders

# Bone Micro Drill System

## ORDERING INFORMATION

### Bone Micro Drill System

Ref. No.

**Complete Bone Drill System**

120 VAC

CMA 72-4950

230 VAC

CMA 72-4951

Accessory Kit for Micro Drill  
(see below\*)

CMA 72-4967

**Abrading Tip**

Rubber, pkg. of 20

CMA 72-4952

Stone, pkg. of 5

CMA 72-4953

Accessory Stand

CMA 72-4954

**Ball Mill, Carbide, pkg. of 5**

#1, .031 in Diameter

CMA 72-4955

#2, .039 in Diameter

CMA 72-4956

#3, .047 in Diameter

CMA 72-4957

#4, .055 in Diameter

CMA 72-4958

#5, .063 in Diameter

CMA 72-4959

#6, .071 in Diameter

CMA 72-4960

#7, .083 in Diameter

CMA 72-4961

#1/4, .019 in Diameter

CMA 72-4962

#1/2, .027 in Diameter

CMA 72-4963

Cutoff Disk, pkg. of 20

CMA 72-4964

Mandrel, Screw, pkg. of 5

CMA 72-4965

Mandrel, Threaded, pkg. of 5

CMA 72-4966

Extra Large Probe Holder for  
attachment of hand piece  
to stereotax

CMA 72-4860

**\*Accessory Kit Includes (CMA 72-4967):**

Abrading Tip, Rubber, Qty. 4

Abrading Tip, Stone, Qty. 1

Accessory Stand, Qty. 1

Ball Mill, Carbide, #1-7

Ball Mill, Carbide, #1/4

Ball Mill, Carbide, #1/2

Cutoff Disk

Mandrel, Screw

Mandrel, Threaded



- \* Dental quality construction for delicate work
- \* Flexible telephone-style cord eliminates bothersome drive cables
- \* Quick change chuck for easy bit replacement
- \* Versatile forward, reverse, and variable speeds
- \* Small, lightweight, ergonomically designed hand piece reduces fatigue
- \* Complete - includes ball mills, abrasive bits, and cutting discs

**THIS MICRO DRILL** is a workhorse in a kit. This versatile powerhouse is ideal for milling, drilling, grinding and cutting. This drill quickly cuts through bone and other materials. It may also be used for general purpose work such as removing coatings, cutting, drilling holes, cutting slots, as well as performing many other procedures using various interchangeable bits. Unlike most hand-held tools, the Micro Drill has a tiny, high speed DC motor in the hand piece, eliminating bothersome drive cables and giving the researcher better control. A separate power supply keeps the hand piece lightweight and reduces fatigue. Power is supplied by a panel switch or foot switch for ease of use.



# Cordless Clipper and Skin Tunneling Needles



ChroMini  
Cordless  
Clipper



Skin Tunneling  
Needles

- \* Cordless operation
- \* Lightweight
- \* Simple & easy to use

- \* Assure minimal trauma to the animal
- \* Reduce the number of skin incisions and the time to make a tunnel

**THIS CHROMINI CORDLESS CLIPPER** is ideal for removing fine hair from laboratory animals without hurting delicate skin. It combines unbeatable cutting performance and cordless operation. This permits you to achieve the results that professionals demand. The Clipper features a superior quick detachable blade. This clipper comes complete with rechargeable/cordless trimmer, charger stand, detachable #30 blade, cleaning brush, oil, snap on guide comb, and instruction book.

**SKIN TUNNELING NEEDLES** provide a quick and easy method of making subcutaneous tunnels in research animals for routing catheters and electrode leads to convenient exterior sites. They are constructed of tempered heavy wall stainless steel tubing and come with semi-blunt 45° bevel points. The needles are made with a through-hole in the handle, which is a continuation of the needle lumen, to allow catheter feed-through. For bundles of catheters and electrode leads that are too large for the lumen of the needles, suture wire can be passed through the needles and used to pull the bundles through the subcutaneous tunnel. Supplied in a set of 3.

## ORDERING INFORMATION

### ChroMini Cordless Clipper

Ref. No.

ChroMini Cordless Clipper, 115 VAC, 60 Hz	<b>CMA 72-9063</b>
Replacement #30 Blade, for 72-9063	<b>CMA 72-9064</b>
ChroMini Cordless Clipper, 230 VAC, 60 Hz	<b>CMA 34-1414</b>
Replacement #30 Blade, for 34-1414	<b>CMA 34-1418</b>

### Skin Tunneling Needles

Ref. No.

OD x ID: 3.2 x 25 mm (1/8 x 1 1/10 in)	
Lengths: 15.2, 22.9, 30.5 cm (6, 9, 12 in)	<b>CMA 72-0680</b>
OD x ID: 4.8 x 3.2 mm (3/16 x 1/8 in)	
Lengths: 22.9, 30.5, 40.6 cm (9, 12, 16 in)	<b>CMA 72-0679</b>



Harvard Apparatus Line of Surgical Instruments

Minor and Major Surgical Kits

ORDERING INFORMATION

Minor Surgery Surgical Kit

	Ref. No.
<b>Minor Surgery Surgical Kit</b>	<b>CMA 72-8940</b>
<b>This kit consists of:</b>	
Scalpel Handle No. 3	CMA 72-8350
Scalpel Blades No. 10, Sterile	CMA 72-8360
Eye Scissors, 11.5 cm Curved, Special Cut	CMA 72-8441
Blumenthal Bone Rongeurs, Curved, 15.5 cm	CMA 72-8906
Universal Clothing Scissors	CMA 72-8450
Operating Scissors, 14.5 cm Sharp/Blunt, Staight	CMA 72-8393
Kuehne Cover Glass Forceps, 10 cm, Angled	CMA 72-8676
Jeweller's Forceps 11 cm, No. 5 with Extra Delicate Points	CMA 72-8696
Probe 14.5 cm Double Ended, 1 mm Diameter	CMA 72-8912



**HARVARD APPARATUS SURGICAL INSTRUMENTS** are forged and finished in a German ISO 9001 facility. These superior quality tools are highly resistant to corrosion and maintain their sharp cutting surfaces for a long time. You can purchase these surgical instruments individually or in a convenient kit.

**MINOR SURGERY SURGICAL KIT** is ideally suited for basic procedures and minor surgery.

## Harvard Apparatus Line of Surgical Instruments

### Minor and Major Surgical Kits



**HARVARD APPARATUS SURGICAL INSTRUMENTS** are forged and finished in a German ISO 9001 facility. These superior quality tools are highly resistant to corrosion and maintain their sharp cutting surfaces for a long time. You can purchase these surgical instruments individually or in a convenient kit.

**DELUXE MAJOR SURGICAL KIT** is ideally suited for more extensive procedures and major laboratory animal surgeries.

## ORDERING INFORMATION

## Deluxe Major Surgical Kit

	Ref. No.
<b>Deluxe Major Surgical Kit</b>	<b>CMA 72-8941</b>
<b>This kit consists of:</b>	
Scalpel Handle No. 3	<b>CMA 72-8350</b>
Scalpel Blades No. 10, Sterile	<b>CMA 72-8360</b>
Scalpel Blades No. 11, Sterile	<b>CMA 72-8362</b>
Vannas Eye Scissors,	
Spring Action Model Tubingen,	
8.5 cm, Straight	<b>CMA 72-8508</b>
Olsen-Hegar Needle Holders	
with Scissors with Tungsten	
Carbide Inserts, 14.0 cm	<b>CMA 72-8899</b>
Eye Scissors, 11.5 cm,	
Straight, Special Cut	<b>CMA 72-8440</b>
Jeweller's Forceps, 11.0 cm,	
No. 5, with Extra Delicate Points	<b>CMA 72-8696</b>
Graefe Iris Forceps, Serrated,	
7.0 cm, Curved, Points 0.5 mm	<b>CMA 72-8598</b>
UltraEdge Operating Scissors,	
14.5 cm Sharp/Blunt, Straight	<b>CMA 72-8394</b>
Universal Clothing Scissors	<b>CMA 72-8450</b>
Friedman Bone Rongeurs,	
Delicate	<b>CMA 72-8905</b>
Adson Tissue Forceps, 12.0 cm,	
1x2 Teeth	<b>CMA 72-8547</b>
Barraquer (Colibri) Eye Specula,	
Large	<b>CMA 72-8919</b>
Probes, 14.5 cm, Double Ended,	
1 mm, Diameter	<b>CMA 72-8912</b>

# Harvard Apparatus Line of Surgical Instruments

## Rat Surgical Kit

### ORDERING INFORMATION

#### Rat Surgical Kit

	Ref. No.
<b>Rat Surgical Kit</b>	<b>CMA 72-8942</b>
<b>This kit consists of:</b>	
Disposable Scalpels with plastic handle No. 11, sterile box of 10	<b>CMA 72-8372</b>
Jeweler's Forceps 11.0 cm No. 5, with Extra Delicate Points	<b>CMA 72-8696</b>
Vannas Eye Scissors 8.5 cm Straight, Spring Action	<b>CMA 72-8503</b>
Graefe Iris Forceps Serrated 10.0 cm Curved Points, 0.7 mm	<b>CMA 72-8604</b>
Eye Scissors 11.5 cm Straight, Special Cut	<b>CMA 72-8440</b>
Barraquer (Colibri) Eye Specula, Large	<b>CMA 72-8919</b>
Olsen-Hegar Needle Holder with Scissors, 11.5 cm	<b>CMA 72-8844</b>
Probes 14.5 cm Double Ended, 1 mm Diameter	<b>CMA 72-8912</b>



**HARVARD APPARATUS SURGICAL INSTRUMENTS** are forged and finished in a German ISO 9001 facility. These superior quality tools are highly resistant to corrosion and maintain their sharp cutting surfaces for a long time. You can purchase these surgical instruments individually or in a convenient kit.

**RAT SURGICAL KIT** is an ideal starting point for surgical procedures commonly performed on laboratory rats.

# Harvard Apparatus Line of Surgical Instruments

## Mouse Surgical Kit



**HARVARD APPARATUS SURGICAL INSTRUMENTS** are forged and finished in a German ISO 9001 facility. These superior quality tools are highly resistant to corrosion and maintain their sharp cutting surfaces for a long time. You can purchase these surgical instruments individually or in a convenient kit.

**MOUSE SURGICAL KIT** is ideal starting point for surgical procedures performed on laboratory mice.

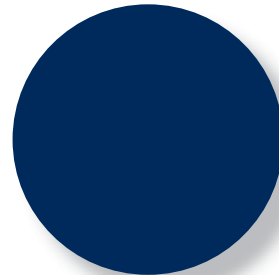
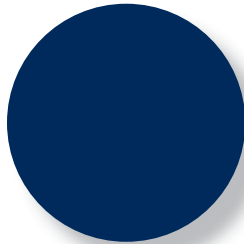
### ORDERING INFORMATION

#### Mouse Surgical Kit

	Ref. No.
<b>Mouse Surgical Kit</b>	<b>CMA 72-8943</b>
<b>This kit consists of:</b>	
Disposable Scalpels with Plastic Handle No. 11, Sterile, Box of 10	<b>CMA 72-8372</b>
Jeweller's Forceps No. 5, 11.0 cm with Extra Delicate Points	<b>CMA 72-8696</b>
Vannas Eye Scissors, 8.5 cm Straight Spring Action	<b>CMA 72-8503</b>
Graefe Iris Forceps Serrated, 10.0 cm, Curved Points 0.7 mm	<b>CMA 72-8604</b>
Eye Scissors 10.5 cm, Straight	<b>CMA 72-8426</b>
Barraquer (Colibri) Eye Specula, Small	<b>CMA 72-8918</b>
Derf Needle Holders, 12.0 cm	<b>CMA 72-8826</b>
Probe, 14.5 cm Double Ended, 1 mm Diameter	<b>CMA 72-8912</b>



# *General Information*



Customer Support

Internet Support

US Office and  
Distributors

## Customer Support

### Support and Technical Service

For general information about the technique and for more information regarding our products you are welcome to contact us or the CMA distributor in your area.

We have a skilled staff available to solve your technical problems if an equipment oriented problem should arise.

Obtain a return authorization number from either your local CMA Representative or CMA Service before you return any products for repair.

A detailed description will help minimize cost and turnaround time.

Visit [www.microdialysis.com](http://www.microdialysis.com) for the latest technical support and service information.

### Head Office

Phone: **+46-8-470 10 00**  
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Email: **[cma@microdialysis.se](mailto:cma@microdialysis.se)**

### US Office

Phone: **(508) 893-8999**  
Fax: **(508) 429-5732**  
Email: **[techsupport@harvardapparatus.com](mailto:techsupport@harvardapparatus.com)**

## Training Course

### Microdialysis Training Courses

Introductory courses on Microdialysis are organized for those who are about to start or have just started using the technique.

The course program includes both lectures on Microdialysis and practical demonstrations. Participants will gain a general overview of the Microdialysis technique, its advantages, and limitations. In basic research practical classes can be organized to conduct experiments under the leadership of highly qualified instructors.

This is also an excellent opportunity for open discussions and an exchange of ideas while meeting with other scientists, and experts in the field.

Course program and upcoming dates can be found on **[www.microdialysis.com](http://www.microdialysis.com)**



### Sweden Office

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Delivery address:

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The head office of CMA Microdialysis is located on the grounds of an industrial park in Solna, Sweden close to the Karolinska Institute.

### US Office

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# *Exploring Tissue Chemistry*

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