

products for

MICRODIALYSIS

research



Table of Contents

Introduction	2-4	Surgical Instruments	
Microdialysis for Basic Research	5-6	Minor Surgery Surgical Kit	42
The Principle of Microdialysis	7	Major Deluxe Surgical Kit	43
Microdialysis Academy	8	Rat Surgical Kit	44
Microdialysis Systems and Configurations Overview	9-11	Mouse Surgical Kit	45
Probes		General Information	
Overview	12-13	Customer Support	47
CMA 7 Microdialysis Probe	14	Training Course	47
CMA 11 Microdialysis Probe	15	Contact Us	48
CMA 12 Microdialysis Probe	16		
CMA 20 Microdialysis Probe	17		
CMA 30 Linear Microdialysis Probe	18		
CMA 31 Linear Microdialysis Probe	19		
Probe Guide Cannulae	20		
Custom Made Probes	21		
Accessories	22-23		
Instruments			
CMA 120 System for Freely Moving Animals	24-25		
Microdialysis Systems for Freely Moving Animals	26		
Stainless Steel Swivels	27		
Multi-Channel Swivels	28		
Harvard/Instech Head Block Tethers	29		
CMA 4004 Syringe Pump	30		
CMA 402 Syringe Pump	31		
CMA 4004 and CMA 402 Syringe Pump Acces.	32		
CMA 110 Liquid Switch	33		
CMA 130 In Vitro Stand	34		
Homeothermic Monitoring System	35		
CMA 142 Microfraction Collector	36		
CMA 470 Refrigerated Fraction Collector	37		
Stereotaxic Equipment	38-39		
Bone Micro Drill System	40		
Cordless Clipper and Skin Tunneling Needles	41		

Our Vision

INTRODUCTION

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 office is located outside Stockholm, Sweden. CMA has distributors across the globe, responsible for local sales, service and support.

Ownership and Governance

CMA is owned by Harvard Apparatus: Harvard Apparatus was founded in 1901 by Dr. William T. Porter of the Harvard Medical School. Harvard Apparatus developed a name not only for quality but also for innovation. Harvard Apparatus invented the mechanical syringe pump in the 1950s, developed the first small animal Ventilator and introduced the first microprocessor controlled syringe pumps in the 1980s.

Harvard Apparatus is part of the Harvard Bioscience family of companies. Harvard Bioscience (Nasdaq: HBIO) is a global developer, manufacturer and marketer of a broad range of specialized products addressing important research problems in the life sciences.

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.

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. Not for use with humans.

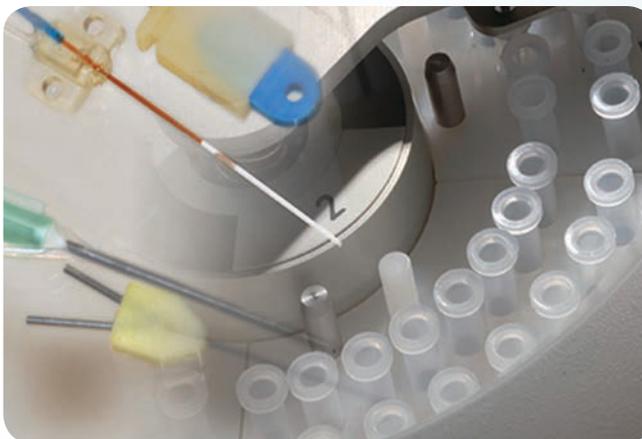
Research Applications

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.



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.

CMA regularly attends Neuroscience and Microdialysis meetings 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.

CMA offers global pre and post sales support to help customers carry out successful microdialysis experiments.



Microdialysis Products for Basic Research



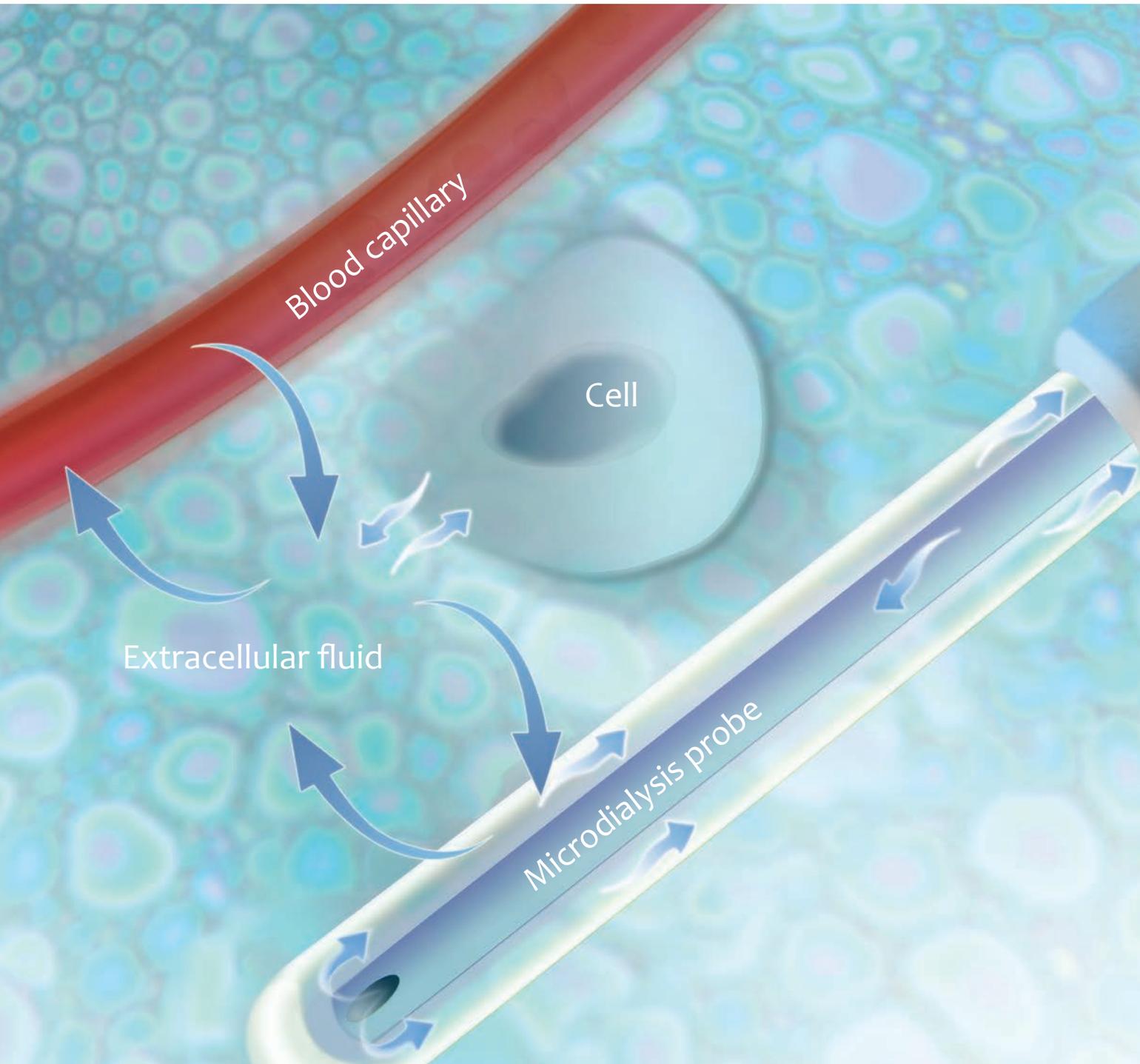
**Microdialysis
Probes**



**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

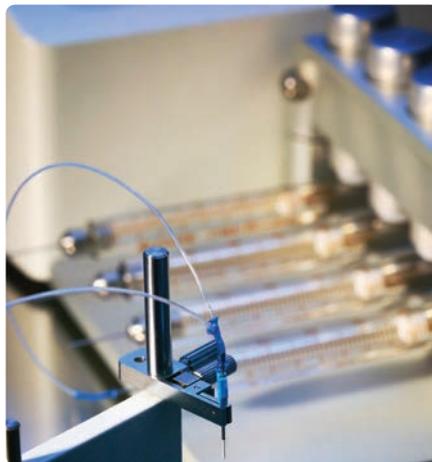
Ideally, it should be as close as possible to the composition of the extracellular fluid. However, you may want to change the concentration of sodium, potassium, or calcium in order to influence the cell membrane function in the region you are studying.

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

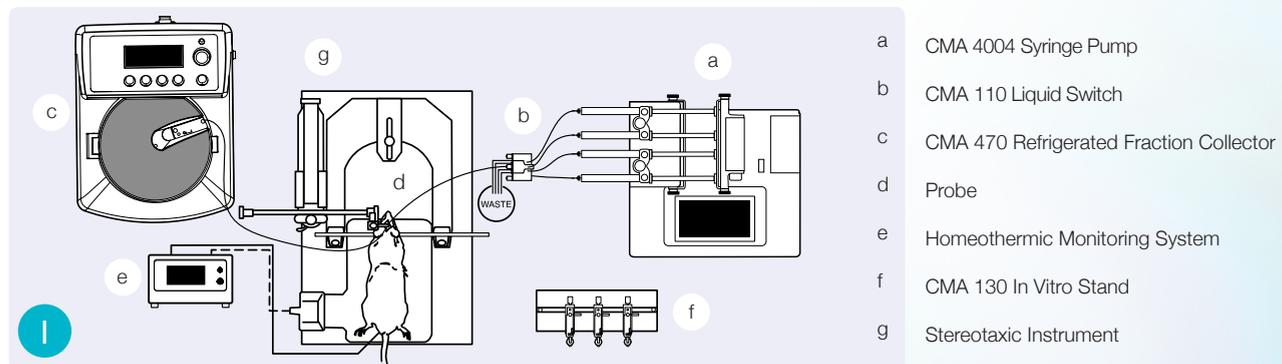
INSTRUMENTS

Overview

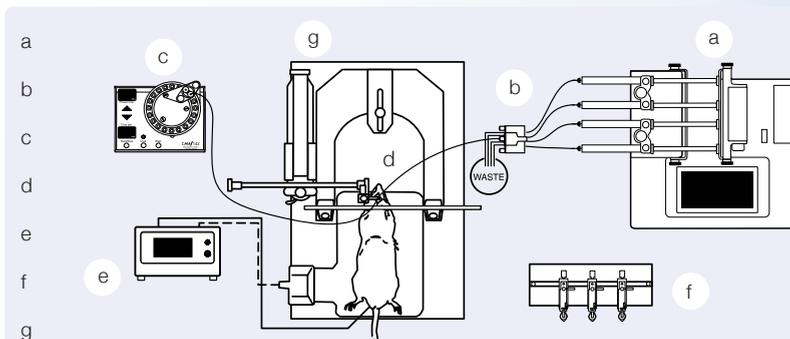
There are a few different models of each component in the Microdialysis system and each is described in this catalog. Your choice of components, or system configuration, should be based on the application and the experimental requirements. After deciding to work with anesthetized or freely moving animals, 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
- Liquid switch
- *In Vitro* storage stand
- Microdialysis probes and guide cannula
- Fraction collector
- Temperature controller
- Tubing and tubing adapters
- Surgical supplies and accessories



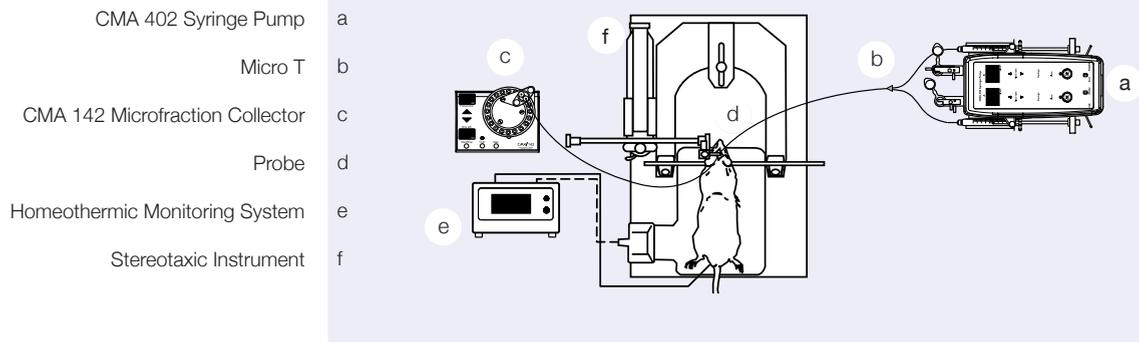
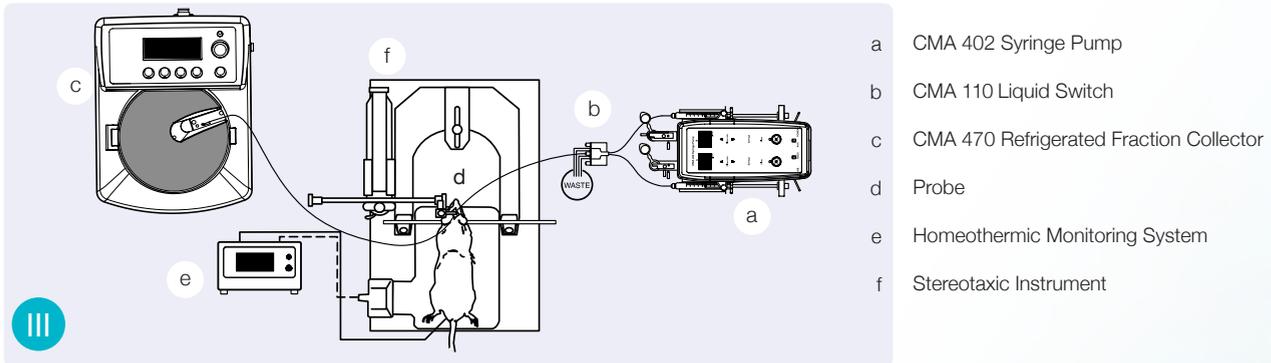
- CMA 4004 Syringe Pump
- CMA 110 Liquid Switch
- CMA 142 Microfraction Collector
- Probe
- Homeothermic Monitoring System
- CMA 130 In Vitro Stand
- Stereotaxic Instrument



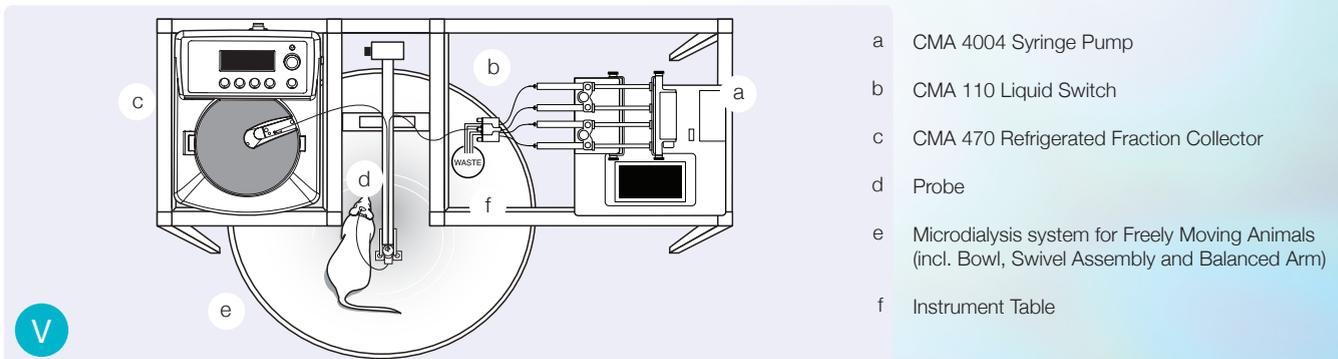
Microdialysis Systems and Configurations

INSTRUMENTS

Overview



Microdialysis Systems for Freely Moving Animals



Microdialysis Systems and Configurations

INSTRUMENTS

Overview

CMA 4004 Syringe Pump

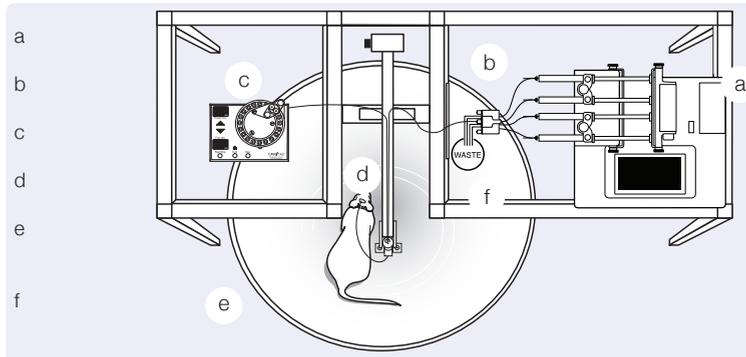
CMA 110 Liquid Switch

CMA 142 Microfraction Collector

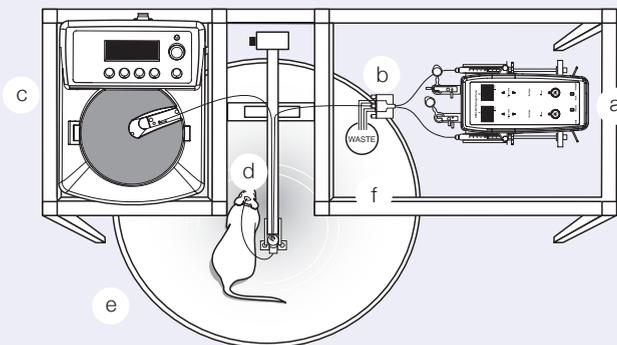
Probe

Microdialysis system for Freely Moving Animals
(incl. Bowl, Swivel Assembly and Balanced Arm)

Instrument Table



VI



VII

a CMA 402 Syringe Pump

b CMA 110 Liquid Switch

c CMA 470 Refrigerated Fraction Collector

d Probe

e Microdialysis system for Freely Moving Animals
(incl. Bowl, Swivel Assembly and Balanced Arm)

f Instrument Table

CMA 402 Syringe Pump

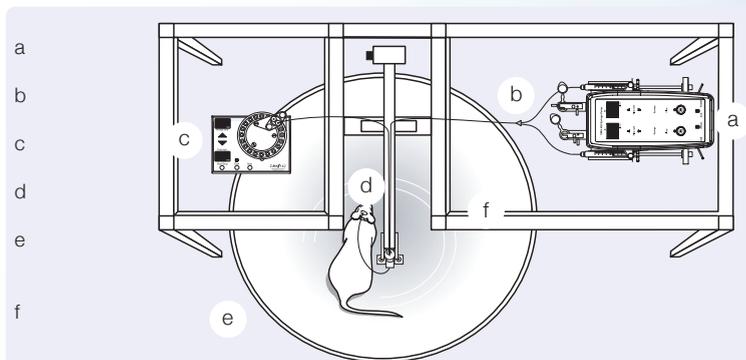
Micro T

CMA 142 Microfraction Collector

Probe

Microdialysis system for Freely Moving Animals
(incl. Bowl, Swivel Assembly and Balanced Arm)

Instrument Table



VIII

Microdialysis Probes

Overview

PROBES

CMA 7 Probe + Guide Cannula



- Ideal for CNS studies in small animals
- Designed for dialysis in transgenic mice, available metal free or β -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 metal free or β -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, available metal free
- 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

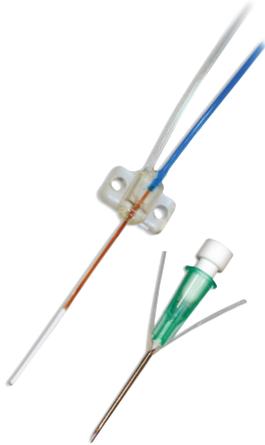
pages. Probes are delivered in vacuum-sealed packages, 3 pcs/pkg, or 4 pcs/pkg, and each probe is guaranteed for a single use. Flexible probes are packaged with introducers and split tubing guides. The linear probes consist of a tubing in which the middle part has a window with a membrane, where microdialysis takes place. Complete instructions are included in each package.

Microdialysis Probes

Overview

PROBES

CMA 20 PROBE + Introducer



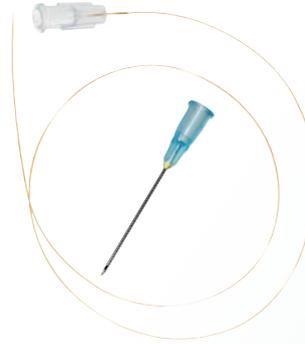
- Tailored for dialysis in peripheral tissues and blood vessels
- Inlet and outlet tubing is attached
- Soft, non-metallic construction
- Available membranes: PAES, 20 kDa MWCO
PES, 100 kDa MWCO
- Membrane lengths - 4 or 10 mm

CMA 30 Linear Probe



- 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

CMA 31 Linear Probe



- 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

Custom Made Probes

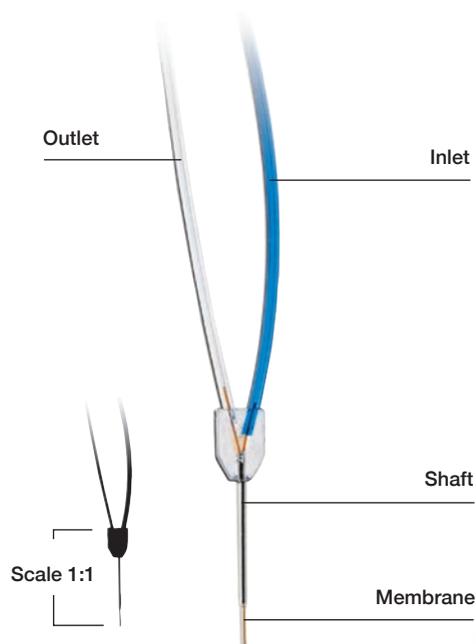


- For all occasions when standard probes are not appropriate
- Variety of styles and sizes according to the physio-chemical characteristics of recovered molecules, various organs, and biological species
- Customer specified style, shaft length, membrane type, membrane length and cut-off
- Coordinating guide cannula

CMA 7 Microdialysis Probe

Specially suited for CNS in mice

PROBES



- Extremely small
- Inlet and outlet tubing directly mounted
- Optimized for CNS use
- Available metal free or β -irradiated
- Ideal for chronic implantation

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.

ORDERING INFORMATION

CMA 7 Microdialysis Probe
3/pkg

Available membrane:
Cuprophane, 6000 Daltons cut-off

Membrane length Ref. No.

Standard

1 mm	CMA P000082
2 mm	CMA P000083

β -irradiated

1 mm	CMA 8010681
2 mm	CMA 8010682

Metal Free

1 mm	CMA 8010771
2 mm	CMA 8011084

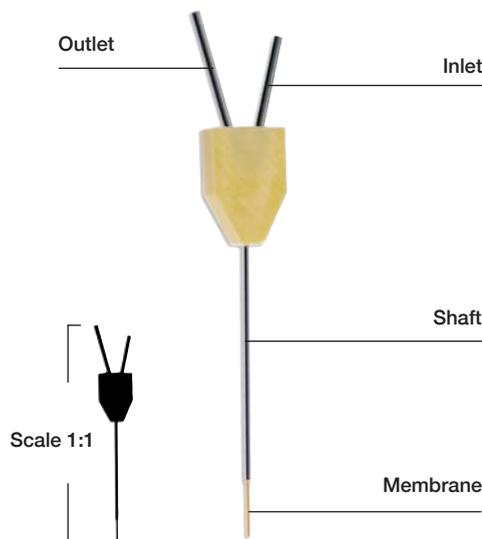
TECHNICAL INFORMATION

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

CMA 11 Microdialysis Probe

for discrete areas in the CNS

PROBES



- Small diameter
- High spatial resolution
- Minimal tissue damage
- Low internal volume
- Available metal free or β -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). β -irradiated CMA 11 probes are available for use in experiments where it is essential to minimize contamination by pathogens.

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

Membrane length Ref. No.

Standard

1 mm	CMA 8309581
2 mm	CMA 8309582
3 mm	CMA 8309583
4 mm	CMA 8309584

β -irradiated

1 mm	CMA 8011001
2 mm	CMA 8011002
3mm	CMA 8011003
4mm	CMA 8011004

Metal Free

1 mm	CMA 8011081
2 mm	CMA 8011082
3 mm	CMA 8011083
4 mm	CMA 8011084

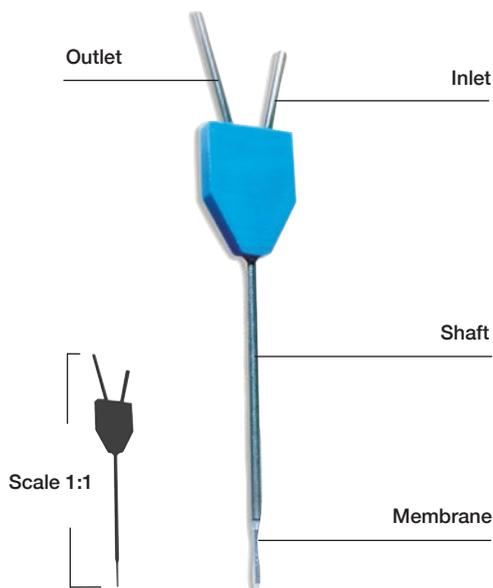
TECHNICAL INFORMATION

Stainless-steel shaft diameter	0.38 mm
Shaft length	14 mm
Membrane diameter	0.24 mm
Inlet internal volume	negligible
Outlet internal volume	1 μL

CMA 12 Microdialysis Probe

for regular use in the CNS

PROBES



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

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).

The CMA 12 Microdialysis Probes are guaranteed for single use. Complete instructions are included.

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.
CMA 12 Elite	
1 mm	CMA 8010431
2 mm	CMA 8010432
3 mm	CMA 8010433
4 mm	CMA 8010434
CMA 12 High cut-off	
1 mm	CMA 8309661
2 mm	CMA 8309662
3 mm	CMA 8309663
4 mm	CMA 8309664
CMA 12 Elite Metal Free	
1 mm	CMA 8011201
2 mm	CMA 8011202
3 mm	CMA 8011203
4 mm	CMA 8011204
CMA 12 High cut-off Metal Free	
1 mm	CMA 8011221
2 mm	CMA 8011222
3 mm	CMA 8011223
4 mm	CMA 8011224

CMA 12 Elite

CMA 12 High cut-off

CMA 12 Elite Metal Free

CMA 12 High cut-off Metal Free

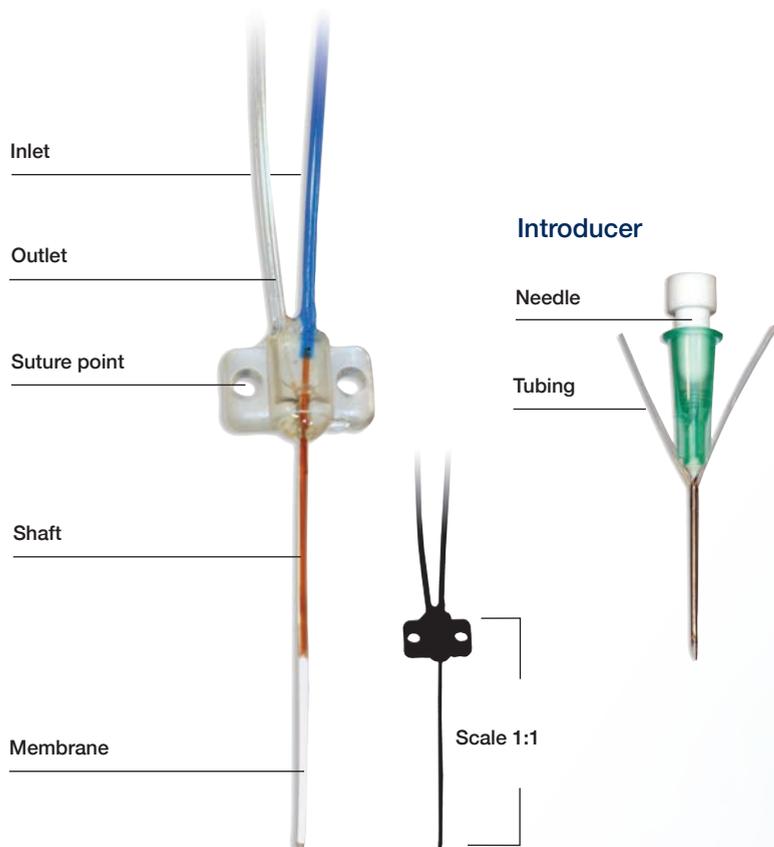
TECHNICAL INFORMATION

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

CMA 20 Microdialysis Probe

A flexible probe for peripheral tissues

PROBES



- Soft, non-metallic construction
- Ideal for cell metabolism studies
- Easy implantation procedure
- 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	Ref. No.
CMA 20 Elite	
4 mm	CMA 8010435
10 mm	CMA 8010436
CMA 20 High cut-off	
4 mm	CMA 8309670
10 mm	CMA 8309671



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

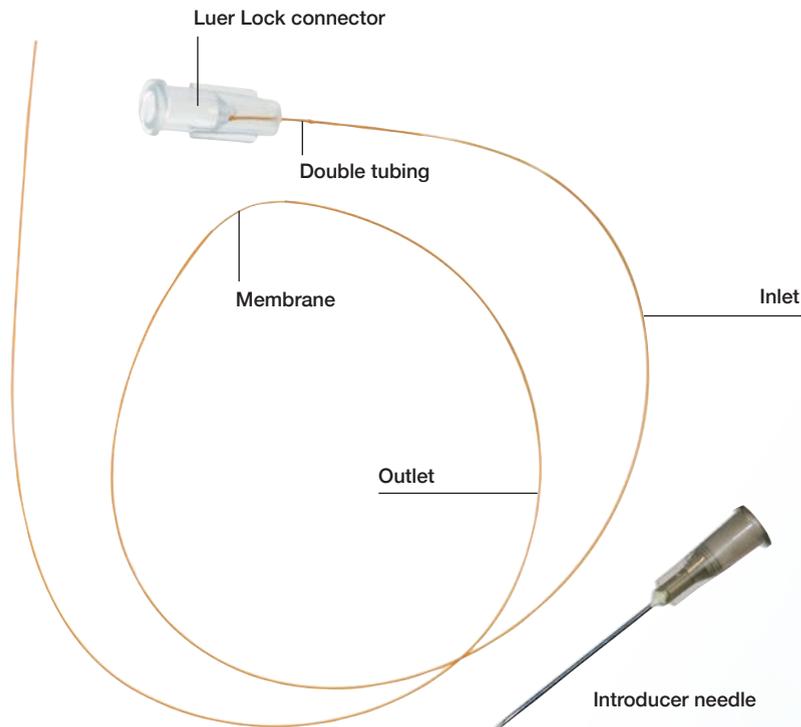
TECHNICAL INFORMATION

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

PROBES



ORDERING INFORMATION

CMA 30 Linear Microdialysis Probe
4/pkg

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

Membrane length	Ref. No.
10 mm	CMA 8010460

TECHNICAL INFORMATION

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

- 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

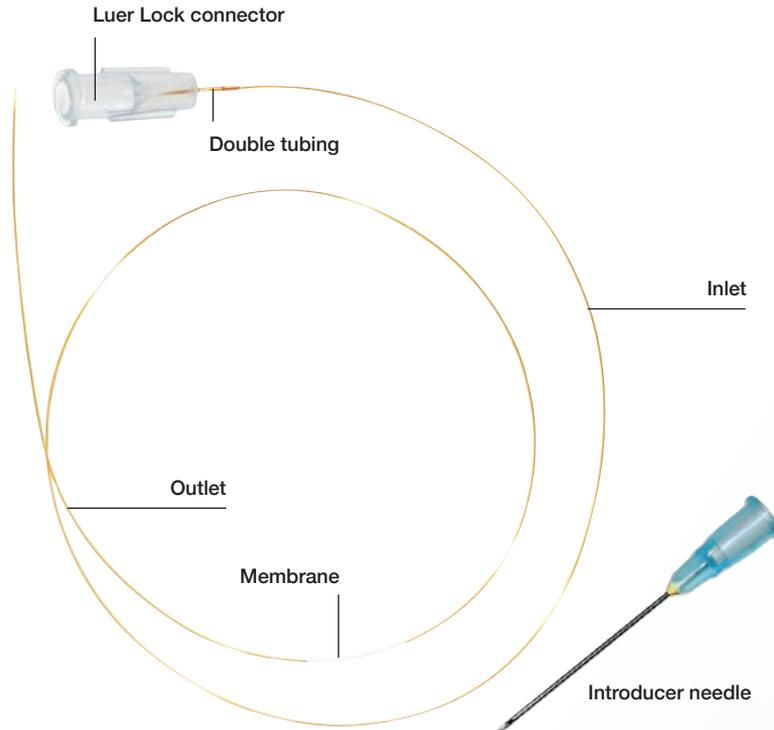
the tissue. The inlet of the probe has a Luer Lock connector that can be attached to a single use syringe, or can be cut off in order to use a glass syringe with a fixed needle and a tubing adapter.

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

PROBES



ORDERING INFORMATION

CMA 31 Linear Microdialysis Probe
4/pkg

Available membrane:
Polyethersulfone, 55 000 Daltons cut-off

Membrane length	Ref. No.
10 mm	CMA 8010631

TECHNICAL INFORMATION

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

- 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.

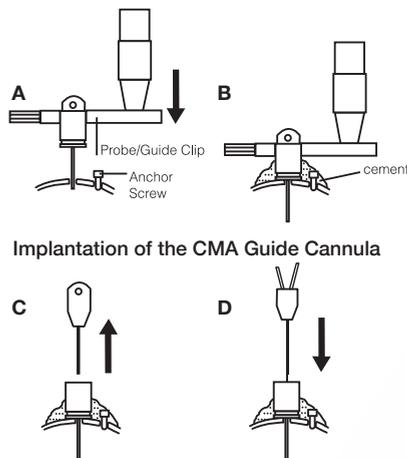
The probe is easy to implant, using an introducer needle that is included. The inlet of the probe has

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.

Probe Guide Cannulae

for Intracerebral Implantation



- 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 before ordering custom-made guides.

* Customer specified shaft length.

PROBES

ORDERING INFORMATION

Probe Guide Cannulae

	Ref. No.
CMA 7 Guide Cannula	
3/pkg	CMA P000137
30/pkg	CMA P000138
CMA 11 Guide Cannula	
3/pkg	CMA 8309017
30/pkg	CMA 8309018
CMA 11 Guide Metal Free	
3/pkg	CMA 8011085
CMA 12 Guide Cannula	
3/pkg	CMA 8309024
30/pkg	CMA 8309025
CMA 12 Guide Metal Free	
3/pkg	CMA 8011205
30/pkg	CMA 8011206

Custom Made Probe Guides*

	Ref. No.
CMA 7 Guide Cannula, Custom Made	
3/pkg	CMA 8010313
30/pkg	CMA 8010314
CMA 7 Guide β-irradiated, Custom Made	
3/pkg	CMA 8010683
30/pkg	CMA 8010684
CMA 7 Guide, Metal Free, Custom Made	
3/pkg	CMA 8010773
CMA 11 Guide Cannula, Custom Made	
3/pkg	CMA 8309029
30/pkg	CMA 8309030
CMA 11 Guide β-irradiated, Custom Made	
3/pkg	CMA 8011031
30/pkg	CMA 8011032
CMA 12 Guide Cannula, Custom Made	
3/pkg	CMA 8309008
30/pkg	CMA 8309009

* Specify shaft length.

Custom Made Probes

for Special Applications

PROBES



- Customer specified shaft length
- Customer specified membrane length
- Different membrane materials
- Metal Free

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 before ordering custom-made probes.

ORDERING INFORMATION

Custom Made Probes

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

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

Accessories

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.

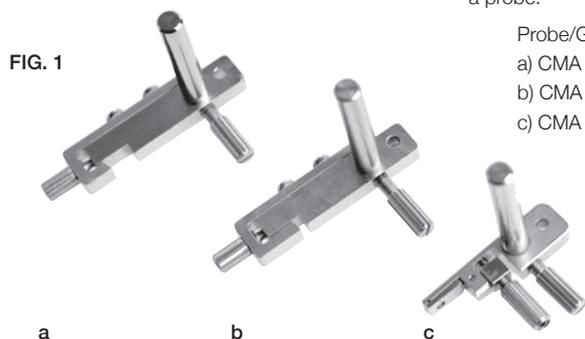


FIG. 1

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.

Probe/Guide Clips:

- CMA 11+12 Clip,
- CMA 7 Clip,
- CMA Probe Shaft Clip

FEP Tubing (FIG. 2)

This precise tubing with 0.12 mm inner diameter (internal volume of 1.2 $\mu\text{L}/100$ mm length) is, together with the Tubing Adapters, ideal for use in microdialysis experiments.

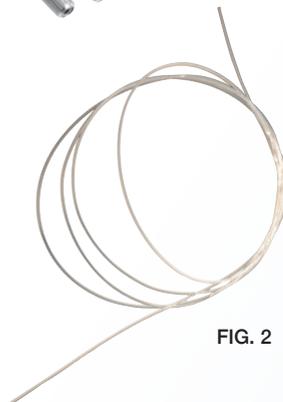


FIG. 2

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

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
Tubing Adapters, Linear Probe 10/pkg	CMA 8010464
Trepine Drill Bits, 3/pkg	CMA 8011158
Anchor Screw Drill Bits, 3/pkg	CMA 8003264
Anchor Screws, 100/pkg	CMA 7431021
Screw Driver Kit	CMA 8309673
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	75-0027
Replacement Glass Ionomer Cement Capsules, pkg. of 5	72-9169

Perfusion Fluid T1

5 mL glass ampoules, 10/pkg

Contents:

NaCl 147 mmol/L

KCl 4 mmol/L

CaCl₂ 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

CaCl₂ 1.2 mmol/L

MgCl₂ 0.85 mmol/L

Total chloride content:

153.8 mmol/L

Accessories

Trephine Drill Bits (fig. 4), Screw Drill Bits (fig. 5), Anchor Screws (fig. 6) and Screw Driver

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 for the Anchor Screws are available.

FIG. 6



Perfusion Fluid (FIG. 7)

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.

FIG. 7



Split Tubing (fig. 8)

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

FIG. 8



FIG. 9



Glass Ionomer Cement (FIG. 9)

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.

This Kit includes: 2 cartridges, 44 tips and 1 dispenser. Sold for laboratory animal research applications only.

CMA 120 System for Freely Moving Animals

INSTRUMENTS



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 μ 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 **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.

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 μ 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

Accessories

INSTRUMENTS

ORDERING INFORMATION

CMA 120 System for Freely Moving Animals, Accessories

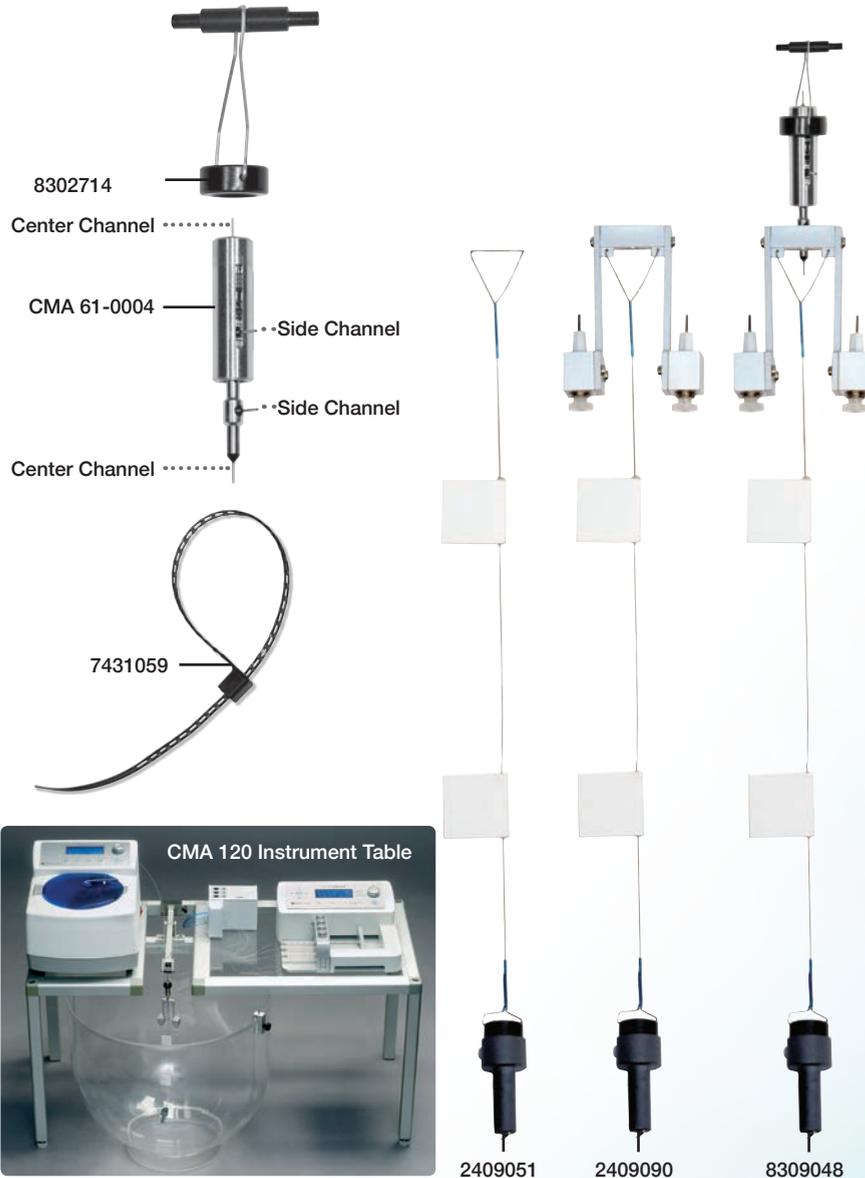
	Ref. No.
CMA 120 System without Bowl	CMA 8409029
CMA 120 Plastic Bowl	CMA 8309031
CMA 120 Swivel Assembly	CMA 8309048
CMA 120 Swivel Assembly without Swivel	CMA 2409090
CMA 120 Wire Set with Collar Connector	CMA 2409051
CMA 120 Balance arm	CMA 8309032
Gimbal for Swivel	CMA 8002714
Dual Channel Swivel	61-0004
Dual Channel Swivel for mouse	72-0000
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 micro-dialysis experiment for ease of operation

CMA 8309046

See accessories on next page.



CMA 120 Instrument Table

2409051

2409090

8309048

Microdialysis Systems for Freely Moving Animals

INSTRUMENTS



CMA 402 Syringe Pump

Mouse Cage

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

Instech durable polycarbonate cages designed to house tethered mice during short-term infusion and micro-dialysis 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.

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

ORDERING INFORMATION

Microdialysis System for Freely Moving Animals

	Ref. No.
Mouse Cage* and Accessories	
Polycarbonate	
(21.6 cm (8.5 in) high)	61-0046
with Pellet Feeder	72-0014
with Water Bottle	72-0015
with Pellet Feeder & Water Bottle	72-0016
Cage Lid	61-0048
Bottom Screen	61-0047
3.5 in (8.9 cm) Counter-Balanced Lever Arm	61-0024
Swivel for mice	CMA 8001346
Head Block Tether	61-0037
FEP Tubing 1m x10	CMA 8409501
Tubing Adapter	CMA 3409500
Vial Plastic 300uL 1000/pkg	CMA 7431100
Caps Plastic re-sealing 1000/pkg	CMA 7431102
Rat Cage* and Accessories	
Rat Cage* and Accessories	
Polycarbonate(38cm (15 in) high)	61-0042
with pellet Feeder	72-0017
with Water Bottle	72-0018
with Pellet Feeder & Water Bottle	72-0019
Cage Lid	61-0044
6 in (15.2 cm) Counter-Balanced Arm Swivel for Rats	61-0023
Head Block Tether	61-0036
FEP Tubing 1m x10	CMA 8409500
Tubing Adapter	CMA 3409500
Vial Plastic 300uL 1000/pkg	CMA 7431100
Caps Plastic re-sealing 1000/pkg	CMA 7431102
Microdialysis Instruments**	
Standard option 1:	
CMA 4004 Infusion Pump	CMA 400400
Syringe 2.5ml	CMA 8309021
CMA 470 Fraction Collector	CMA 8002770
Standard option 2:	
CMA 402 Infusion Pump	CMA 8003100
Syringe 2.5ml	CMA 8309021
CMA 142 Fraction Collector	CMA 8381142

*can be changed to cage without feeder and water.

** all pump/fraction collector combinations are possible depending on the experimental purpose

Stainless Steel Swivels

INSTRUMENTS



CMA 61-0004



CMA 72-0000



ORDERING INFORMATION

Stainless Steel Swivel

	Ref. No.
Dual Channel	61-0004
Dual Channel	72-0000

TECHNICAL INFORMATION

Ref. No. for Swivel	72-0000	61-0004
Inlet & Outlet Tube Gauge	22	22
Center Channel ID	0.006 in	0.06 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 Harvard/Insteck 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 Harvard/Insteck 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.

Multi-Channel Swivels

INSTRUMENTS



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

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

There are three standard configurations available; one with all 22 gauge infusion channels and two with a variety of combinations of microdialysis channels (low dead volume and lined to protect neurotransmitters) and standard 22 gauge infusion channels.

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 can have large dead volumes or problems with cross-channel leakage.

To solve these problems the seals were kept tight on the Multi-Channel Swivel and a motor was added to assist the rotation. A controller senses the animal's movement and 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 an Instech Single Channel Swivel.

ORDERING INFORMATION

Multi-Channel Swivels

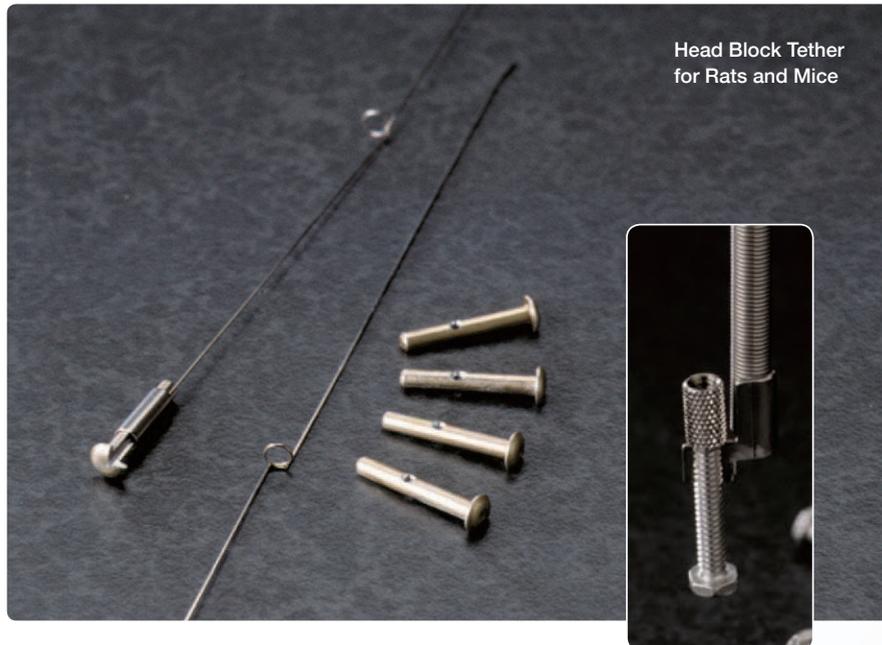
	Ref. No.
Powered Five Channel Swivel 5 Channels, 4 Microdialysis and 1 x 22 Gauge Channel, pkg. of 1	72-6134
5 Channels, 2 Microdialysis and 3 x 22 Gauge Channels, pkg. of 1	72-9351
5 Channels, all 22 Gauge Channels, pkg. of 1	72-9162

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

INSTRUMENTS



Head Block Tether
for Rats and Mice

ORDERING INFORMATION

Head Block Tethers

	Ref. No.
Head Block Tether	
for Rats	61-0036
for Mice	61-0037

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 block screws	5 head block pegs
	Miniature nut	Peg sleeve
	Tether with blade	Looped wire tether
Ref. No.	61-0036	61-0037

- 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 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 Glass ionomer Cement (see page 23). The wire tether is easily attached by inserting it into a hole in the peg and sliding a sleeve over it.

CMA 4004 Syringe Pump

Four-syringe liquid delivery



- Four syringe carriage
- Both pull and push options
- High Resolution LCD color touch screen
- Wide flow rate range from 0.54 pl/min to 11.70 ml/min

The CMA 4004 Syringe Pump is a totally new design that is easy-to-use, can hold four syringes, and provides a very broad flow range rate suitable for microdialysis. In addition the pump can deliver very precise micro-injections that can be repeated in intervals.

Using the high resolution LCD color touch screen makes it very easy to program and recall methods. The direction of flow can easily be reversed for experiments requiring fluid withdrawal.

The CMA 4004 Syringe Pump has the ability to run in a horizontal or vertical orientation. This allows choosing the proper orientation based on the experiment setup.

The CMA 4004 is equipped with RS-485 for daisy chaining pumps and Digital I/O for remote control as well as USB serial port for computer control.

INSTRUMENTS

ORDERING INFORMATION

CMA 4004 Syringe Pump

Ref. No.

CMA 400400

The pump is delivered without syringes.
1-10 mL syringes available (see page 32).

TECHNICAL INFORMATION

Number of syringes	1 to 4
Syringe Size (Min./Max.)	0.5 µl to 10 ml
(Minimum - 0.5 µl syringe)	0.54 pl/min Flow Rate
(Maximum - 10 ml syringe)	11.70 ml/min
Accuracy	±0.35%
Reproducibility	±0.05%
Linear Force (Max)	16 kg (35 lbs) @ 100% Force Selection
Drive Motor	0.9° Stepper Motor
Motor Drive Control	Microprocessor with 1/16 microstepping
Display	4.3 WQVGA Color Touchpad
Number of Microsteps per one rev. of Lead	Screw 20,480
Step Resolution	0.031 µm/µstep
Step Rate (Min)	27.5 sec/µstep
Step Rate (Max)	26 µsec/µstep
Power Supply	100-240 VAC, 50-60 Hz

Intended use: Designed for research and industrial applications, the CMA 4004 Syringe Pump is not approved for clinical use.

CMA 402 Syringe Pump

Dual syringe perfusion



- Dual syringes independently controlled
- Flow rates from 0.1- 20 $\mu\text{L}/\text{min}$
- Independent flow directions to infuse or withdraw

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 $\mu\text{L}/\text{min}$ and 20 $\mu\text{L}/\text{min}$. 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 $\mu\text{L}/\text{min}$. 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.

INSTRUMENTS

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

TECHNICAL INFORMATION

Syringes	Piston stroke 60 mm, 1, 2.5 or 5 mL
Flow rate range	0.1 $\mu\text{L}/\text{min}$ - 20 $\mu\text{L}/\text{min}$
Flush flow rate	Approx 20 $\mu\text{L}/\text{min}$ (with 1 mL syringe)
Piston carriage speed	2.4 $\mu\text{m}/\text{min}$- 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

Intended use: Designed for research and industrial applications, the CMA 402 Syringe Pump is not approved for clinical use.

CMA 4004 and CMA 402 Syringe Pump

Accessories

INSTRUMENTS

ORDERING INFORMATION

CMA 4004 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 4004 Syringe Pump

** For use with CMA 402 Syringe Pump

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.

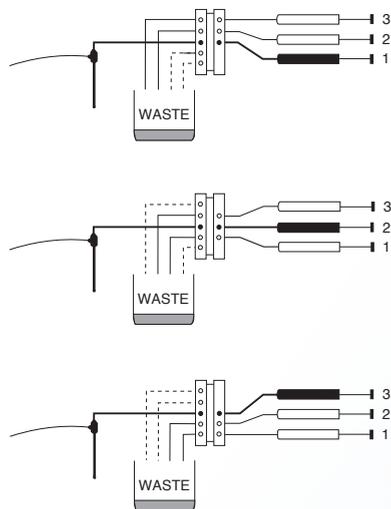
Syringe Clip (FIG. 2) The Syringe Clip enables the withdrawal of liquids when using the CMA 402 Syringe Pump. The clip fastens the syringe plunger to the carriage of the pump.

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.

CMA 110 Liquid Switch

Switching perfusion lines



- 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.

INSTRUMENTS

ORDERING INFORMATION

CMA 110 Liquid Switch

Ref. No.

Includes:
Tubing Kit

CMA 8308200

Accessories

CMA 110 Tubing Kit

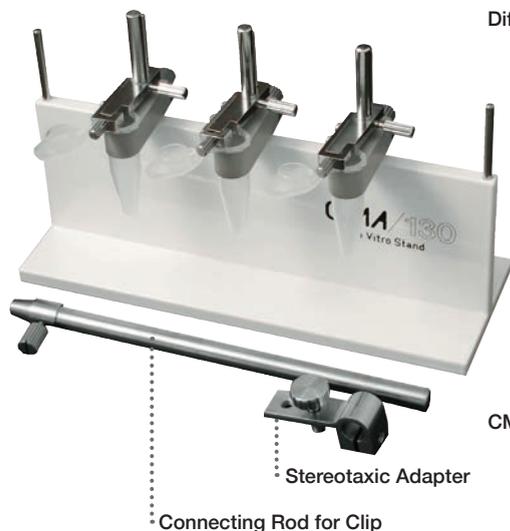
CMA 3408550

TECHNICAL INFORMATION

Size	66 x 46 x 50 mm
Weight	0.13 kg
Internal volume	Inlet side 1.7 µL, Outlet side 1.7 µL

CMA 130 in Vitro Stand

INSTRUMENTS



- 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

Ref. No.

CMA 130 In Vitro Stand
with CMA 11+12 Clips x 3 **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 P000136**
CMA 11 + 12 Clip **CMA 8309013**
CMA Probe Shaft Clip **CMA 8309003**
Connecting Rod for Clip **CMA 8309004**
Stereotaxic Adaptor **CMA 8309005**

Homeothermic Monitoring System

INSTRUMENTS



- Easy to use touchscreen
- Flexible rectal probe
- Easy to clean, flexible heating pad
- Multiple heating pad sizes available

The Homeothermic Monitoring System is a closed loop temperature control system for small rodents. Utilizing a small, flexible rectal probe to monitor the animal's core temperature and a heating pad to provide heat input, the subject's core body temperature can be accurately controlled. The system is provided complete and includes the control unit, flexible rectal probe, standard size heating pad (12 x 20.5 cm) and an insulation pad.

The easy to use touch screen allows users to set the target temperature and clearly view the subject's current core body temperature, as well as the set temperature, at all times. Additionally,

audible alarms can be set to advise the user should the animal's core body temperature deviate $\pm 1^\circ\text{C}$ from the set temperature.

Heating pads are available in three sizes to fit all your surgical needs. The standard size is appropriate for mice and rats and fits nicely into standard stereotaxic instruments. Two additional sizes are available to fit the common stereotaxic instrument adapters. The pads are flexible enough to fully wrap the animals, which allows the animal to be warmed from all sides rather than just the front or back.

ORDERING INFORMATION

Homeothermic Monitoring System

includes:
Homeothermic Control Unit, Rectal Probe,
Heating Pad, Insulation Pad and USB cable.

	Ref. No.
System with the Standard Size Heating Pad (12.0 x 20.5 cm)	55-7020
System with the Mouse Stereotaxic Heating Pad (7.0 x 14.5 cm)	55-7030
System with the Stereotaxic Gas Anesthesia Heating Pad (3.7 x 14.5 cm)	55-7031

Accessories

Flexible Rectal Probe, 1.6 mm OD	55-7021
Heating Pad, standard, 12.0 x 20.5 cm	55-7022
Heating Pad, for Mouse Stereotaxic Adapter, 7.0 x 14.5 cm	55-7023
Heating Pad, for Stereotaxic Gas Anesthesia Platform, 3.7 x 1.5 cm	55-7024
Insulation Pad, for Standard Heating Pad, 12.0 x 20.5 cm	55-7025
Insulation Pad, for Mouse Stereotaxic Adapter Heating Pad, 7.0 x 14.5 cm	55-7026
Insulation Pad, for Stereotaxic Gas Anesthesia Platform Heating pad, 3.7 x 14.5 cm	55-7027

TECHNICAL INFORMATION

Temperature Range	20-50°C (68-122°F)
Resolution	0.1°C
Integrated Temperature Sensor	Yes
Temperature Stability	0.1°C
Temperature Display	Select °C/°F
Pad Material	Silicone
Probe	Flexible rectal prob
Probe Tip Diameter	1.6 mm (0.06 in)
Probe Shaft Diameter	1.6 mm (0.06 in)
Probe Shaft Length	100 mm (3.94 in)
Serial Communication	RS-485
Analog Output	0-5V, 20-50°
Analog Input	0-5V, 20-50°
Dimensions (H x W x D)	12.0 x 22.6 x 15.8 cm (4.72 x 8.91 x 6.21 in)
Weight	0.68 kg (1.5 lbs)
Voltage	100-240 VAC, 50/60 Hz

CMA 142 Microfraction Collector

for single/dual probe sampling



- Sampling from one or two probes
- Precision and accuracy from 1 μL
- Compact design

The CMA 142 Microfraction Collector is a unique, stand-alone instrument dedicated for microdialysis sampling. Fractions ranging from 1 to 50 μL can be collected from one or two micro-dialysis 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.

INSTRUMENTS

ORDERING INFORMATION

CMA 142 Microfraction Collector

CMA 142, 230 V

CMA 142, 115 V

Ref. No.

CMA 8381142

CMA 8381143

Accessories

Vials, plastic 300 μL , 1000/pkg

CMA 7431100

Caps, plastic re-sealing 1000/pkg*

CMA 7431102

Vials, glass 300 μL , 500/pkg

CMA 7431007

Caps/Seals Non-Reclosing
Small, 1000/pkg*

CMA 7432175

* Not for use in the Fraction Collector.

TECHNICAL INFORMATION

Minimum fraction volume **1 μL**

Maximum fraction volume **50 μL**

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

INSTRUMENTS

ORDERING INFORMATION

CMA 470 Refrigerated Fraction Collector

Ref. No.

CMA 8002770

Includes:

- 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 μ L (1000/pkg) **CMA 7431100**
- Caps Plastic re-sealing 1000/pkg* **CMA 7431102**
- Vials, Glass 300 μ 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 μL - 1.2 mL
Number of vials	64 x 300 μL, 40 x 2.0 mL
Septa	Non-Reclosing
Cooling	Down to +6 oC, in steps of 1 oC
Cooling capacity	-15 oC from environmental temperature or better
Temperature accuracy	\pm1.5 oC
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 oC
- Holds up to 64 vials
- Fractions from 1 to 1200 μ L
- 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 μ L at the bottom of each vial. The capacity of the collector is 64 vials of 300 μ 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.

New Standard Stereotaxic Instruments

STEREOTAXIC EQUIPMENT



- 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 μ 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.

ORDERING INFORMATION

New Standard Stereotaxic Instruments

	Ref. No.
New Standard Stereotaxic for Rats and Mice, Model 51500	72-6335
Dual New Standard Stereotaxic for Rats and Mice, Model 51503	72-6336
Digital New Standard Stereotaxic for Rats and Mice, Model 51500D	72-6338
Digital Dual New Standard Stereotaxic for Rats and Mice, Model 51503D	72-6339
Motorized New Standard Stereotaxic for Rats and Mice, Model 51500M	72-6340
New Standard Stereotaxic for Rats and Mice (no manipulator arm), Model 51501	72-6337

Just for Mouse™ Stereotaxic Instruments

STEREOTAXIC EQUIPMENT



Just for Mouse™
Stereotaxic Instruments

ORDERING INFORMATION

Just for Mouse™ Stereotaxic
Instruments

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

* Delrin® Ear bars with 3 types of head holders

- Ear and tooth bar adjustment to accommodate animals between 10 and 75 grams

The Just for Mouse™ Stereotaxic Instruments are 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.

Bone Micro Drill System

INSTRUMENTS



- 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

This **Bone Micro Drill System** 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

- Small, lightweight, ergonomically designed hand piece reduces fatigue
- Complete - includes ball mills, abrasive bits, and cutting discs

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.

ORDERING INFORMATION

Bone Micro Drill System	Ref. No.
Complete Bone Drill System	
120 VAC	72-4950
230 VAC	72-4951
Accessory Kit for Micro Drill (see below*)	72-4967
Abrading Tip	
Rubber, pkg. of 20	72-4952
Stone, pkg. of 5	72-4953
Accessory Stand	72-4954
Ball Mill, Carbide, pkg. of 5	
#1, .031 in Diameter	72-4955
#2, .039 in Diameter	72-4956
#3, .047 in Diameter	72-4957
#4, .055 in Diameter	72-4958
#5, .063 in Diameter	72-4959
#6, .071 in Diameter	72-4960
#7, .083 in Diameter	72-4961
#1/4, .019 in Diameter	72-4962
#1/2, .027 in Diameter	72-4963
Cutoff Disk, pkg. of 20	72-4964
Mandrel, Screw, pkg. of 5	72-4965
Mandrel, Threaded, pkg. of 5	72-4966
Extra Large Probe Holder for attachment of hand piece to stereotax	72-4860

*Accessory Kit Includes (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

Cordless Clipper and Skin Tunneling Needles

INSTRUMENTS

ORDERING INFORMATION

BravMini Cordless Clipper

	Ref. No.
BravMini Cordless Clipper, 115 VAC	72-9069

Size 30 Replacement Blade for 72-9069*	72-9064
---	----------------

BravMini Cordless Clipper, 230 VAC	34-1442
---------------------------------------	----------------

Size 30 Replacement Blade for 34-1442*	34-1448
---	----------------

*Size #30 replacement blades also fit the ChroMini Clipper.

Skin Tunneling Needles

	Ref. No.
OD x ID: 3.2 x 25 mm (1/8 x 1/10 in) Lengths: 15.2, 22.9, 30.5 cm (6, 9, 12 in)	72-0680

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)	72-0679
---	----------------



- Cordless operation with approximately 1 hour, 40 minutes cordless run time
- Lightweight and quiet
- Easy to use

This **BravMini Cordless Clipper** is ideal for removing fine hair from laboratory animals without causing damage to their delicate skin. It combines unbeatable performance and cordless operation. This permits you to achieve the results that professionals demand. The clipper features a superior quick detachable blade. Cutting length is 0.4 mm and cutting width is 32 mm.

This clipper comes complete with rechargeable/cordless trimmer, charger stand, detachable #30 blade, cleaning brush, oil, and snap on guide comb.

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.

Minor Surgery Surgical Kit

SURGICAL INSTRUMENTS



ORDERING INFORMATION

Minor Surgery Surgical Kit

Ref. No.

Minor Surgery Surgical Kit **72-8940**

This kit consists of:

Scalpel Handle No. 3 **72-8350**

Scalpel Blades No. 10, Sterile **72-8360**

Eye Scissors, 11.5 cm Curved,
Special Cut **72-8441**

Blumenthal Bone Rongeurs,
Curved, 15.5 cm **72-8906**

Universal Clothing Scissors **72-8450**

Operating Scissors, 14.5 cm
Sharp/Blunt, Straight **72-8393**

Kuehne Cover Glass Forceps,
10 cm, Angled **72-8676**

Jeweller's Forceps 11 cm,
No. 5 with Extra Delicate Points **72-8696**

Probe 14.5 cm Double Ended,
1 mm Diameter **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.

The Minor Surgery Surgical Kit is ideally suited for basic procedures and minor surgery.

Major Deluxe Surgical Kit

SURGICAL INSTRUMENTS



ORDERING INFORMATION

Major Deluxe Surgical Kit

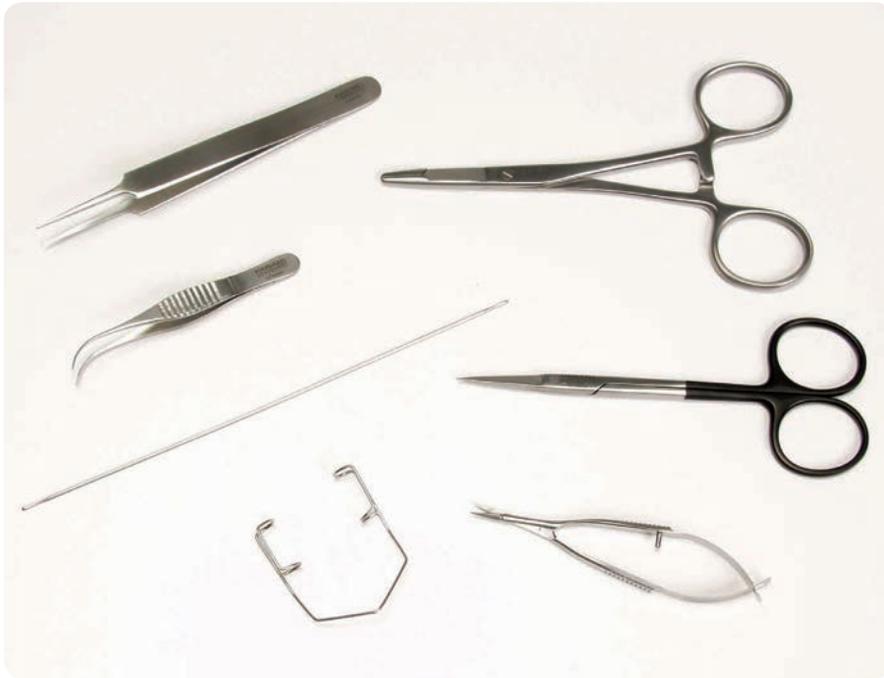
	Ref. No.
Major Deluxe Surgical Kit	72-8941
This kit consists of:	
Scalpel Handle No. 3	72-8350
Scalpel Blades No. 10, Sterile	72-8360
Scalpel Blades No. 11, Sterile	72-8362
Vannas Eye Scissors, Spring Action Model Tübingen, 8.5 cm, Straight	72-8508
Olsen-Hegar Needle Holders with Scissors with Tungsten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

The Major Deluxe Surgical Kit is ideally suited for more extensive procedures and major laboratory animal surgeries.

Rat Surgical Kit

SURGICAL INSTRUMENTS



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 long time. You can purchase these surgical instruments individually or in a convenient kit.

The Rat Surgical Kit is an ideal starting point for surgical procedures commonly performed on laboratory rats.

ORDERING INFORMATION

Rat Surgical Kit

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

Mouse Surgical Kit

SURGICAL INSTRUMENTS



ORDERING INFORMATION

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

The Mouse Surgical Kit is ideal starting point for surgical procedures performed on laboratory mice.



Customer Support

GENERAL INFORMATION

Support and Technical Services

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 for the latest technical support and service information.

Sweden Office

Phone: +46-8-470 10 00

Email: cma@microdialysis.se

US Office

Phone: (800) 547-6766

Fax: (508) 429-5732

Email: support@hbiosci.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.

Ask us for more information

Contact Us

GENERAL INFORMATION

Sweden Office

**CMA Microdialysis AB
(Head Office)
Torshamnsgatan 30A
SE-164 40 Kista
Sweden**

Phone: **+46 8 470 10 00**
E-mail: **cma@microdialysis.se**
Website: **www.microdialysis.com**

Visiting address:

Torshamnsgatan 30A

Delivery address:

**Torshamnsgatan 30B, godsmottagningen,
plan 3:
SE-164 Kista**

US Office

**Harvard Apparatus
84 October Hill Road
Holliston
MA 01746, USA**

Phone: **(800) 547-6766**
E-mail: **support@hbiosci.com**
Website: **www.harvardapparatus.com**



Exploring Tissue Chemistry

CMA Microdialysis AB

Sweden Office

Torshamnsgatan 30A • SE-164 40 Kista
Tel: +46-8-470 10 00
E-mail: cma@microdialysis.se

Harvard Apparatus

US Office

84 October Hill Road
Holliston • MA 01746 • USA
Tel: (800) 547-6766
E-mail: support@hbiosci.com

www.microdialysis.com
www.harvardapparatus.com

Distributor