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CTS™ DynaMag™ Magnet

USER GUIDE

For Optimal Separation of Dynabeads™ Magnetic Beads

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Product information

Product description

The CTS™ DynaMag™ Magnet is a magnetic device for use in combination with Dynabeads™ magnetic beads for medium to large-scale separation of cells.

The magnet is suitable for use with commercially available sterile blood/culture bags, tubing and connectors to perform positive isolation of target cells or depletion of unwanted cells in a sterile and closed system.

The CTS™ DynaMag™ Magnet is intended for research use or manufacturing of cell, gene, or tissue-based products.

The magnet can be used in combination with clinical research products from the CTS™ Dynabeads™ portfolio to:

- Positively isolate bead-bound cells for subsequent stimulation/expansion of T cells with CTS™ Dynabeads™ CD3/CD28 magnetic beads (Cat. No. 40203D), and removal of Dynabeads™ magnetic beads after expansion.
- Deplete unwanted cell types by discarding magnetically captured bead-bound cells with customized Dynabeads™ products for depletion of specific cell populations, or indirect isolation of cells that are incubated with specific antibodies prior to adding secondary coated Dynabeads™ magnetic beads.

System overview

The CTS™ DynaMag™ Magnet consists of a Rotation Unit with a detachable Primary Magnet, a Secondary Magnet, a Base Unit with a Solution Pole to hold a bag with priming and washing solution, and a retractable plate to hold the bag with the residual cells after the magnetic capture of bead-bound cells. Standard blood bags and tubing are included in the figure for illustrative purposes only, and are not supplied by Thermo Fisher Scientific.

See "Operating the CTS™ DynaMag™ Magnet" (page 6) for detailed information of the operation of the CTS™ DynaMag™ Magnet.

Storage conditions

Protect the CTS™ DynaMag™ Magnet from vibration and keep out of direct sunlight.

Front view

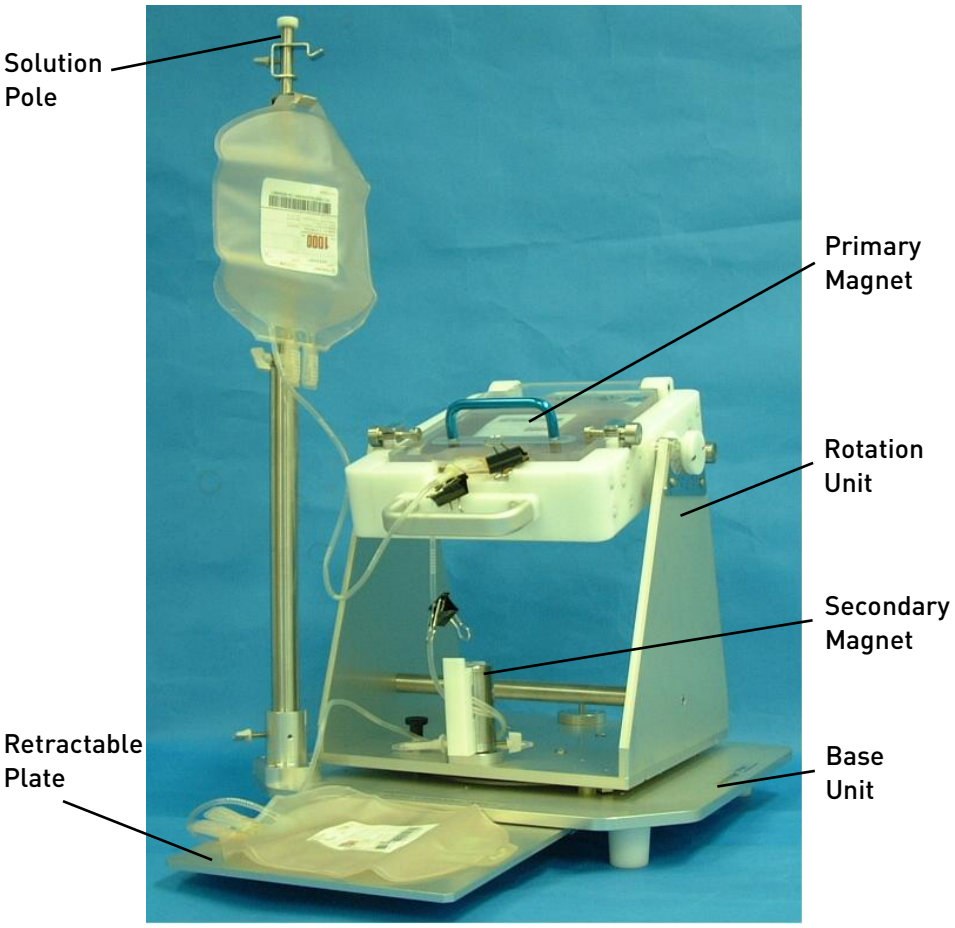


Figure 1 Overview of the CTS™ DynaMag™ Magnet

CAUTION! This device contains extremely powerful permanent magnets. Keep ferromagnetic and ferromagnetically-sensitive material away from the magnetic surfaces and associated fields. Do not bring tools, equipment or personal items containing steel, iron or other magnetic materials close to the magnets. The strong magnetic field can erase magnetic media such as floppy disks and tapes, disable ATM and credit cards, and can damage some watches. Strong magnetic fields can also cause serious injury to persons with implanted or attached medical devices, such as pacemakers and prosthetic parts.

The Health and Safety Officer should take all necessary steps and full responsibility to ensure that the precautions and statements are followed and adhered to. IN NO EVENT SHALL THERMO FISHER SCIENTIFIC AS BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES.

Description of Parts

System components

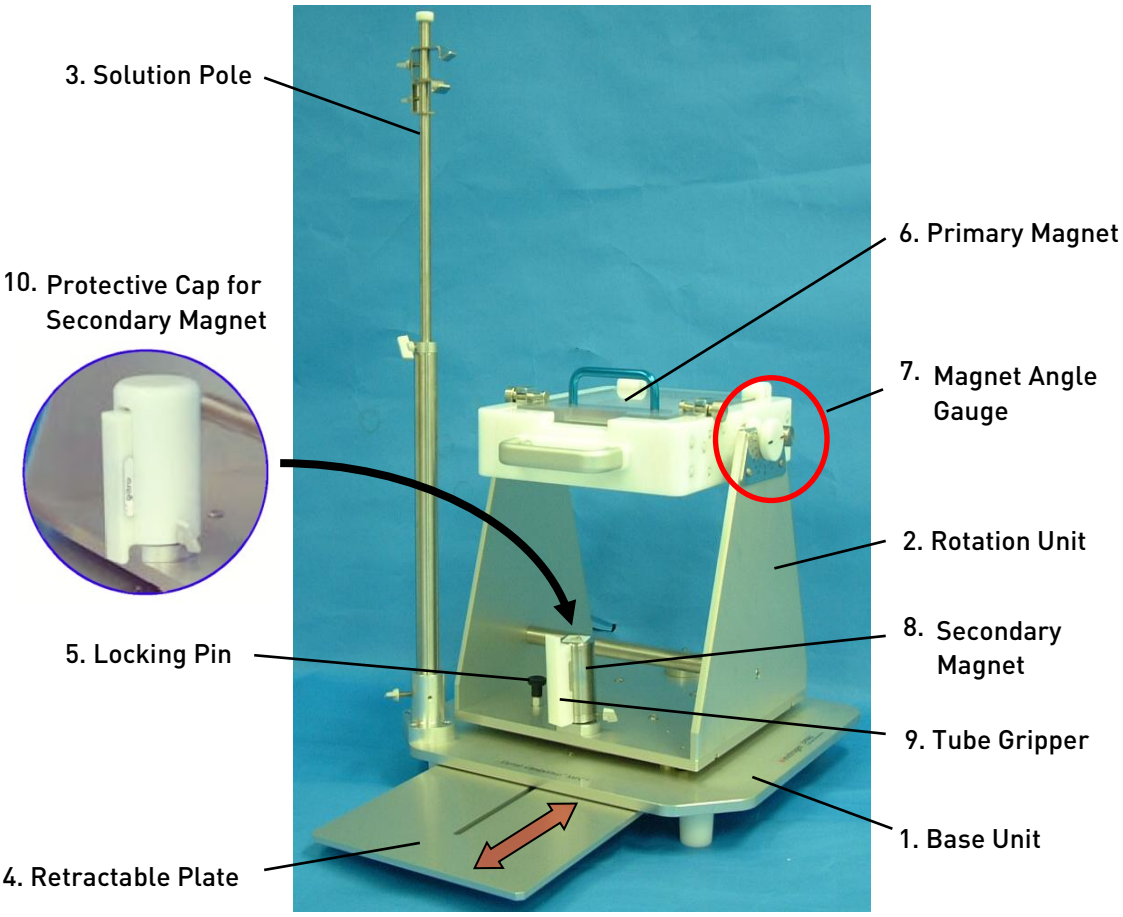


Figure 2 Detailed overview of the CTS™ DynaMag™ Magnet

Base Unit

The Base Unit (1) holds the Rotation Unit (2) and a Solution Pole (3) for the bag with priming and washing solution. A Retractable Plate (4) under the front of the base provides extra space for another bag.

Rotation Unit

The Rotation Unit (2) can be rotated 0°, 90° and 180°. To release the Rotation Unit, pull up the Locking Pin (5). The pin will automatically fix the Rotation Unit at the desired position.

Solution Pole

The Solution Pole (3) supports the bag with priming and washing solution. The height of the pole can be adjusted from 50 to 80 cm.

Retractable Plate

The Retractable Plate (4) under the Base Unit provides additional space and can hold a bag of up to 3 kg. Placing the bag horizontally is considered to be gentler to the cells.

Primary Magnet

The Primary Magnet consists of an array of extremely strong permanent Neodymium-Iron-Boron magnets. The arrangement is optimized to give high field strength and a favorable field gradient, which ensures efficient separation of M-450 Dynabeads™ magnetic beads within 1 minute. Optimal separation takes place in closed, sterile bags at an approximate distance of 11 mm or less from the magnet surface, which is possible with sample volumes up to 330 mL in 1000 mL bags in static separations. A continuous-flow separation procedure for larger volumes using an equivalent magnetic separation system is described [reference 2].

The Primary Magnet can be detached from the Rotation Unit to allow refrigeration if cold separations are desired. Refer to "Attaching and detaching the Primary Magnet" (page 6) for the detachment/attachment procedures.

The Primary Magnet can be inclined stepwise to optimize separation (Figure 4, page 5). Additionally, optional configurations allow the magnet to be positioned below or above the sample bag (Figure 9, page 9). When the magnet is positioned above the sample bag, the bead-cell complexes have to move against gravity, thus avoiding unspecific cell trapping.

The Primary Magnet is protected by a transparent plexiglass lid. Iron plates embedded in the lid apply pressure to the sample bag by magnetic attraction. In addition, springs in the Lid Shutting Pin unit will help to compress the bag. These features ensure that the Dynabeads™ magnetic beads are kept within the optimal range of the magnetic field.

Figure 3 CTS™ DynaMag™ Primary Magnet

Note: The field strength of the magnet decreases exponentially with the distance to the surface of the magnet. If the field strength is found to be too high for a specific application, adjust the distance to the magnet by adding a thin spacer (e.g., plastic film or a bench coat, between the bag and the magnet).

The Primary Magnet can be positioned below or above the bag by combining rotation of the base with inverting the Primary Magnet. The magnet can be inclined counterclockwise at –15°, 0°, 15°, 30°, 45°, 60°, 90°, 165°, 180°, and 195° to optimize the separation.

Set the angle by turning the magnet to the required angle indicated on the Angle Gauge and set the Magnet Fixing Pin.

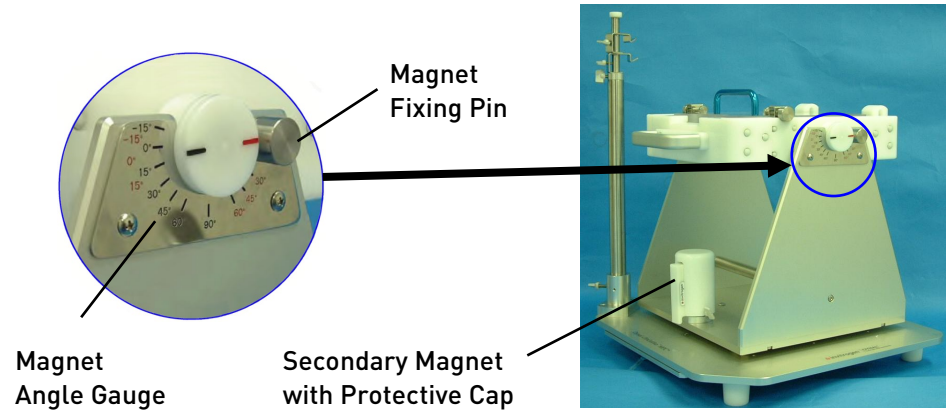


Figure 4 Adjusting the angle of the CTS™ DynaMag™ Primary Magnet

Secondary Magnet

The pillar shaped Secondary Magnet is used to trap residual Dynabeads™ magnetic beads that may escape the Primary Magnet, and can be fixed to the Rotation Unit in two positions depending on the configuration of the Primary Magnet (see "Changing the configuration of the Primary Magnet", page 9).

The Secondary Magnet is formed from individual Neodymium-Iron-Boron magnets oriented parallel to the axis of the pillar. The individual magnets are separated from each other by non-magnetic material in a specific configuration to ensure optimization of the magnetic capture in flow-through systems (i.e., large surface area for capture in conjunction with a relatively long flow path under influence of a strong magnetic field).

For details on setting up the Secondary Magnet, refer to "Setting up the Secondary Magnet" (page 10).

Place the Protective Cap over the Secondary Magnet when it is not in use.

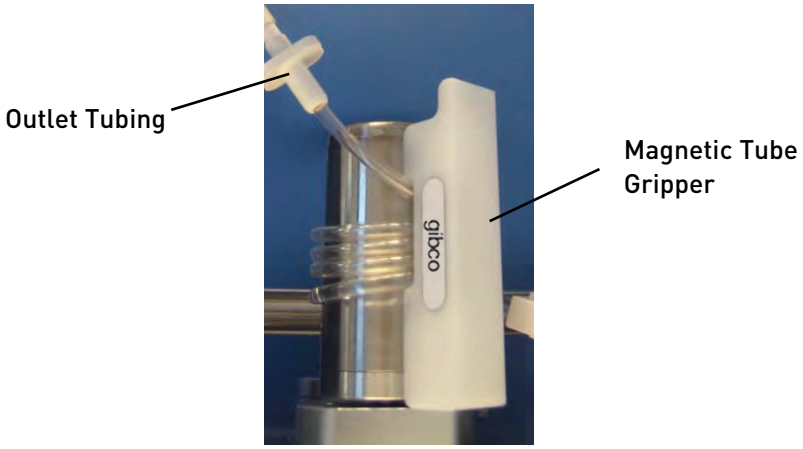


Figure 5 CTS™ DynaMag™ Secondary Magnet

Operating the CTS™ DynaMag™ Magnet

Attaching and detaching the Primary Magnet

The Primary Magnet can be detached from the Rotation Unit for refrigeration prior to the cell separation if cold conditions are required.

Prior to detaching/attaching the Primary Magnet, remove the Solution Pole from the Base Unit.

As the Primary Magnet is heavy, it is easier to lift the magnet by its grips if the rotation unit is positioned perpendicular to the base position. Turn the Rotation Unit 90˚as shown in Figure 9 (page 9).

Ensure that the Magnet Fixing Pin is released (Figure 6).

Attaching the magnet: Hold the Primary Magnet grips tightly (Figure 3) and align the grooves of the rollers on the roller guides of the Rotation Unit. Insert the roller Guide into the grooves.

Fix the magnet to the Rotation Unit with the Magnet Fixing Pin.

Detaching the magnet: Release Magnet Fixing Pin. Hold the Primary Magnet grips tightly and pull the magnet straight up.

1. Release the Magnet Fixing Pin prior to attaching or detaching the Primary Magnet to the Rotation Unit.
2. Place the Primary Magnet onto the Rotation Unit by fitting the Roller Guide into the groove of the Roller.

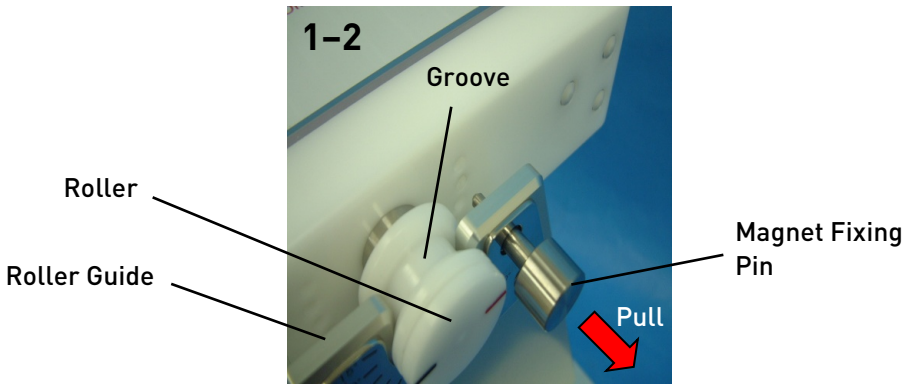
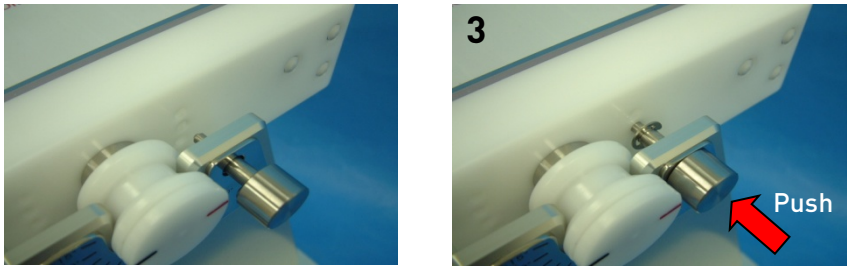


Figure 6 Releasing the Primary Magnet

3. Push the Magnet Fixing Pin to lock the Primary Magnet in place.

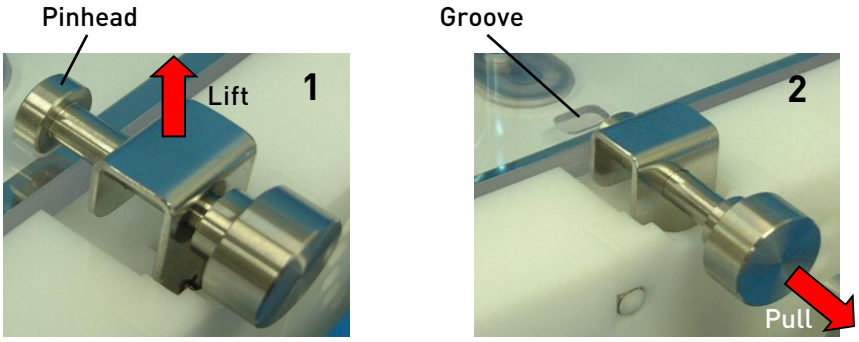


Released Position | Fixed Position

Opening and closing the Primary Magnet Lid

Open the Primary Magnet Lid using the following procedure. Close the Primary Magnet Lid by reversing the procedure.

1. Lift the Shutting Pin and remove the pinhead from the groove in the lid.
2. Pull out the pin.



3. Open the Lid using the Open/Close Handle.

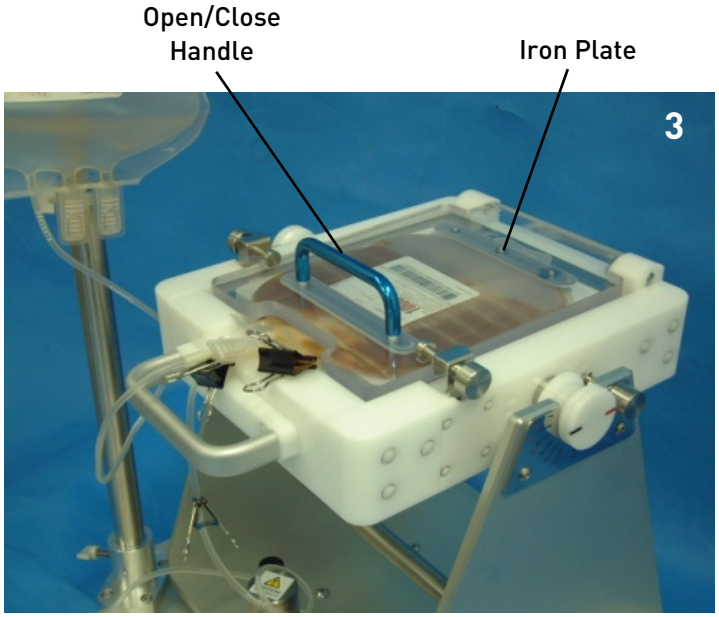


Figure 7 Opening/closing the Primary Magnet Lid

Setting the operating angle of the Primary Magnet

Set the incline and position of the Primary Magnet with the Angle Gauge and the Magnet Fixing Pin as illustrated in the following procedure.

CAUTION: **Do not turn** the Primary Magnet when the fixing pin is set.

CAUTION: **Do not turn** the Primary Magnet when the secondary magnet protective cap is used. The magnet grips may hit the secondary magnet.

CAUTION: **Do not turn** the Primary Magnet when the lid is open. The pin head may hit the Rotation Unit and damage the lid. Make sure the lid is closed (Figure 7, page 7).

1. Release the Magnet Fixing Pin.
2. Incline the Primary Magnet to the desired setting indicated on the Angle Gauge.
3. Fix the Magnet Fixing Pin to lock the Primary Magnet in place.

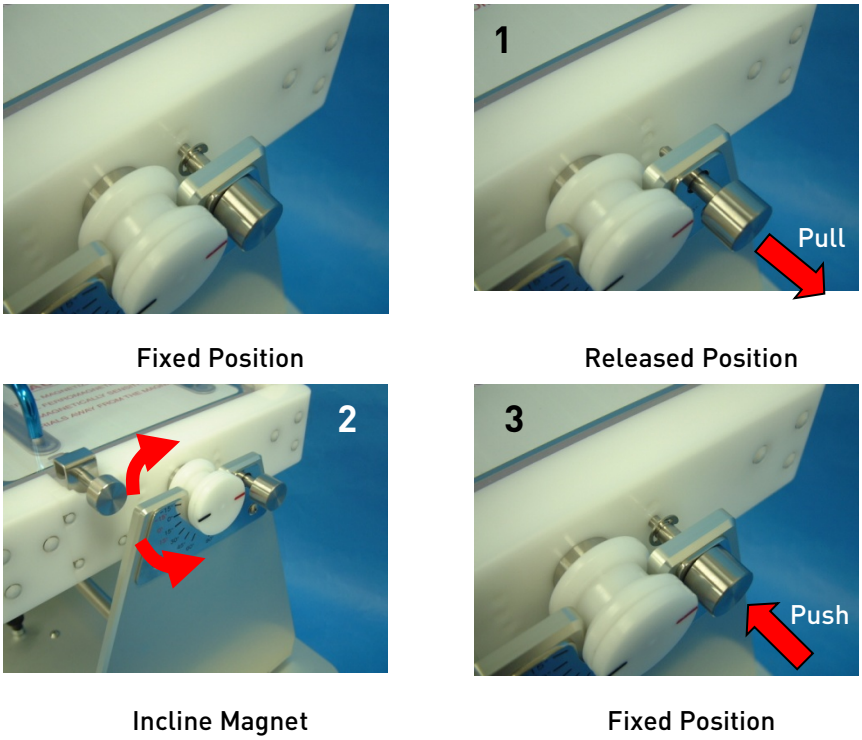


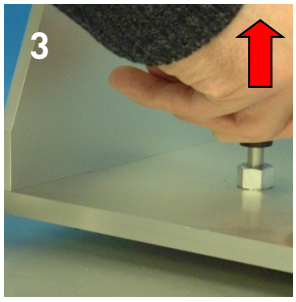
Figure 8 Setting the operating angle of the Primary Magnet

Changing the configuration of the Primary Magnet

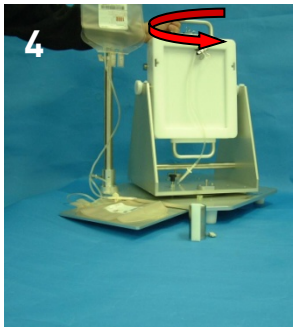
To optimize magnetic separation, the CTS™ DynaMag™ system offers an alternative configuration with the Primary Magnet placed above the blood bag. In this position, the bead-cell complexes are driven against gravity by magnetic forces, avoiding unspecific cell trapping. Note: the lid shutting pin must be secured before starting this process.

1. Remove secondary magnet

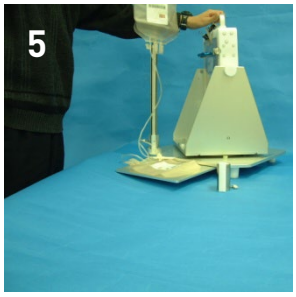
2. Tilt the Primary Magnet by 90°



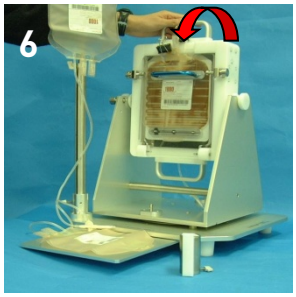
3. Pull up the plunger pin to release the Rotation Unit



4. Turn Rotation unit 180°.



5. The plunger pin will automatically lock the base.



6. Turn the magnet forward to the horizontal position.

7. Lock the Primary Magnet

8. Attach the secondary magnet

Figure 9 Changing the configuration of the Primary Magnet

Setting up the Secondary Magnet

1. Detach the Secondary Magnet from the base.
2. Wrap the outlet tubing for the fluid downstream of the Primary Magnet around the Secondary Magnet four times (Figure 10).
3. Attach the Magnetic Tube Gripper to hold the tubing in place.
4. Re-attach the Secondary Magnet to the base.

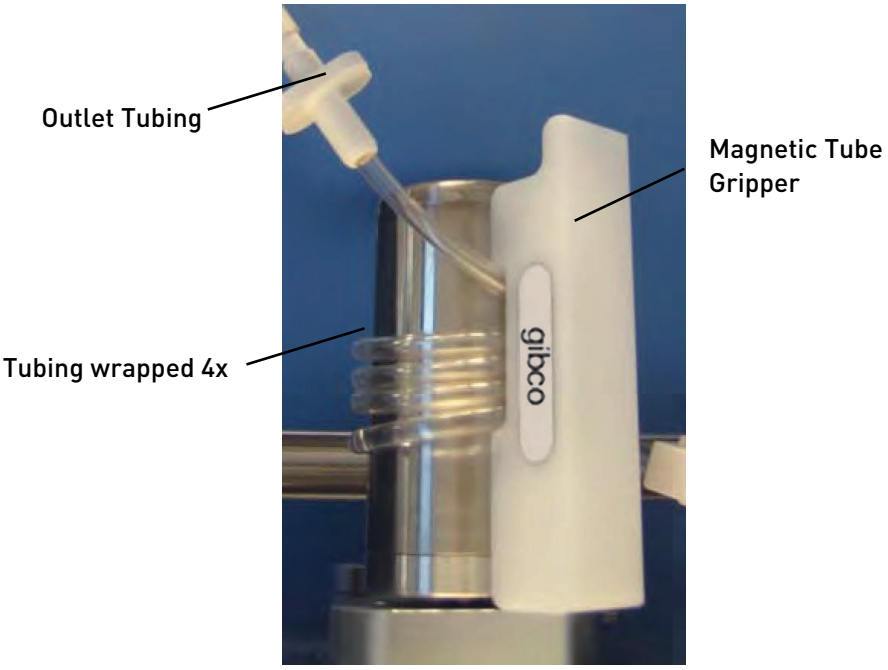


Figure 10 Tubing wrapped four times around the Secondary Magnet

Cleaning and maintenance procedures

CAUTION: Fix the Primary Magnet to the base with the positioning pin when washing. Unexpected rotation of the magnet may cause injury.

- Treat biological materials as potentially infectious and wear appropriate protective clothing during cleanup procedures.
- Disinfect surfaces that have been in contact with blood or blood components with a chemical germicide (sterilants). Remove any residue of sterilant by rinsing with water and drying to avoid corrosion.

  Freshly prepared solutions of diluted sodium hypochlorite (1:100) or 70% GMP isopropyl alcohol may be used to disinfect surfaces.
- Clean the device with mild soap and a damp cloth.
- Do not immerse in fluids and avoid prolonged exposure to aqueous solutions.
- Do not autoclave or use abrasive or strong solvent cleaners.

Instructions for magnetic separation

General description of immunomagnetic separation (IMS)

It is essential that the operator have theoretical knowledge as well as lab-scale practical experience with Immunomagnetic Separation (IMS).

The CTS™ DynaMag™ Magnet isolates cells labeled with Dynabeads™ magnetic beads. Dynabeads™ magnetic beads are superparamagnetic, thus they become magnetized when exposed to a magnetic field, and pull towards the magnet.

Once removed from the magnetic field, Dynabeads™ magnetic beads have no magnetic remanence, and will resuspend easily when gently agitated.

Cell isolations can be either direct or indirect:

- **Direct isolation:** Specific antibodies are coated (coupled) to Dynabeads™ magnetic beads prior to the isolation.
- **Indirect isolation:** Cells are incubated with specific antibodies prior to adding secondary coated Dynabeads™ magnetic beads.

Figure 11 illustrates direct cell isolation. Dynabeads™ magnetic beads are added to the cell population in a sterile bag. Dynabeads™ magnetic beads bind to the target cells during a short incubation, and then the bead-bound cells are isolated by the magnet.

In a positive isolation, bead-bound cells are used for downstream applications. With depletion, unwanted cell types are discarded and the remaining, untouched cells are used for the downstream applications.

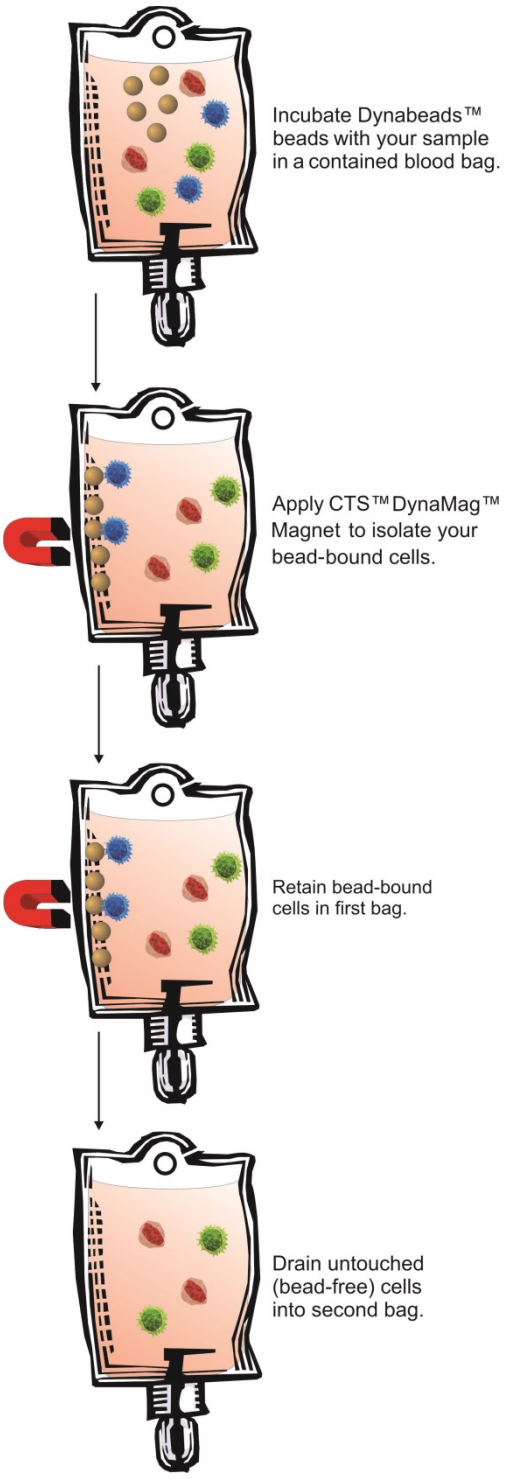


Figure 11 Direct immunomagnetic isolation

Immunomagnetic separation in clinical research

Accessories that are required in this process, but not supplied by Thermo Fisher Scientific: multi-plane tilting device for incubation, peristaltic pump (optional), sterile filters, standard blood bags, plastic tubing with line clamps and roller clamps, sterile connection device (optional), and culture media and buffers.

Use aseptic techniques for all procedures. A schematic representation of a closed bag system that can be used for the magnetic isolation with the CTS™ DynaMag™ Magnet is shown in Figure 12.

The primary bag (A) containing the bead-cell suspension is connected to the priming and washing solution bag (B) and the collection bag (C) with standard transfer tubes and plasma sets with line and roller clamps as described.

The primary bag holds the sample with the Dynabeads™ magnetic beads and the cells are placed on the Primary Magnet for the isolation. The Primary Magnet attracts and retains the bead-cell complexes, while the bead-free cell suspension is drained from the Primary Magnet to the collection bag. All fluid leaving the primary bag passes the Secondary Magnet before entering the collection bag. Prime the tubing connecting the bags with priming and washing solution to displace air prior to isolation. Use the priming and washing solution to wash the bead-cell complexes after isolation.

Use a roller clamp to regulate the flow rate from the primary bag, or include a peristaltic pump to the system. Use a minimum length of 50 cm for Tube C as this shall be wrapped around the Secondary Magnet as described (Figure 10, page 10).

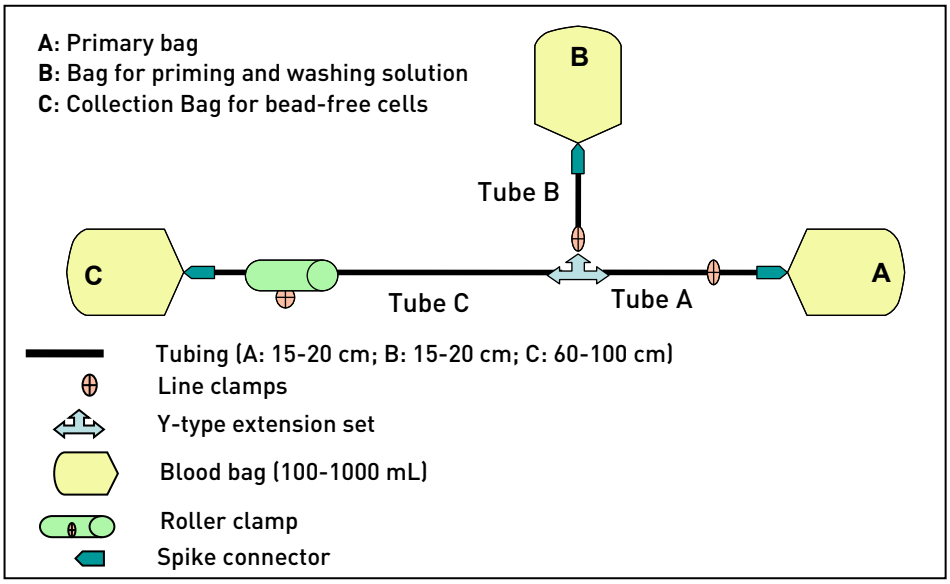


Figure 12 A schematic presentation of a closed system for static separations. This configuration can be obtained with sterile bags (Terumo® or equivalent), Terumo® Plasma Transfer Sets (with 2 Couplers), Terumo® Sampling Site Coupler Spike (with Needle Injection Site).

Cell isolation using the CTS™ DynaMag™ Magnet

General guidelines

The following instructions are general guidelines. The operator using the system must determine optimal conditions for cell isolation and operation of the magnet.

- Follow instructions provided in product specific package inserts for using Dynabeads™ magnetic beads.
- If it is necessary to cool the Primary Magnet, place the magnet in a refrigerator for a minimum of 3 hours before using it for magnetic separation.
- **Do not overfill** the primary bag. Magnetic strength decreases exponentially with distance from the magnet surface. Optimal distance is <11 mm. To meet this requirement, it is essential that no more than 330 mL of sample is added to a 1000 mL standard transfer bag. Overfilling can result in unsatisfactory capture and contamination of the recovered suspension with Dynabeads™ magnetic beads.
- **Remove all bubbles** from the primary bag and tubing. Dynabeads™ magnetic beads adhere strongly to foam and air bubbles, and can be carried downstream by bubbles despite the presence of a strong magnet.
- Maintain a low flow rate (20–30 mL/min) for optimal magnetic capture efficiency. Adjust the flow rate with the roller clamp, or alternatively a peristaltic pump can be connected to the system to achieve a constant flow rate.
- For optimal purity when performing positive isolation, rotate the Primary Magnet so that it is positioned above the primary bag (Figure 9, page 9). In this configuration, the bead-cell complexes are driven against gravity by magnetic force to avoid non-specific cell trapping.

Pre-isolation procedure

The procedure for pre-treating cell suspensions varies, depending on the application. The operator must determine the optimal conditions (time, temperature, concentrations) for incubation of the cells with the Dynabeads™ magnetic beads.

1. Aseptically add the required volume of washed Dynabeads™ magnetic beads via a sampling site coupler into a side port of the primary bag (A) containing the target cell suspension.
2. Incubate the bag containing Dynabeads™ magnetic beads and target cell suspension on the platform of a multi-plane tilting device (e.g., Heidolph Polymax 2040).

Isolation of bead-bound cells

A closed bag system as described (Figure 12, page 12) is recommended for isolation and washing procedures.

1. Remove air from the closed system by priming tubing and connectors with priming and washing buffer. Open/close the line clamps to direct the fluid through the tubing. Ensure that all air is displaced with buffer.
2. Ensure that the primary bag is free of air and foam. If present, manipulate the air/foam to the port and remove it aseptically with a syringe and needle.
3. Ensure that all tubing line clamps and roller clamps on the connection lines are closed. Hang the bag with the priming and washing solution on the Solution Pole.
4. Open the lid of the Primary Magnet and gently remix the contents of the primary bag before placing on the magnet.
5. Lift the primary bag in front to ensure that the Dynabeads™ magnetic beads are flushed from the outlet port and toward the magnet surface (Figure 13).

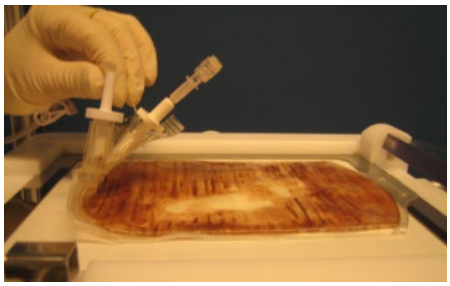


Figure 13 Flush Dynabeads™ magnetic beads from the outlet ports

6. Close the lid. The lid compresses the bag and ensures that Dynabeads™ magnetic beads are kept within optimal distance of the magnet.
7. Back-flush a small volume of priming solution into the primary bag by opening the line clamps between the priming and washing solution bag and the primary bag, and close the line clamps.

   This flushes Dynabeads™ magnetic beads (which would otherwise escape magnetic capture) from the outlet port, and into the primary bag.
8. Detach the Secondary Magnet from its base. Wrap the outlet tubing around the pillar (See Figure 10, page 10) and add the Magnetic Tube Gripper to hold the tubing in place. Re-attach the secondary magnet to its base.
9. Pull out the retractable plate and place the collection bag on the plate.
10. Carefully drain the bead-free fraction from the primary bag by releasing the line clamp of the primary bag (Tube A) and the roller clamp on the outlet (Tube C). Ensure that the line clamp of the priming and washing solution bag (Tube B) is closed. To increase cell recovery, incline the Primary Magnet to 15° to 60° as described (Figure 4, page 5).

    Note: Maintain a low flow rate (20–30 m/min) for optimal magnetic capture efficiency.

    Note: For optimal purity when performing positive isolation, rotate the Primary Magnet so that it is positioned above the primary bag (Figure 9, page 9).

Isolation of bead-bound cells, continued

11. When the primary bag is almost empty, stop the flow with the line clamp. Close the roller clamp.

    Do not allow the bag to empty. The efficiency of the magnetic capture of the Dynabeads™ magnetic beads is reduced if air bubbles enter the tubing.

12. Open the magnet lid and remove the primary bag. Open the line clamps between the priming and washing solution bag and the primary bag and drain priming and washing solution into the primary bag. Gently resuspend the bead-cell complexes. Use approximately the same volume as the initial volume for the separation. Exact volumes can be determined gravimetrically.
13. Repeat steps 3–12 twice. The number of washing steps should be optimized.
14. Positively isolated bead-bound cells or negatively isolated bead-free cells are now ready for downstream applications.

Determination of residual Dynabeads™ magnetic beads in the bead-free cell suspension

Efficiency of the magnetic capture depends on the size and the iron content of the beads, as well as the viscosity of the sample. Because conditions may vary, it is recommended that each investigator determine the efficiency for each separation as necessary.

Repeated rounds of bead removal may be required depending upon the amount of residual beads.

Studies have been performed regarding the safety of Dynabeads™ magnetic beads in rats [reference 1]. Information is also available on magnetic capture of Dynabeads™ magnetic beads using a magnetic system similar to the CTS™ DynaMag™ Magnet [reference 2–3], as well as for using the CTS™ DynaMag™ Magnet itself [reference 4].

The following procedure can be used to determine the amount of residual beads:

1. Transfer a sample of 1 x 10^6 cells to a 1.5 mL microcentrifuge tube. Add water to 1 mL.
2. Add 100 µL of 10% Triton® X-100 solution to the tube.
3. Spin the tube in a microcentrifuge at 14,000 rpm for 2 minutes. Remove the supernatant. Leave a residual pellet of approximately 50 µL in the tube.
4. Transfer the entire pellet to a microscope slide and allow to air dry.
5. Add one drop of crystal/mount fixing solution to area containing the dried pellet. Place a cover slip over the slide. Allow slide to dry.
6. Scan the entire microscope slide and record number of Dynabeads™ magnetic beads in 1 x 10^6 cells.

Note: An alternative protocol can be found in reference 2.

Appendix A

Product specifications

CTS™ DynaMag™ Magnet specifications

The specifications for the CTS™ DynaMag™ Magnet are listed below.

CTS™ DynaMag™ Magnet	
Type:	Benchtop device
Overall Dimensions:	430 mm (width) × 390 mm (depth) × 500 mm (height with pole retracted) 740 mm (height with pole extended)
Overall Weight:	27 kg
Rotation:	0°, 90°, and 180°
Primary Magnet	
Overall Dimensions:	326 mm (width) × 404 mm (depth) × 64 mm (height)
Weight:	14 kg
Magnet Dimensions:	170 mm (width) × 200 mm (depth)
Magnetic Strength:	>8 kGauss
Solution Pole Dimensions:	500 to 800 mm (height)
Rotation:	–15°, 0°, 15°, 30°, 45°, 60°, 90°, 165°, 180°, and 195°
Maximum Bag Size:	190 mm (width) × 235 mm (depth)
Secondary Magnet	
Magnet Dimensions:	38.1 mm (dia.) × 75 mm (height)
Protective Cap Dimensions:	56 mm (dia.) × 90 mm (height)

Warning and limitations

This product guarantees optimum isolation of Dynabeads™ magnetic beads, not the isolation of a specific material. Recovery of bio-molecules by magnetic isolation depends on the avidity of the antibodies or ligands on the surface of Dynabeads™ magnetic beads, as well as factors concerning the biomolecules themselves and the matrix from which they are to be isolated.

References

1. White R.D., *et. al.* (1995) Intravenous Safety Study in Rats Given Paramagnetic, Polystyrene Beads with covalently Bound Sheep Anti-Mouse Immunoglobulin G (IgG). *J. Am. Coll. Toxicol.*, 14:251–256.
2. Levine B.L., *et. al.* (1998) Large-scale production of CD4+ T cells from HIV-1-infected donors after CD3/CD28 costimulation. *J Hematotherapy*, 7:437–488.
3. Thompson, *et. al.* (2003) A phase I Trial of CD3/CD28 activated T Cells (Xcellerated T Cells) and Interleukin-2 in Patients with Metastatic Renal Cell Carcinoma. *Clin. Can. Res.*, 9:3562–3570.
4. Hollyman D., *et. al.* (2009) Manufacturing Validation of Biological Funtional T Cells Targeted to CD19 Antigen for Autologous Adoptive Cell Therapy. *J Immunother*, Vol 32, No 2:169–180.

Appendix B: Related products

Accessory products

Unless otherwise indicated, all materials are available through thermofisher.com.
MLS: Fisher Scientific (fisherscientific.com) or other major laboratory supplier.

Product	Quantity	Catalog No.
CTS™ Dynabeads™ CD3/CD28	10 mL	40203D
CTS™ DPBS (without calcium chloride, without magnesium chloride)	1 L	A1285601
HulaMixer™ Sample Mixer	1 unit	15920D
CTS™ OpTmizer™ T-Cell Expansion SFM, no phenol red	1 kit	A3705003
CTS™ IL-2 Recombinant Human Protein	100 µg 1 mg	CTP0021 CTP0023
CTS™ AIM-V™ Medium	1 L	0870112DK
CTS™ Immune Cell SR	50 mL 500 mL	A25961-01 A25961-02

Appendix C: Documentation and support

Customer and technical support

Visit thermofisher.com/support for the latest in services and support, including:

- Worldwide contact telephone numbers
- Product support, including:
  - Product FAQs
  - Software, patches, and updates
  - Training for many applications and instruments
- Order and web support
- Product documentation, including:
  - User guides, manuals, and protocols
  - Certificates of Analysis

Limited product warranty

Life Technologies Corporation and/or its affiliate(s) warrant their products as set forth in the Life Technologies' General Terms and Conditions of Sale found on Life Technologies' website at www.thermofisher.com/us/en/home/global/terms-and-conditions.html. If you have any questions, please contact Life Technologies at www.thermofisher.com/support.

Certificate of Conformity

A Certificate of Conformity is supplied with each device, and provides detailed quality control and product qualification information for each product.

Serial number

For your own reference, record the serial number of your CTS™ DynaMag™ Magnet in the space provided. The serial number can be found on the machine label on the base plate of the unit.

Serial Number _____Date Received_____

Appendix D: Safety

General Instrument Safety

Before starting

Before you begin using this product, or any installation or service operation, please read the following safety information. Attention to these warnings will help prevent personal injuries and damage to the products

It is your responsibility to use the product in an appropriate manner. This product is designed for use solely in laboratory environments, and must not be used in any way that may cause personal injury or property damage.

You are responsible if the product is used for any intention other than its designated purpose or in disregard of Thermo Fisher Scientific instructions. Thermo Fisher Scientific shall assume no responsibility for such use of the product.

The product is used for its designated purpose if it is used in accordance with its product documentation and within its performance limits.

Using the product requires technical skills and a basic knowledge of English. It is therefore essential that only skilled and specialized staff or thoroughly trained personnel with the required skills be allowed to use the product.

Keep the basic safety instructions and the product documentation in a safe place and pass them on to the subsequent users.

Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.

Explanation of Symbols and Warnings

 Caution	The **Caution** symbol denotes a risk of safety hazard. Refer to accompanying documentation.
REF	REF on labels is the symbol for catalog number.

SPC0021407

For support visit thermofisher.com/techresources or email cellculturesupport@thermofisher.com

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