

SPHERO™ Magnetic Particles

- SPHERO™ Magnetic Microparticles provide high quality and reproducible results for your application
- Allow for rapid and reliable binding between the target and magnetic particle
- Consists of a uniform, monodispersed surface for optimal performance

The SPHERO™ Magnetic Particles (Paramagnetic Particles) are prepared by coating a layer of iron oxide and polystyrene onto polystyrene core particles. The SPHERO™ Magnetic Particles are relatively uniform in size, spherical in shape and paramagnetic in nature. The paramagnetic nature of the particles allows them to be separated using a magnet and resuspend easily when removed from the magnet. They do not retain any significant magnetism even after repeat exposure to strong magnetic fields.

The SPHERO™ Smooth Surface Magnetic Particles have a thick layer of polymer coating on the surface of the particles to fully encapsulate the iron oxide coating. There is no exposed iron oxide on the surface of the particles. These particles are paramagnetic. The SPHERO™ Smooth Surface Magnetic Particles are particularly useful in applications where exposed iron oxide may interfere with the enzymatic activities or cause other undesirable interferences. The SPHERO™ Magnetic Particles are used for cell separation, affinity purification, DNA probe assays, magnetic particle EIA, etc.

The SPHERO™ Cross-Linked Magnetic Particles are prepared to render them resistant to common organic solvents such as acetone, acetonitrile, DMF and chloroform. Since these particles are manufactured by coating a layer of polymer onto the surface of iron oxide crystals, they are not uniform in size and are essentially nonspherical in shape. Their overall size ranges from ~1.0 - 2.0 μm . However, cross-linked magnetic particles have significantly greater surface area and higher magnetite content (70%) compared to the 4.0 μm uniform magnetic particles. They are also paramagnetic. Large surface area combined with higher magnetite content make SPHERO™ Cross-Linked Magnetic Particles ideal solid phase for use in cell separation, magnetic removal of microorganisms, viruses and cross reactants in serum, as well as, affinity purification applications.

Figure 62 Histograms of Cat. No. CM-60-10 (Carboxyl Magnetic Particles, 2.5% w/v, 7.1 μm , 10 mL)

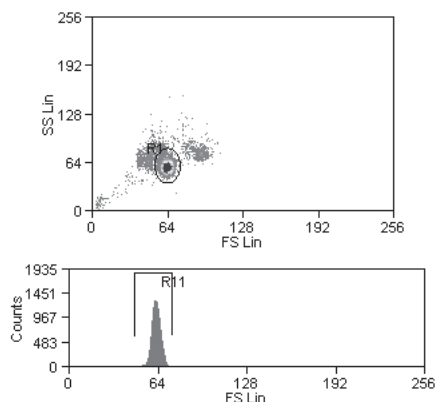
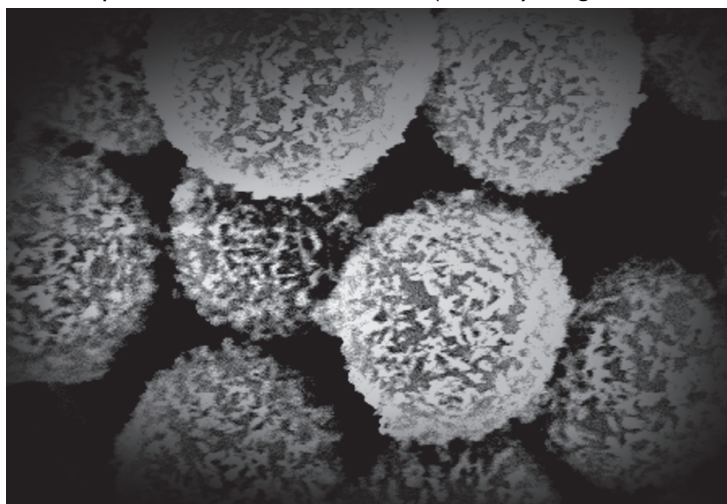


Figure 63 SEM Photo of Spherotech Cat. No. CM-80-10 (Carboxyl Magnetic Particles, 1% w/v, 8.5 μm , 10 mL)



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Figure 64 Representative Scanning Electron Microscope photos of SPHERO™ Magnetic Particles are shown below: (A) CM-30-10 at 2000X, (B) CM-40-10 at 1000X, (C) Cross section of SPHERO™ Magnetic Particles, dark specks in (C) are magnetite on the surface of core particles. The SEM photo of SPHERO™ Smooth Surface Magnetic Particles, CMS-40-10, is shown in (D) at 5000x.

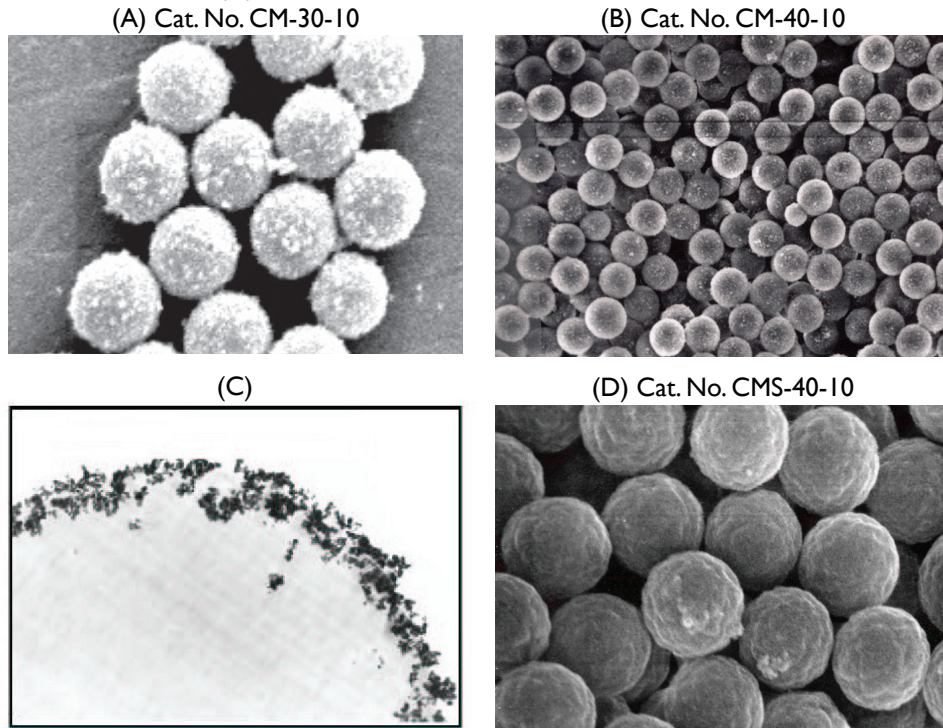
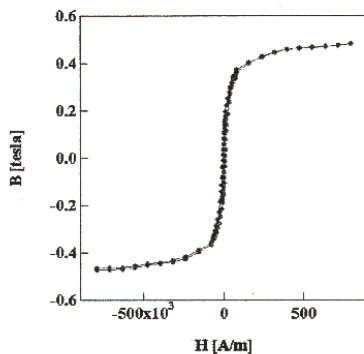


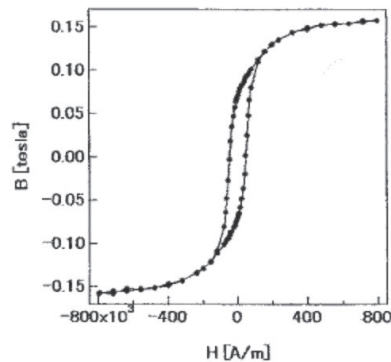
Figure 65 Magnetic Characteristics of SPHERO™ Magnetic Particles and Ferromagnetic Particles

The magnetic characteristics of magnetic particles are determined by measuring the magnetic Hysteresis Loop of magnetic particles with a magnetometer as shown below. The magnetic particles are subjected to an increasing magnetizing field (H in Oersted) in one direction, while sensing the magnetic field (B in Gauss) in the sample to reach maximum or saturation magnetization (B_m). The magnetizing field is then returned to zero and the field retained is measured as the remnant magnetization (B_r). Finally, the field is reversed until magnetization is at zero again. The corresponding field strength (H_c) is the coercivity of the magnetic particles. If the B_r and H_c are near zero, the magnetic particles are characterized as superparamagnetic as shown in (A). On the other hand, the Ferromagnetic Particles will have Hysteresis Loop similar to (B).

(A) Cat. No. CM-10-10 showing superparamagnetic characteristics



(B) Cat. No. FCM-40-10 showing ferromagnetic characteristics



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SPHERO™ Magnetic Polystyrene Particles

- Paramagnetic particles prepared using a proprietary procedure
- Manufactured by coating a layer of iron oxide and polystyrene onto polystyrene core particles
- Uniform in size, spherical in shape
- Separated using a magnet and resuspended when removed from the magnetic field
- Used for cell separation, affinity purification, DNA probe assays, magnetic particle EIA, etc.

Particle Type and Surface	Size, μm	% w/v	Catalog No.	Unit
Magnetic Polystyrene	2.0-2.9	2.5	PM-20-10	10 mL
Magnetic Polystyrene	2.0-2.9	2.5	PM-20-100	100 mL
Magnetic Polystyrene	3.0-3.9	2.5	PM-30-10	10 mL
Magnetic Polystyrene	3.0-3.9	2.5	PM-30-100	100 mL
Magnetic Polystyrene	4.0-4.5	2.5	PM-40-10	10 mL
Magnetic Polystyrene	4.0-4.5	2.5	PM-40-100	100 mL
Magnetic Polystyrene	5.0-5.9	2.5	PM-50-10	10 mL
Magnetic Polystyrene	5.0-5.9	2.5	PM-50-100	100 mL

SPHERO™ Carboxyl Magnetic Particles

- Used during the isolation and affinity purification of biomolecules in a wide range of assays and applications
- Contain carboxylic acid groups which can be used for carbodiimide activation (e.g. EDC) for covalent coupling
- Couple to the primary amino groups of nucleic acids, peptides, proteins or other target molecules

Particle Type and Surface	Size, μm	% w/v	Catalog No.	Unit
Carboxyl Magnetic	0.1-0.39	2.5	CM-025-10	10 mL
Carboxyl Magnetic	0.4-0.69	2.5	CM-05-10	10 mL
Carboxyl Magnetic	0.7-0.9	2.5	CM-08-10	10 mL
Carboxyl Magnetic	1.0-1.4	2.5	CM-10-10	10 mL
Carboxyl Magnetic	1.0-1.4	2.5	CM-10-100	100 mL
Carboxyl Magnetic	1.5-1.9	2.5	CM-15-10	10 mL
Carboxyl Magnetic	1.5-1.9	2.5	CM-15-100	100 mL
Carboxyl Magnetic	2.0-2.9	2.5	CM-20-10	10 mL
Carboxyl Magnetic	2.0-2.9	2.5	CM-20-100	100 mL
Carboxyl Magnetic	3.0-3.9	2.5	CM-30-10	10 mL
Carboxyl Magnetic	3.0-3.9	2.5	CM-30-100	100 mL
Carboxyl Magnetic	4.0-4.5	2.5	CM-40-10	10 mL
Carboxyl Magnetic	4.0-4.5	2.5	CM-40-100	100 mL
Carboxyl Magnetic	5.0-5.9	2.5	CM-50-10	10 mL
Carboxyl Magnetic	6.0-8.0	2.5	CM-60-10	10 mL
Carboxyl Magnetic	6.0-8.0	2.5	CM-60-100	100 mL
Carboxyl Magnetic	8.0-9.9	2.5	CM-80-10	10 mL
Carboxyl Magnetic	10.0-13.9	1.0	CM-100-10	10 mL
Carboxyl Magnetic	14.0-17.9	1.0	CM-150-10	10 mL
Carboxyl Magnetic	18.0-22.9	1.0	CM-200-10	10 mL

SPHERO™ Jeffamine® Magnetic Particles

Contains a PEG-based spacer arm that is terminated with amine groups for coupling carboxyl-containing molecules

Particle Type and Surface	Size, μm	% w/v	Catalog No.	Unit
Jeffamine® Magnetic	0.1-0.39	1.0	JAM-025-10	10 mL

JEFFAMINE® is a registered trademark of Huntsman Corporation

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SPHERO™ Amino Magnetic Particles

- Supplied as an aqueous suspension of magnetic iron oxide particles coated to provide primary amino groups
- Used to covalently couple proteins using bifunctional crosslinking agents
- Rapidly separates bound from unbound molecules using a magnetic separator due to paramagnetic properties

Particle Type and Surface	Size, μm	% w/v	Catalog No.	Unit
Amino Magnetic	1.0-1.4	2.5	AM-10-10	10 mL
Amino Magnetic	1.0-1.4	2.5	AM-10-100	100 mL
Amino Magnetic	1.5-1.9	2.5	AM-15-10	10 mL
Amino Magnetic	1.5-1.9	2.5	AM-15-100	100 mL
Amino Magnetic	2.0-2.9	2.5	AM-20-10	10 mL
Amino Magnetic	2.0-2.9	2.5	AM-20-100	100 mL
Amino Magnetic	3.0-3.9	2.5	AM-30-10	10 mL
Amino Magnetic	3.0-3.9	2.5	AM-30-100	100 mL
Amino Magnetic	4.0-4.5	2.5	AM-40-10	10 mL
Amino Magnetic	4.0-4.5	2.5	AM-40-100	100 mL
Amino Magnetic	6.0-6.9	1.0	AM-60-10	10 mL
Amino Magnetic	6.0-6.9	1.0	AM-60-100	100 mL
Amino Magnetic	8.0-9.9	1.0	AM-80-10	10 mL

SPHERO™ Magnetic Cross-linked Particles

- Contains a very high magnetic content for fast magnetic response time
- Have high binding capacities due to their large surface area
- Resistant to common organic solvents such as acetone, acetonitrile, DMF and chloroform
- Used in a wide variety of molecular biology, nucleic acid isolation, research protocols and clinical immunoassay reagent applications

Particle Type and Surface	Size, μm	% w/v	Catalog No.	Unit
Magnetic, Cross-linked, granules, non-uniform	3.0-6.0	2.5	PMX-40-10	10 mL
Amino Magnetic, Cross-linked, granules, non-uniform	~1-2 μm	2.5	AMX-10-10	10 mL
Amino Magnetic, Cross-linked, granules, non-uniform	~1-2 μm	2.5	AMX-10-100	100 mL
Amino Magnetic, Cross-linked, granules, non-uniform	3.0-6.0	2.5	AMX-40-10	10 mL
Amino Magnetic, 0.5% DVB Cross-linked, uniform	13.0-17.9	1.0	AMX-150-5	5 mL
Carboxyl Magnetic, Cross-linked, granules, non-uniform	~1-2 μm	2.5	CMX-10-10	10 mL
Carboxyl Magnetic, Cross-linked, granules, non-uniform	~1-2 μm	2.5	CMX-10-100	100 mL
Carboxyl Magnetic, Cross-linked, granules, non-uniform	3.0-6.0	2.5	CMX-40-10	10 mL

SPHERO™ Diethylamino Magnetic Particles

Particle Type and Surface	Size, μm	% w/v	Catalog No.	Unit
Diethylamino Magnetic	3.0-3.9	2.5	DEM-30-10	10 mL

SPHERO™ Dimethylamino Magnetic Particles

Particle Type and Surface	Size, μm	% w/v	Catalog No.	Unit
Dimethylamino Magnetic	3.0-3.9	2.5	DM-30-10	10 mL

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SPHERO™ Magnetic Polystyrene Particles, Smooth Surface

- Consists of a thick layer of polymer coating on the surface to encapsulate the iron oxide coating
- No exposed iron oxide on the surface
- Used in applications where exposed iron oxide causes undesirable interferences

Particle Type and Surface	Size, μm	% w/v	Catalog No.	Unit
Magnetic Polystyrene , Smooth Surface	2.0-2.9	2.5	PMS-20-10	10 mL
Magnetic Polystyrene , Smooth Surface	2.0-2.9	2.5	PMS-20-100	100 mL
Magnetic Polystyrene , Smooth Surface	3.0-3.9	2.5	PMS-30-10	10 mL
Magnetic Polystyrene , Smooth Surface	3.0-3.9	2.5	PMS-30-100	100 mL
Magnetic Polystyrene , Smooth Surface	4.0-5.0	2.5	PMS-40-10	10 mL
Magnetic Polystyrene , Smooth Surface	4.0-5.0	2.5	PMS-40-100	100 mL

SPHERO™ Amino Magnetic Particles, Smooth Surface

- NEW - SPHERO™ Amino High Magnetic Content Microparticles
- Aids in the separation in whole blood
- Monodispersed surface for optimal performance

Particle Type and Surface	Size, μm	% w/v	Catalog No.	Unit
Amino Magnetic, Smooth Surface	4.0-5.0	2.5	AMS-40-10	10 mL
Amino Magnetic, Smooth Surface	4.0-5.0	2.5	AMS-40-100	100 mL
Amino Magnetic, Smooth Surface, High Iron	4.0-4.9	2.5	AMS-40-10H	10 mL

SPHERO™ Carboxyl Magnetic Particles, Smooth Surface

- Activated for covalent coupling to amine-containing molecules using a variety of mechanisms
- Used with one or two-step coupling using EDC to form amide bonds with proteins or other molecules
- Used for coupling to amino modified oligonucleotide probes with MES buffer and EDC

Particle Type and Surface	Size, μm	% w/v	Catalog No.	Unit
Carboxyl Magnetic, Smooth Surface	3.0-3.9	2.5	CMS-30-10	10 mL
Carboxyl Magnetic, Smooth Surface	3.0-3.9	2.5	CMS-30-100	100 mL
Carboxyl Magnetic, Smooth Surface	4.0-5.0	2.5	CMS-40-10	10 mL
Carboxyl Magnetic, Smooth Surface	4.0-5.0	2.5	CMS-40-100	100 mL
Carboxyl Magnetic, Smooth Surface	8.0-9.9	1.0	CMS-80-10	10 mL

SPHERO™ Hydroxyethyl Magnetic Particles, Smooth Surface

- Contains primary hydroxyls on the surface
- Exhibit hydrophilic characteristics
- Activated for covalent coupling using epoxy and vinyl sulfone activation procedures
- Used for the coupling to amine-, thiol-, or hydroxyl-containing ligands

Particle Type and Surface	Size, μm	% w/v	Catalog No.	Unit
Hydroxyethyl Magnetic, Smooth Surface	3.0-3.9	2.5	HEMS-30-10	10 mL

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SPHERO™ Ferromagnetic Particles

- Manufactured by coating a layer of chromium dioxide and polystyrene onto polystyrene core particles
- Retain magnetism once exposed to a magnetic field
- Exhibits a higher magnetic moment than paramagnetic particles
- Have been used for magnetic twisting cytometry, microfluidics, and cellular labeling

Unlike paramagnetic particles that are made using iron oxide, SPHERO™ Ferromagnetic Particles are prepared using chromium dioxide coated onto uniform polystyrene particles. These particles retain magnetism once exposed to a magnetic field. The particles can be demagnetized and re-magnetized repeatedly and reproducibly. Ferromagnetic particles have been used for studying mechanotransduction across the cell surface and through the cytoskeleton. This is performed by binding them to cell surface receptors and applying mechanical stress directly to the receptor using a device to twist the magnetic particle.

SPHERO™ Amino Ferromagnetic Particles

Particle Type and Surface	Size, μm	% w/v	Catalog No.	Unit
Amino Ferromagnetic	4.0-4.5	1.0	AFM-40-10	10 mL

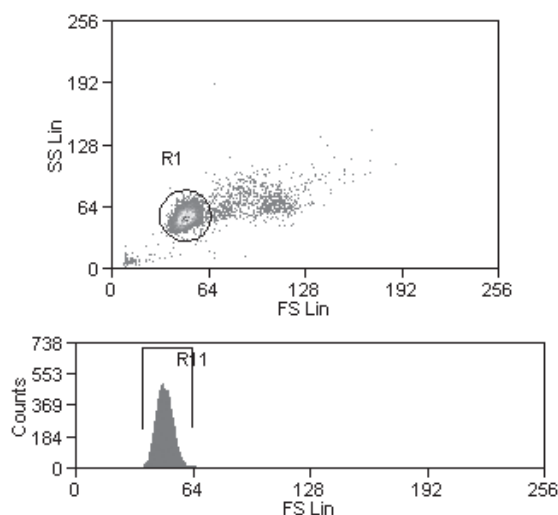
SPHERO™ Carboxyl Ferromagnetic Particles

Particle Type and Surface	Size, μm	% w/v	Catalog No.	Unit
Carboxyl Ferromagnetic	2.0-2.9	1.0	CFM-20-10	10 mL
Carboxyl Ferromagnetic	4.0-4.9	1.0	CFM-40-10	10 mL
Carboxyl Ferromagnetic	6.0-7.9	1.0	CFM-60-5	5 mL
Carboxyl Ferromagnetic	8.0-8.9	1.0	CFM-80-5	5 mL
Carboxyl Ferromagnetic Particles, Cross-linked, granules, non-uniform	~1-2 μm	1.0	CFMX-10-10	10 mL

SPHERO™ Fluorescent Carboxyl Ferromagnetic Particles

Particle Type and Surface	Size, μm	% w/v	Catalog No.	Unit
Fluorescent Yellow Carboxyl Ferromagnetic	2.0-2.9	1.0	FCFM-2052-2	2 mL
Fluorescent Yellow Carboxyl Ferromagnetic	4.0-4.9	1.0	FCFM-4052-2	2 mL
Fluorescent Nile Red Carboxyl Ferromagnetic	4.0-4.9	1.0	FCFM-4056-2	2 mL

Figure 66 Histograms of Cat. No. CFM-40-10 (Carboxyl Ferromagnetic Particles, 1.0% w/v, 4.93 μm , 10 mL)



SPHERO™ Fluorescent Magnetic Particles

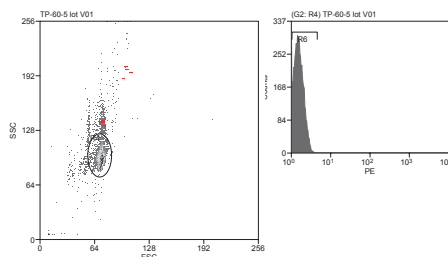
- Consists of paramagnetic particles made by either staining the polystyrene core with a fluorophore solution or by polymerizing a fluorophore in styrene in the presence of polystyrene core particles
- Available in a variety of sizes, fluorescence, and surface functional groups

SPHERO™ Fluorescent Magnetic Particles

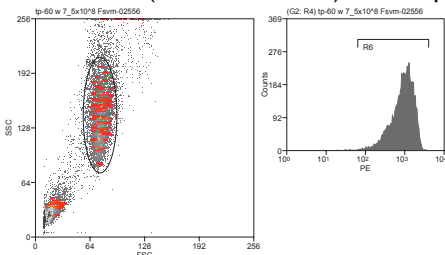
Particle Type and Surface	Size, μm	% w/v	Catalog No.	Unit
Fluorescent Nile Red Magnetic	4.0-4.9	1.0	FPM-4056-2	2 mL
Fluorescent UV Magnetic Particles	5.0-5.9	0.1	FPM-5041-2	2 mL

Figure 67 Histograms of the magnetic separation of Biotin Coated (Cat. No. TP-60-5) after exposure to streptavidin coated carboxyl fluorescent magnetic particles, nile red (Cat. No. FCM-02556-5)

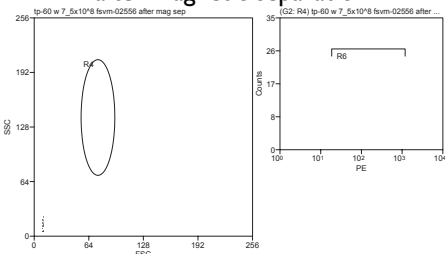
A. Biotin Coated (Cat. No. TP-60-5) before exposure



B. Biotin Coated (Cat. No. TP-60-5) after exposure



C. Biotin Coated (Cat. No. TP-60-5) after magnetic separation



SPHERO™ Carboxyl Fluorescent Magnetic Particles

Particle Type and Surface	Size, μm	% w/v	Catalog No.	Unit
Fluorescent Nile Red Carboxyl Magnetic	0.2-0.39	1.0	FCM-02556-2	2 mL
Fluorescent Yellow Carboxyl Magnetic	1.0-1.4	1.0	FCM-1052-2	2 mL
Fluorescent Pink Carboxyl Magnetic	1.0-1.4	1.0	FCM-1058-2	2 mL
Fluorescent Yellow Carboxyl Magnetic	2.0-2.4	1.0	FCM-2052-2	2 mL
Fluorescent Pink Carboxyl Magnetic	2.0-2.4	1.0	FCM-2058-2	2 mL
Fluorescent Yellow Carboxyl Magnetic	4.0-4.9	1.0	FCM-4052-2	2 mL
Fluorescent Nile Red Carboxyl Magnetic	4.0-4.9	1.0	FCM-4056-2	2 mL
Fluorescent Pink Carboxyl Magnetic	4.0-4.9	1.0	FCM-4058-2	2 mL
Fluorescent UV Carboxyl Magnetic	7.0-7.9	0.1	FCM-7041-2	2 mL
Fluorescent PAK Blue Carboxyl Magnetic	7.0-7.9	0.1	FCM-7067-2	2 mL
Fluorescent Yellow Carboxyl Magnetic	8.0-9.9	1.0	FCM-8052-2	2 mL
Fluorescent Nile Red Carboxyl Magnetic	8.0-9.9	1.0	FCM-8056-2	2 mL
Fluorescent Yellow Carboxyl Magnetic	10.0-14.0	1.0	FCM-10052-2	2 mL
Fluorescent Yellow Carboxyl Magnetic	18.0-24.9	1.0	FCM-20052-2	2 mL
Fluorescent Yellow Carboxyl Magnetic	44.0-52.9	1.0	FCM-50052-2	2 mL
Fluorescent Yellow Carboxyl Magnetic	90-105	1.0	FCM-100052-2	2 mL
Fluorescent Yellow Carboxyl Magnetic	180-210	1.0	FCM-200052-2	2 mL

SPHERO™ Amino Fluorescent Magnetic Particles

Particle Type and Surface	Size, μm	% w/v	Catalog No.	Unit
Fluorescent Yellow Amino Magnetic	2.0-2.9	1.0	FAM-2052-2	2 mL
Fluorescent Pink Amino Magnetic	2.0-2.9	1.0	FAM-2058-2	2 mL
Fluorescent Nile Red Amino Magnetic	4.0-4.9	1.0	FAM-4056-2	2 mL