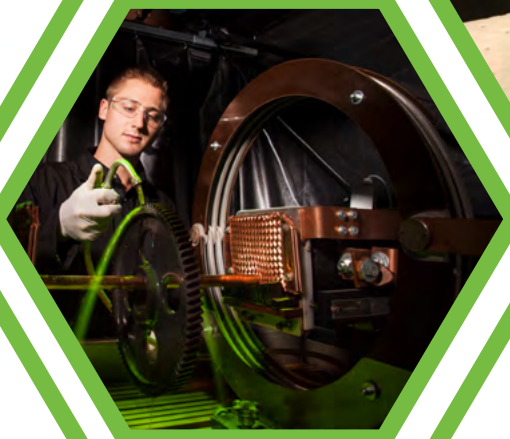
MAGNAFLUX®

MAGNETIC PARTICLE

The Essential Guide to Magnetic Particle Inspection

- Fluorescent Magnetic Particles
- Colored Magnetic Particles
- Carrier Fluids
- Contrast Paints
- MPI Accessories
- MPI Equipment



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The Importance of Magnetic Particle Inspection

Magnetic particle inspection (MPI) is a nondestructive testing (NDT) method that does not harm the parts being inspected. MPI is a cost-effective and reliable testing method commonly used to identify surface and slightly subsurface discontinuities in ferromagnetic materials. The process is used on machined parts, iron and steel castings, forgings, welds, parts that undergo heat treatment, and several other applications that will be placed into service or already are in service and require maintenance. MPI is often used to locate defects in mechanical parts in the aerospace, automotive, oil & gas, welding and power generation industries.

The process of magnetic particle inspection involves generating a magnetic field and applying magnetic particles, visible or fluorescent, to a part being inspected. After applying magnetization, if an indication is present, the particles will accumulate directly over the discontinuity at the magnetic flux leakage fields. The indication can then be visually detected under proper lighting conditions. The part may be accepted, rejected, or repaired according to industry specifications.

Immediate results
Magnetic particle inspection is fast and relatively easy to apply, making it one of the most widely utilized nondestructive testing methods.

Detects surface and sub-surface discontinuities
Magnetic particle inspection is an ideal method for detecting surface and subsurface defects in ferromagnetic materials.

Detection through coatings
Magnetic particle inspection may detect discontinuities through thin nonconductive coatings, such as paint (on the order of 1 to 2 mil or 0.02 to 0.05 mm) and does not require the removal of the coating which can save time and money during the inspection process.

Determining Inspection Method

The primary considerations when deciding between visible or fluorescent inspection are the type of indication on the part, and where you will be physically inspecting the part.

Visible Color Inspection
This method is ideal for locating large surface defects. Visible inspection may be performed indoors or outdoors with portable applications under white light.

Fluorescent Inspection
This method is ideal for locating very fine discontinuities at or just below the surface. Fluorescent inspection must be done in a dark room with a maximum white light intensity of 2 fc (22 lux) and performed under ultraviolet light.

Determining Application Method

Magnetic particles can be applied to a part as either a powder (dry method) or suspended in a liquid (wet method) such as an oil- or water-based carrier.

Dry Method Visible
This method is ideal for low to medium sensitivity inspections, and works on most ferrous metal surfaces. It is commonly used in field testing and yoke inspection when working with rough cast or forged parts.

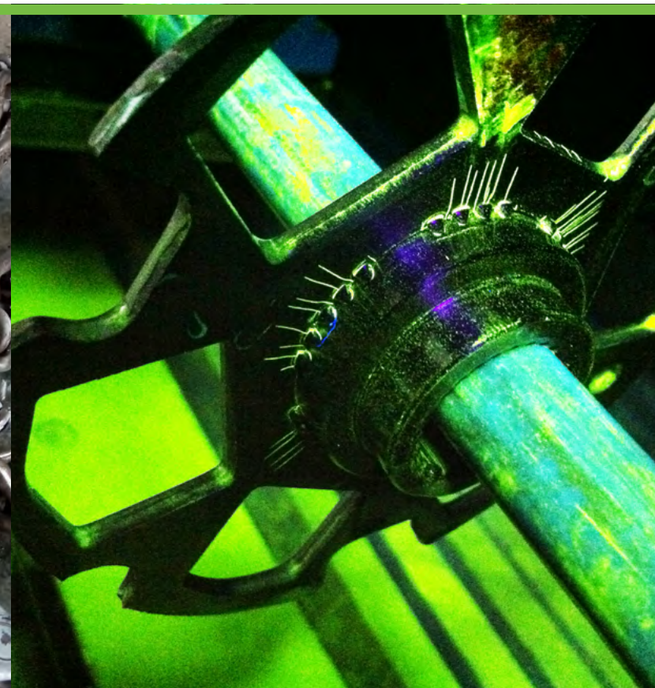
Products Needed
- Dry powders
- Magnetic yoke or power pack

Wet Method Visible
This method is ideal for high sensitivity inspections on parts with varying shapes and sizes. It is commonly used for detecting shallow and fine surface cracks in outdoor testing environments.

Products Needed
- Black particle
- White contrast paint
- Magnetic yoke or power pack

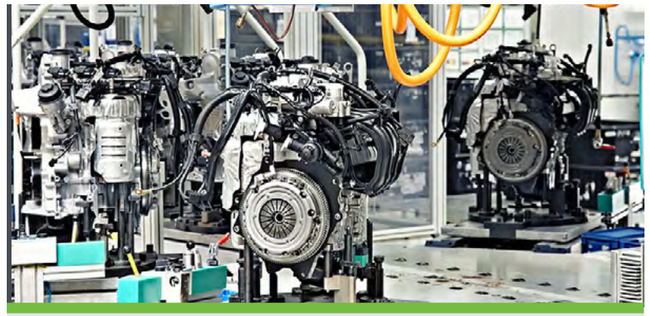
Wet Method Fluorescent
This method is ideal for high volume, high sensitivity inspections on parts. Quickly and easily coat the parts with an even layer of magnetic particle bath.

Products Needed
- Powder, premix, or concentrate particles
- Carrier oil or water
- Wet bench or power pack



Common Applications

Aerospace processes commonly use **fluorescent magnetic particles and NDT-approved carrier oils** for safety critical ferrous parts including steel alloy landing gear.



Automotive processes commonly use **fluorescent or visible magnetic particles** to inspect ferrous components such as crank shafts and engine heads.

Oil & Gas commonly use **fluorescent or visible magnetic particles** to inspect ferrous parts such as tubular goods, couplings, or bottom hole assembly.

Common Terms

Background – The surface of the test part against which the indication is viewed.

Defect – A material or component that does not meet the specified acceptance criteria and is rejectable.

Demagnetization – A process through which magnetism is removed from a test part.

Ferromagnetic – A metal with a chemical composition largely iron and a high susceptibility to magnetization.

Inspection – Visual examination of the test part after completion of the magnetic particle testing processing steps.

Magnetic flux leakage – The magnetic field of a test part will exit and re-enter at the location of the discontinuity producing a visible indication as a result of magnetic particles collection.

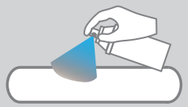
Magnetic Particle Testing – A nondestructive test that uses magnetic particles to detect discontinuities located at or near the surface in ferromagnetic materials.

Precleaning – The removal of surface contaminants from the test part so that they will not interfere with the examination process.

Magnetic Yoke – Portable device for detecting surface and sub-surface cracking in any ferromagnetic material.

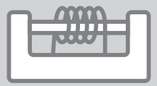
Ultraviolet Lamps – Black lights that are designed for use with fluorescent magnetic particle and liquid penetrant inspection.

Fluorescent

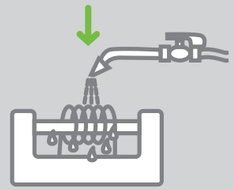


1. Prepare
Clean the part or test area with SKC-S cleaner.

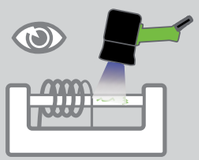
Magnetic Bench



2. Mount the part to be tested.
Select current type and output. Start the particle suspension flow.



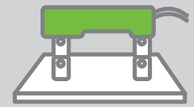
3. Apply suspension to all test surfaces.
Stop the particle suspension flow. Trigger mag shot on equipment.



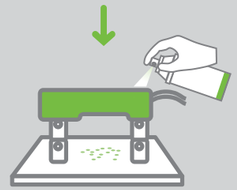
4. Inspect the part or test area for indications under UV-A light.

5. Demagnetize
Switch on the magnetizing current. Put the part in the demagnetizing unit. Draw the part through the demagnetizing unit. Remove the part from the demagnetizing unit. Switch off the current. Check the part for residual magnetism.

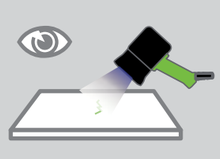
Yoke or Prods



2. Position yoke or prods on the part or test area.
Switch on the magnetizing current.

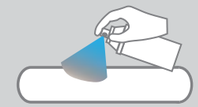


3. Apply the magnetic particles.
Switch off the current.



4. Inspect the part or test area for indications under UV-A light.

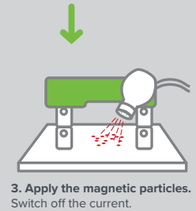
Visible Dry



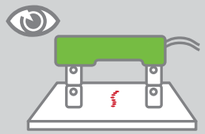
1. Prepare
Clean the part or test area with SKC-S cleaner.

Dry Method

2. Position yoke, prods, cable, or coil on the part or test area.
Switch on the magnetizing current.



3. Apply the magnetic particles.
Switch off the current.



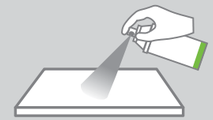
4. Inspect the part or test area for indications in a well lit environment.

5/6. Demagnetize
Switch on the magnetizing current. Put the part in the demagnetizing unit. Draw the part through the demagnetizing unit. Remove the part from the demagnetizing unit. Switch off the current. Check the part for residual magnetism.

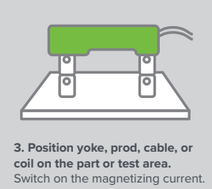
Visible Wet

1. Prepare
Clean the part or test area with SKC-S cleaner.

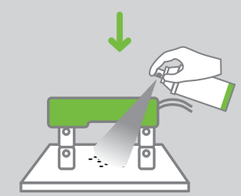
Wet Method/Black and White Method



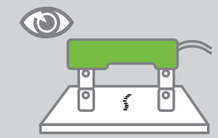
2. Apply contrast paint to the part or test area.



3. Position yoke, prod, cable, or coil on the part or test area.
Switch on the magnetizing current.



4. Apply the magnetic particles.
Switch off the current.



5. Inspect the part or test area for indications in a well lit environment.

1 Select Method Type

2 Select Magnetic Particles

3 Select Carrier or Contrast Paint

4 Select Equipment

Fluorescent Wet

Visible Wet

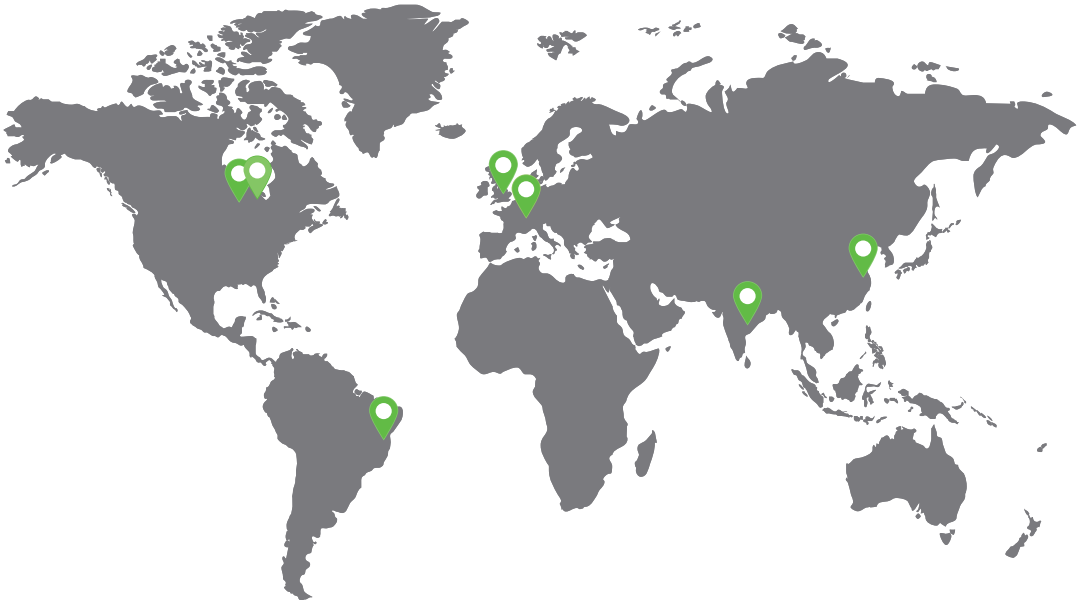
Visible Dry

Product Name	Application	Form	Suspension Medium	Part Numbers
14A	Fluorescent Wet	Particles	Carrier II or Water with WA-2B	1 lb jar (6).....01-0130-71 20 lb pail 01-0130-75
14AM		Ready-to-use liquid & aerosol	Carrier II	Aerosol case (12)...01-0145-78 5 gal pail.....01-0145-40
14A Aqua-Glo		Ready-to-use liquid	Water	1 gal jug case (4)....01-1725-35
14A Redi-Bath		Concentrated liquid	Water	27 fl oz bottle (6) 01-9130-41 1 gal jug case (4) 01-9130-35
20B		Powder premix	Water	1 lb jar (6).....01-0179-71 15 lb pail .....01-0179-70 30 lb pail 01-0179-84
7C Black	Visible Wet	Powder	Carrier II or Water with WA-2B	25 lb pail.....01-1116-81
7HF		Aerosol	Oil	Aerosol case (12) 01-1580-78
MV-740		Ready-to-use liquid	Water	1 gal jug case (4) 01-9140-35
#1 Gray	Visible Dry	Powder	-	10 lb pail.....01-1716-69 45 lb pail.....01-1716-87
#2 Yellow			-	10 lb pail.....01-1732-69 45 lb pail.....01-1732-87
#8A Red			-	10 lb pail.....01-1780-69 45 lb pail.....01-1780-87

Product Name	Method	Form	Part Numbers
Carrier II	Fluorescent Wet	Liquid	5 gal pail.....01-2122-40 20 gal drum.....01-2122-30 55 gal drum.....01-2122-45
WCP-2	Visible Wet	Aerosol	Aerosol case (12) 01-2250-78

Product Name	Series	Model	Description	Current type
Wet Bench	A-Series	A-2030	AC	3,000
	AD-Series	AD-2045	AC	4,000
			FWDC	5,000
		ADH-2045	AC	4,000
			HWDC	5,000
	D-Series	D-2060	FWDC 3-phase	6,000
		D-2100	FWDC 3-phase	10,000
	MD-Series	MD-2030	AC	2,500
			FW/HWDC	3,000
		MD-2060	AC	5,000
			FW/HWDC	6,000
		MD3-2060	AC	5,000
			FW/HWDC	6,000
Stationary Power Packs	CD-Series	CD-2100	FWDC 3-phase	10,000
	CMD-Series	CMD-2060	AC	5,000
			FW/HWDC	6,000
		CMD3-2060	AC	5,000
			FW/HWDC	6,000
	CSV-Series	CSV-10	FWDC 3-phase	10,000
		CSV-20	FWDC 3-phase	20,000
Portable Power Packs	P-Series	P-70	AC/HWDC	750
		P-1500	AC/HWDC	1,500
	M-Series	M-2030	AC/HWDC	3,000
		M-2040	AC/HWDC	4,000
		M-2060	AC/HWDC	6,000

Product Name	Defect Location	Description	Part Numbers
Y-2 Yoke	Surface	AC	628554
Y-7 Yoke	Surface and subsurface	AC/DC	625643
Y-8 Yoke	Subsurface (and some surface)	DC	628994



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