



# Magnetic Particle Inspection

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- Fluorescent Magnetic Particles
- Coloured Magnetic Particles
- Carrier Fluids
- Contrast Paints

# Magnetic Particle Inspection

A close-up photograph of a mechanical component, possibly a valve or a pipe fitting, illuminated with a bright green light. The light highlights the metallic texture and various features of the part, including a central cylindrical section and several circular openings. The background is dark, making the green-lit part stand out.





## 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 Colour 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.

### 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.

### 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

- Dry powders
- Magnetic yoke

#### Products Needed

- Black particle
- White contrast paint
- Magnetic yoke

#### Products Needed

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

## 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 magnetisation, 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 utilised 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.





## 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.

**Demagnetisation** – 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 magnetisation.

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

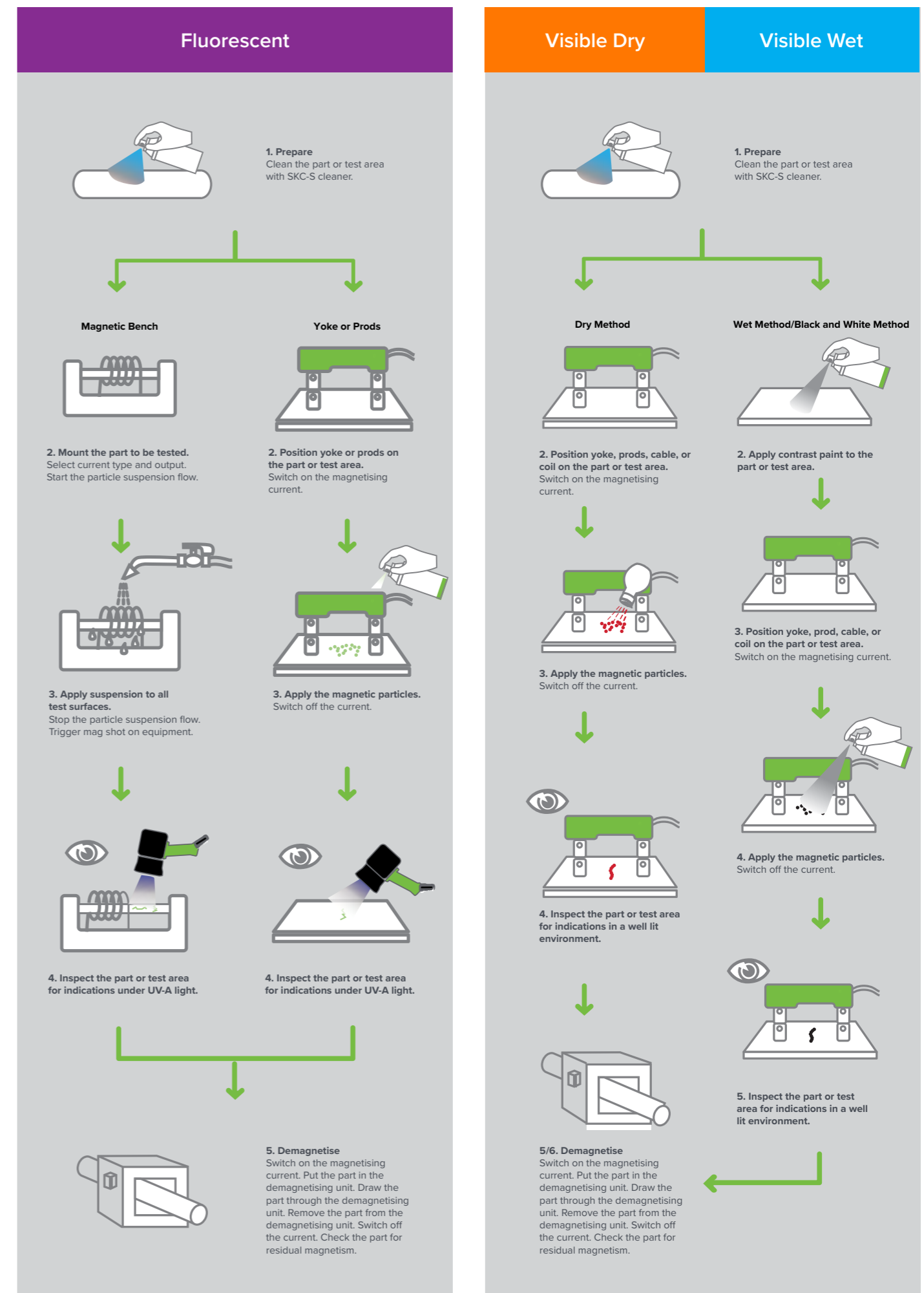
**Magnetic flux leakage** – The magnetic field of a test part will exit and re-enter at the location of the discontinuity producing a visible indication as a result of magnetic particles collection.

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

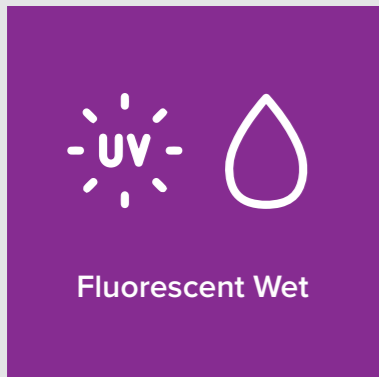
**Precleaning** – The removal of surface contaminants from the test part so that they will not interfere with the examination process.

**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.



**1** Select Method Type      **2** Select Magnetic Particles      **3** Select Carrier or Contrast Paint      **4** Select Equipment



Product Name	Application	Form	Suspension Medium	Part Numbers
14A	Fluorescent Wet	Particles	Carrier II or water	1 Kg.....059C025 5 Kg.....059C026
14HF		Ready-to-use liquid & aerosol	Carrier II	Aerosol x 10.....008A105 5 litres x 4.....058C006 25 litres.....058C007
MF-655 WB		Liquid concentrate	Water	1 litre x 12.....061C063 5 litres x 4.....061C064
MG 410		Particles	Carrier II or water	1 Kg.....057C036
MG 601		Particles	MF-655 WB	1 Kg.....061C026
WB-12		Liquid concentrate	Water	1 litre x 6.....058C033
622.1		Liquid concentrate	Carrier II	1 litre x 6.....061C068
690.1		Ready-to-use aerosol	Carrier II	Aerosol x 10.....008A185

Product Name	Method	Form	Part Numbers
Carrier II	Fluorescent Wet	Liquid	25 litres.....058C024 200 litres.....058C028

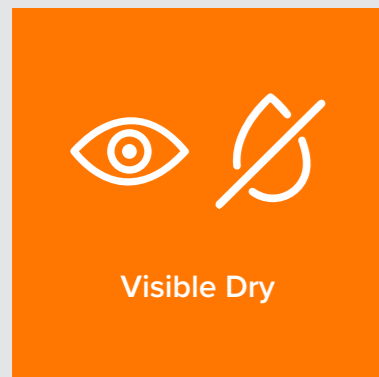
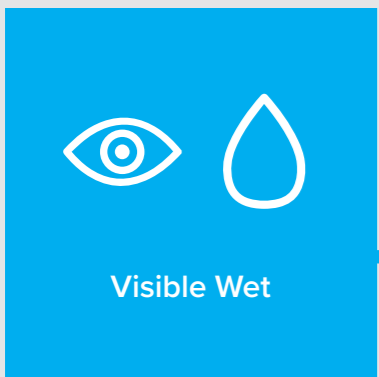
**Optional additives:**

Product Name	Method	Use	Part Numbers
WA-1	Fluorescent Wet	General water conditioner	1 litre x 6.....064C003
WA-2		Antifoam	1 litre x 6.....064C006

Product Name	Method	Use	Part Numbers
WCP-2	Visible Wet	Liquid or Aerosol	Aerosol x 10.....008A009 5 litres x 4.....055C027

Product Name	Application	Form	Suspension Medium	Part Numbers
7HF	Visible Wet	Ready-to-use aerosol	Carrier II	Aerosol x 10.....008A103
WB-27		Liquid concentrate	Water	1 litre x 6.....058C036

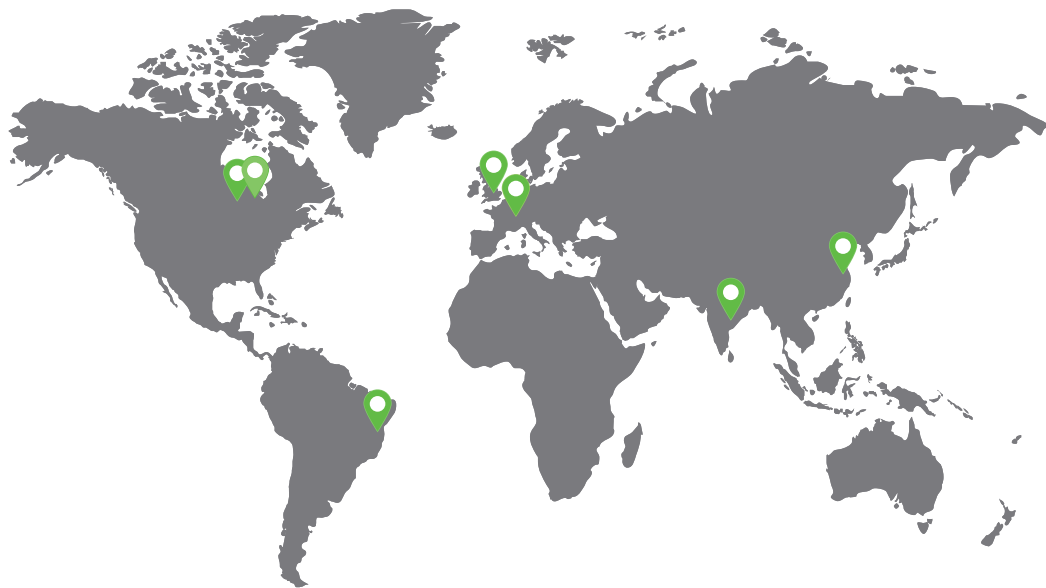
Product Name	Application	Form	Suspension Medium	Part Numbers
1 Grey	Visible Dry	Powder	-	5 Kg.....057C005
8A Red			-	5 Kg.....057C067



Product Name	Series	Description	Current Capacity
Wet Bench	D-2060	AC FWDC	6,000
	Ferroflux Series	AC HWDC FWDC	1,000 - 10,000
	MAG 40 Series	AC HWDC	2,500
	MAG 50 Series	AC HWDC	3,000 - 5,000
	Universal SW	AC	3,000
	Universal WE	AC	2,000

Product Name	Series	Description	Current Capacity
Portable Power Packs	Chain Inspection Unit	AC HWDC	1,000 - 1,500
	Ferrotest Series	AC HWDC	1,000 - 10,000
	Isotest	AC FWDC	3,000 - 10,000

Product Type	Product Name	Defect Location	Description	Part Number
Magnetic Yokes	Y-2	Surface	AC	628555
	Y6	Surface	AC	630405
	Y-8	Subsurface (and some surface)	DC	630550
	TWM 42 N	Surface	AC	072301
	TWM 220 N	Surface	AC	071301



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Rev: 0922