



Magnetic Particle Testing

Product Data Sheet

MR[®]111HB

MAGNETIC PARTICLE COMPOSITION - FLUORESCENT

high brilliance

for wet method testing; suspension in oil and water

The Method

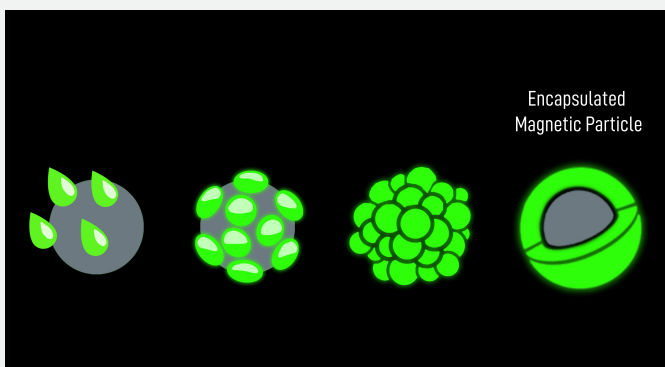
Wet fluorescent magnetic particle inspection (MPI) is a non-destructive testing technique used to detect surface and near-surface defects in ferromagnetic materials. It involves magnetizing the material and applying an oil or water-based suspension containing magnetic particles coated with fluorescent dyes. The particles align with the magnetic field and settle on the surface, highlighting the defects. When illuminated with ultraviolet (UV) light, the coated fluorescent dyes emit visible light, enhancing the visibility of the indications. This method is highly sensitive and can detect cracks, seams, laps, and inclusions. It offers excellent visibility even in low-light conditions. The oil-based nature of the solution reduces chances of corrosion on metal surface. Wet fluorescent oil-based MPI ensures thorough inspections and helps maintain the integrity and quality of critical components and structures.

Description

MR®111HB is an ultra-bright fluorescent magnetic particle powder specifically designed for oil or water (along with conditioner) based wet-method Magnetic Particle Testing (MPI). It exhibits a bright fluorescent green-yellow color when exposed to ultraviolet (UV) light and appears as a dry green powder under visible light. The powder ensures optimal sensitivity and excellent definition of defects while minimizing background interference. It is highly sensitive and capable of detecting coarse, medium to fine surface and slightly subsurface flaws, including cracks, inclusions, seams, tears, laps, flakes, and welding defects.



The Technology



MR's proprietary encapsulation technology involves the precise encapsulation of magnetic iron particles with fluorescent dye resulting in an optimum protective coating around the particles, preventing oxidation and degradation over time which significantly enhances the stability and visibility of cracks, and extends the bath life, reducing the need of frequent replacement of bath and improving overall product longevity and test reliability.

Furthermore, the encapsulation process enhances the dispersion and suspension properties of the magnetic particles for various carrier-media. This allows for better control and uniform distribution of the particles in the solution, resulting in improved inspection outcomes. The encapsulated particles maintain a consistent size and shape, enabling more accurate indications of defects during MPI.

Benefits

- Cost-effective technique for detecting defects in ferromagnetic materials
- Ready-to-use powder. For dilution in water, additional water conditioner MR®304 should be added
- Quick and reliable results for efficient defect detection
- Applicable to a wide range of ferromagnetic materials
- No-odour
- Very long bath life
- User-friendly

Applications

Defect Location: Surface to slightly sub-surface

Test Surface Type: Unfinished to finished

Test Environment: Dark to semi-dark

Defect Types:

Inclusions	Grinding cracks
Seams	Quenching cracks
Shrink cracks	Fatigue cracks
Tears	
Laps	
Flakes	
Welding defects	

Compliances

ASME Code V, Art. 7

DIN ISO 9934 (BS 5044)

ASTM E 709

RCC-M

PMUC (EDF)

AMS 3044

ASTM E1444/1444M

Features

- MR's Proprietary encapsulation technology
- Clear bright indications under UV light
- High sensitivity
- Minimal to No background for easy and precise crack detection
- Good surface wetting on all substrates
- Excellent particle mobility

Usage Instructions

NDT Method	Magnetic Particle Inspection; wet method
Carrier Media	Oil & Water*
Equipments required	Magnetising device, UV source
Recommended Usage	+5°C to +55°C / 41°F to 131°F
Recommended Dilution	1 gm/ L for a sediment of 0.1 ml/100 ml (1h) in oil.
Note	The dilution can be altered depending on the sedimentation required.

* using water conditioner MR®304

Physical & Chemical Properties

Appearance	Free flowing green powder
Chemical Composition	Mixture of magnetic powder, pigments and additives.
Basis	Ferro-magnetic powder
Colour in visible light	Forest green
Colour in UV light	Fluorescent green-yellow
Odour	Odourless
pH	N.A.
Particle Size	7 – 10 µm *
SAE Sensitivity	8 **
Sediment	0.1-0.2 ml/100 ml (1h) ***

*as determined by industrial typical method for measuring particle size

**as per indications on Ketos ring as defined in ASTM E1444/1444M

***with a dilution of 1-2 gm / L (in oil)

Surface Preparation

Prior to inspection, it is essential to ensure that the surface of the part to be inspected is completely clean and free from any contaminants such as grease, water, dirt, or other substances that may have been present during manufacturing or pre-treatment processes. This is necessary to prevent any interference or impact on the accuracy and reliability of the test results.

Corrosion protection

For use with MR®304 - Water Conditioner

MR® 304 is formulated with corrosion inhibitors at low levels. These inhibitors provide adequate protection to parts during magnetic particle inspection testing. When using water-based method, it is essential to prepare them in stainless steel tanks to avoid any contamination.

To prevent corrosion, it is crucial to keep the parts clean and dry both before and after inspection. After inspection, it is especially important to promptly remove any excess water to minimise the risk of corrosion. It's important to note that the duration of corrosion protection depends on various factors such as the job type, working conditions, and pre and post-care of the test object.

For use with MR®82 - Flux oil

MR® Chemie's oil-based powders and liquid concentrates when used with MR®82 - Flux oil is formulated with corrosion inhibitors at low to medium levels. These inhibitors provide adequate protection to parts during magnetic particle inspection testing and until the flux oil layer stays onto the surface.

Note: For longer-lasting corrosion protection, it is recommended to apply a temporary protective film coating to cleaned components.

Concentration Control

In our aerosol products, the particle concentration remains constant. However, in bulk versions, the particle concentration may deplete as particles are used up during inspections. It is important to check the bath strength daily, typically using a graduated ASTM pear-shaped centrifuge tube.

Regarding the carrier fuel, flux oil MR®82 has low volatility, minimising the chances of evaporation. However, with water-based inks, there may be some water evaporation. In such cases, only water should be added to top up the bath to maintain balance, as adding additives could disrupt the bath's composition, which includes wetting agents, anti-foam and corrosion inhibitors.

Bath Preparation

Mix MR®111HB in an appropriate quantity with water or oil for use and stir until the particles are fully and evenly dispersed in the bath or a minimum of 10 minutes. Check concentration of bath before use. Using warm water (100°F / 38°C) to prepare the suspension will help the product mix faster.

Maintenance Considerations

Contamination can occur in the bath due to various factors such as the removal of oil or protective coatings from components during inspection, resulting in the accumulation of ink/oil mixture. To address this issue, we recommend thorough pre-cleaning of components before inspection to prevent sludge buildup.

The same MPI machine can generally be used for both water-based and oil-based applications with proper cleaning and maintenance between uses. It is crucial to note that different types of magnetic particles are required for each application. Water-based particles are dispersed in water, while oil-based particles are dispersed in oil. Incorrect particle selection may lead to unsatisfactory results. Follow the manufacturer's guidelines for particle selection and utilise separate containers and equipment for water-based and oil-based applications. Thoroughly clean the MPI machine according to the manufacturer's instructions to prevent contamination and ensure accurate results. MR® System Cleaner can be used to clean the MPI machine when switching between oil and water mediums.

Suggested Products

MR® System Cleaner: for effective MPI bench cleaning

MR® 71: A solvent based cleaner for removing contaminants such as oil, grease and dirt

MR® 304: Corrosion Inhibitor

MR® 82: Flux oil

MR® 975: UV LED Light

Safety

Magnetic particle inspection (MPI) is generally safe when conducted by trained professionals who follow appropriate safety measures. However, individuals with pacemakers or implanted medical devices should take precautions due to potential risks from the magnetic field and UV light used in the inspection process.

Wear the appropriate safety gears while using the product. Use in a well-ventilated area.

Please read the Material Safety Data Sheet before use!

(Available at: <https://www.3akchemie.com/resources-mrchemie>)

Scan To Download
TDS / MSDS / TC



Ingredients: Iron

Storage Temperature: 41°F to 113°F / +5°C to +45°C

Notice

3AK Chemie makes no warranties expressed or implied, including, but not limited to, any implied warranty of merchantability or fitness for a particular purpose. User is responsible for determining whether our product is fit for a particular purpose and suitable for users method of application.

Limitation of Remedies & Liabilities

If this product is proved to be defective, the exclusive remedy at 3AK CHEMIE's option shall be to refund the purchase price or to repair or to replace the defective MR® CHEMIE product. The company shall not otherwise be liable for loss or damages, whether direct or indirect, special, incidental or consequential regardless of the legal theory asserted including negligence, warranty or strict liability.

Packaging & Order Instructions

SKU	Pack Size	Case
2511-0025	Bulk - 0.5 kg	6
2511-0033	Bulk - 1 kg	6



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