



# Magnetic Particle Testing

Product Data Sheet

## MR<sup>®</sup>158-R

**MAGNETIC POWDER CONCENTRATE- FLUORESCENT**

(liquid)

for wet method testing; suspension in water

## The Method

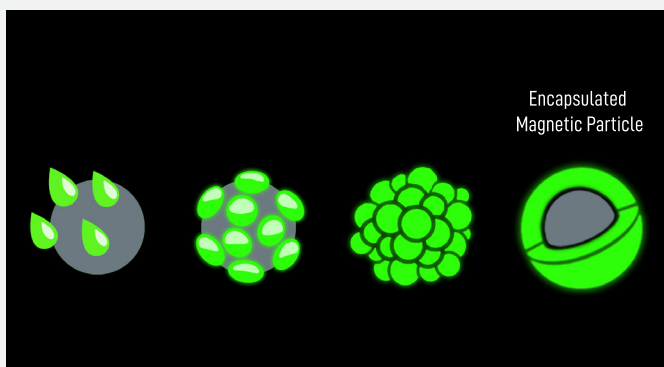
Wet fluorescent magnetic particle inspection (MPI) is a non-destructive testing technique used to detect surface and near-surface defects in ferromagnetic materials. It involves magnetising the material and applying a water-based suspension containing magnetic particles coated with fluorescent dyes. 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 water-based nature of the solution reduces environmental and safety concerns. Wet fluorescent water-based MPI ensures thorough inspections and helps maintain the integrity and quality of critical components and structures.

## Description

MR<sup>®</sup>158-R is an ultra-bright ready-to-use fluorescent magnetic particle concentrate specifically designed for water based wet-method Magnetic Particle Testing. It exhibits a bright fluorescent yellow-green colour when exposed to ultraviolet (UV) light and appears as a brown liquid under visible light. The concentrate is pre-mixed with a water conditioner which includes corrosion inhibitor, surfactants, anti-foam, and wetting agents ensuring optimal sensitivity and excellent definition of defects while minimising 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 liquid concentrate. No need of additional water conditioners
- No need for constant stirring
- 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:** Finished to super-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

DIN) EN ISO 9934

ASME Code V, Art. 7

ASTM E1444/1444M

AMS 3040-46

ASME B & PV Code

TLV 9612 01

AS 4792

ASTM E709

PMUC

RCC-M (EDF)

## Features

- MR's Proprietary encapsulation technology
- Clear bright indications under UV light
- Optimal short-term corrosion protection
- Minimal to No background for easy and precise crack detection
- Good surface wetting on all substrates
- Excellent particle mobility
- Very low-foam formation
- Quick dispersion in water

## Usage Instructions

<b>NDT Method</b>	Magnetic Particle Inspection; wet method
<b>Carrier Media</b>	Water
<b>Equipments required</b>	Magnetising device, UV source
<b>Recommended Usage</b>	+5°C to +55°C / 41°F to 131°F
<b>Recommended Dilution</b>	10 - 20 ml/L for a sediment of 0.1 - 0.2 ml/100ml (1/2h) in water.
<b>Note</b>	The dilution can be altered depending on the sedimentation required.

## Physical & Chemical Properties

<b>Appearance</b>	Brown liquid concentrate
<b>Chemical Composition</b>	Mixture of magnetic powder and corrosion inhibitor, surfactant, wetting agent and anti-foam emulsion.
<b>Basis</b>	Ferro-magnetic powder
<b>Colour in visible light</b>	Brown
<b>Colour in UV light</b>	Fluorescent yellow-green
<b>Odour</b>	Odourless
<b>pH</b>	approx 9
<b>Particle Size</b>	1 – 3 µm *
<b>SAE Sensitivity</b>	9**
<b>Sediment</b>	0.1-0.2 ml/100 ml (1/2h) ***

\*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 10-20 ml/ L (in water)

## 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

MR®Chemie's water-based powders and liquid concentrates are formulated with corrosion inhibitors at low levels. These inhibitors provide adequate protection to parts during magnetic particle inspection testing. When using water-based inks, 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 using water-based inks, it is especially important to promptly remove any excess water to minimise the risk of corrosion.

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

## 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

MR®158-R in an appropriate quantity with water for use and stir until the particles are fully and evenly dispersed in the bath or a minimum of 5 minutes. The product can be added directly over the pump for more rapid dispersion. 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® 302:** Corrosion Inhibitor

**MR® 500:** Anti-Foam emulsion

**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:** Non-hazardous

**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
2511-0053	Bulk - 1L	6
2511-0069	Bulk - 5L	-



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