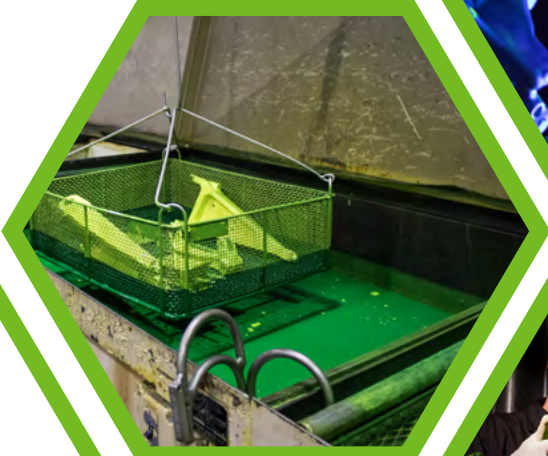


# LPI and MPI Glossary

Your guide to common mag particle and liquid penetrant terminology



# Magnaflux NDT Glossary

**Alternating current (AC):** A type of electric current that reverses direction periodically and used to detect surface defects.

**ASTM:** ASTM International, formerly known as American Society for Testing and Materials.

**Autoignition temperature of a liquid:** The lowest temperature at which vapors from the liquid will ignite even without a source of ignition.

**Background:** The surface of the test part against which the indication is viewed. It may be the natural surface of the test part or the developer coating on the surface.

**Batch inspection certificates:** Batch test results, including sample rate are published and shipped with all Magnaflux products. If you need replacement copies of batch certificates, please [click here](#).

**Batch number:** Each batch of product manufactured and supplied by Magnaflux carries a unique batch number located on the bottom of all aerosol cans and on the label of all bulk containers.

- For bulk products, the batch number consists of five numbers and a letter; The first two digits represent the year of manufacture and the letter represents the month of manufacture (A = January, B = February, C = March, D = April, E = May, F = June, G = July, H = August, J = September, K = October, L = November, M = December).
- For example: 12K112 indicates that the product was manufactured in October 2012.

**Batch testing:** All Magnaflux products are rigorously tested at the time of manufacture and check for flash point, viscosity and fluorescent brightness (Type 1 systems only).

**Best before end (BBE) date:** On bulk product labels and aerosol labels the date which refers to the shelf life of an unopened product.

**Bleedout:** The action of an entrapped liquid penetrant in surfacing from discontinuities to form indications.

**Coil shot:** A quick image that captures the longitudinal magnetic field of a test part as magnetized current is passed through a coil.

**Couplant:** A liquid substance used between a transducer and test surface to increase transmission of ultrasonic energy into the test part.

**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.

**Developer:** A material that is applied to the test surface to accelerate bleedout and to enhance the contrast of indications.

Under AMS 2644, the primary classifications of developer are as follows:

- Form a – dry powder developer
- Form b – aqueous soluble developer
- Form c – aqueous suspendible developer
- Form d – non-aqueous wet developer for fluorescent penetrants
- Form e – non-aqueous wet developer for visible penetrants

**Direct current (DC):** A type of electric current that only flows in one direction and used to detect sub-surface defects.

**Discontinuity:** An interruption in the physical structure of a part.

**Dry powder developers:** Generally considered the least sensitive. However, they are easy to use and inexpensive.

**Dwell time:** The total time that the penetrant or emulsifier is in contact with the test surface, including the time required for application and the drain time.

**Developing Time:** The elapsed time between the application of the developer and the examination of the part.

**Electromagnetic fields (EMFs):** Static electric, static magnetic and time-varying electric, magnetic and electromagnetic (radio wave) fields with frequencies up to 300 GHz. An EMF is produced whenever a piece of electrical or electronic equipment is used.

**Emulsifiers:** An agent that enables removal of excess post emulsifiable penetrant on part surfaces with water. Proper emulsification and rinse times allow removal of excess surface penetrant while any penetrant in discontinuities is not removed.

**Ferromagnetic materials:** Materials such as iron, nickel and cobalt that are strongly attracted to a magnet and can easily be magnetized.

**Ferrous metal:** A metal with a chemical composition that is largely iron. Examples of ferrous metals include carbon steel, stainless steel, cast iron, and alloy steel.

**Fire point of a liquid:** The lowest temperature at which a vapor will keep burning after having been ignited and the source of ignition removed. The fire point will be higher than the flash point because, at the flash point, the vapor may cease to burn following removal of the ignition source.

**Flammable range:** The range between the Lower Explosive Limit (LEL) and Upper Explosive Limit (UEL).

**Flash point of a liquid:** The lowest temperature at which vapors from the liquid will ignite in the presence of a source of ignition, such as a flame, spark or electrostatic discharge.

- Flammable liquids flash point: 21°C to 55°C
- Highly flammable liquids flash point: Below 21°C but are not classified as extremely flammable
- Extremely flammable liquids flash point: Below 0°C and a boiling point or initial boiling point less than or equal to 35°C

**Flaw:** A discontinuity detected in a material or component.

**Fluorescent dye penetrant:** A highly penetrating liquid that will fluoresce under black light to detect surface defects on test parts.



**Head shot:** A quick image that captures the magnetized current as it passes through a test part as it clamped between two electrical contact pads.

**Hydrophilic emulsifier (Method D):** Works like a detergent by emulsifying the excess penetrant so that it can then be removed using water.

- PR: Acronym referring to the hydrophilic method (Method D) for removing post-emulsifiable penetrants.

**In-use testing:** When a penetrant is being used, there are a set of in-use tests that need to be carried out by the customer. ASTM E1417 has established standards for performance checks for in-use materials. You can find out more information on these tests here, where you will also find details of our PeneCert testing service, whereby in-use tests are carried out using an independent laboratory.

**Indication:** The response from an NDT that provides evidence of a discontinuity within a material or component.

**Inspection:** Visual examination of the test part after completion of the liquid penetrant processing steps.

**IP rating:** IP ratings are defined by ANSI/IEC 60529, the Ingress Protection Code. The first digit is the degree of protection against solids, particulate, and dust. A rating of 0 represents no protection, higher numbers mean higher protection, topping out at dust-tight with a rating of 6.

**ISO:** International Organization for Standardization

**Lipophilic emulsifier (Method B):** Acts by essentially changing the chemistry of a penetrant so that it acts like a water-washable penetrant, thus allowing the excess penetrant to be removed using water.

- PE: Acronym referring to the lipophilic method (Method B) for removing post-emulsifiable penetrants.

**Liquid penetrant:** A solution of dye with the ability to penetrate into fine openings.

**Liquid penetrant inspection (LPI):** A simple, cost-effective and reliable method of non-destructive testing that can be used to detect discontinuities that are located at the surface in a wide variety of non-porous material types. LPI can be used for the inspection of non-ferrous metals, large areas and parts, as well as complex geometric shapes.

**Liquid Penetrant Testing:** A nondestructive test that uses liquid penetrant materials to penetrate and detect various types of discontinuities open to the surface.

**Lower explosive limit (LEL):** The minimum concentration of a particular material necessary to combust in air is defined as the Lower for that material. Below this level, the mixture is too “lean” to burn.

**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 the extra magnetic particles added during testing.

**Magnetic particle inspection (MPI):** A simple, cost-effective and reliable method of non-destructive testing that can be used to detect discontinuities that are located at or near the surface in ferromagnetic materials such as iron (non-alloyed and low alloyed steels, cast steel, cast iron), cobalt and nickel. MPI can also detect faults hidden beneath coatings. This testing method is based on the principle that magnetic flux.

**Magnetic particle testing (MT):** A method of non-destructive testing used to locate defects in a test part.

**Magnetic yoke:** Portable device for detecting surface and sub-surface cracking in any ferromagnetic material. Yokes portability makes them ideal for in-plant inspection and repair of welds, automotive components, steel and grey iron castings, and many other applications.



**Meters:** Used to obtain overall or detailed results and can be used to assess equipment in use to determine the Expose Limit Values (ELVs) and safe working distances.

**Non-aqueous developers:** The developer is suspended in a solvent-based carrier. Being solvent-based, there is no need for force drying as the solvent evaporates quickly from the part.

**Non-destructive testing (NDT):** A method of inspecting which allows technicians to locate flaws or defects in materials or components without destroying the part.

**Non-ferromagnetic materials:** Non-magnetic materials such as high alloyed steels (austenitic structure), aluminum, copper, plastics, and composites that contain less than 50% iron.

**Non-ferrous metal:** A metal with a chemical composition that is less than one percent iron. Examples of non-ferrous metals include aluminum, copper, and nickel.

**Nonylphenol Ethoxylates (NPE):** According to the U.S. EPA, “Nonionic surfactants that are used in a wide variety of industrial applications and consume products.”

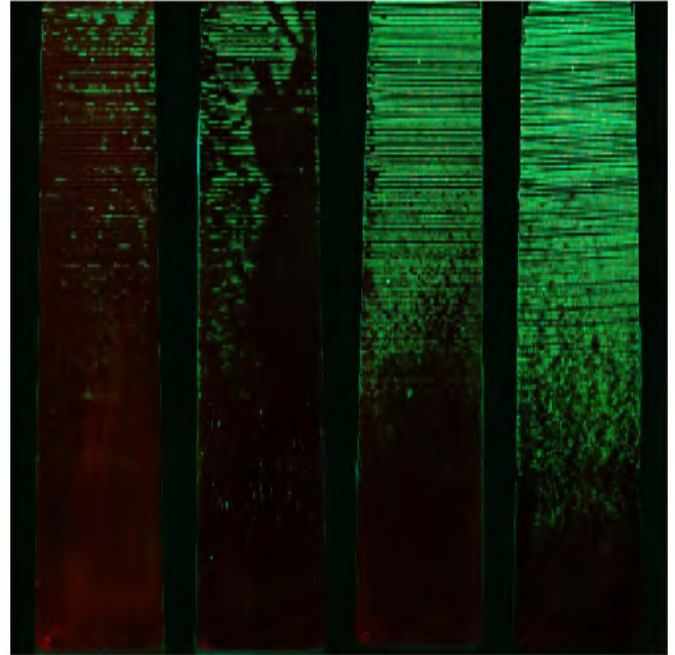
**PE:** Acronym referring to the lipophilic method (Method B) for removing post-emulsifiable penetrants.

**PeneCert™ test services:** Liquid penetrant testing service Maganflux offers to monitor the quality of in-use penetrant, emulsifiers and developers for customers, ensuring continued compliance to standards.

**Penetrant:** A highly penetrating liquid that can detect surface defects on test parts.

**Penetrant removal methods:** Penetrants are classified by the method used to remove the excess penetrant from the test part. The four methods are as follows:

- Method A – water-washable
- Method B – post-emulsifiable, lipophilic
- Method C – solvent-removable
- Method D – post-emulsifiable, hydrophilic



**Penetrant sensitivity level:** Penetrants are classified based on their ability to detect an indication in a test part. Generally, a low sensitivity penetrant is used on rough parts, a medium sensitivity penetrant on general engineering components, and a high sensitivity penetrant on more precision or polished components. The five sensitivity levels are as follows:

- Level ½ – ultra low sensitivity
- Level 1 – low sensitivity
- Level 2 – medium sensitivity
- Level 3 – high sensitivity
- Level 4 – ultra high sensitivity

**Penetrant systems:** Under AMS 2644, penetrant systems are classified as:

- Type 1 – fluorescent penetrants
- Type 2 – visible penetrants

**Penetrant testing (PT):** A method of non-destructive testing that uses visible fluorescent dye to detect discontinuities located at the surface of a test part.

**Penetrant testing applicators:** Product applicators and water sprayers that help speed up the penetrant inspection process by offering fast, consistent and even application of product or water to the part surface.

**Personal monitor:** Worn on the body and will typically give a visual and audible warning when the field strength approaches the permitted Exposure Limit Values (ELV). Some companies provide a monitor to protect those staff that will be exposed to electromagnetic fields. Data log functions can record the level of exposure.

**Post-emulsifiable penetrants:** Can be removed using two different methods of emulsification, namely lipophilic and hydrophilic.

**PR:** Acronym referring to the hydrophilic method (Method D) for removing post-emulsifiable penetrants.

**Pre-cleaning:** The removal of surface contaminants from the test part so that they will not interfere with the examination process.

**Signal words:** Alert the user to the severity of the hazard:

- Danger indicates more severe hazards
- Warning indicates less severe hazards
- No signal word indicates low hazard although there may still be hazard statements

**Solvent-removeable penetrants (Method C):**

Require the use of a solvent to remove the penetrant from the part.

**Test pieces:** Help maintain your PT testing process by verifying penetrant sensitivity and performance. Can be used to check for penetrant deterioration, to compare different penetrants or to verify sensitivity or visibility.

**Type testing:** When seeking approval for a penetrant in accordance with material specifications, the penetrant manufacturer is responsible for getting the product Type tested. This involves sending a sample of the penetrant off to an independent laboratory for verification against a comprehensive set of standard tests.

**Ultraviolet (UV) lamps:** Also known as black lights that are designed for use with Magnaflux fluorescent magnetic particle and liquid penetrant inspection chemicals.

**Upper explosive limit (UEL):** The maximum concentration of a material that will burn in air is defined as the). Above this level, the mixture is too “rich” to burn.

**UV fluorescent penetrants:** The developer particles both reflect and refract the UV light, which makes the indications brighter.

**Visible penetrants:** The developer, in addition to pulling the penetrant back to the surface, creates a white background to create an ideal contrast between the indication and the surrounding surface.

**Water-soluble developers:** The developer particles are dissolved within a water carrier. After application, a film of developer will form on the surface of the part during the drying stage.

**Water-suspendible developer:** The developer particles are suspended in water. It is important to keep the developer suspension stirred or agitated to prevent the particles from settling out of the suspension. After application of the developer, you will need to dry the parts to remove excess water.

**Water-washable (Method A) penetrants:** Contain emulsifiers, which means they can be removed from the part by rinsing with water alone.

