INDUSTREX Digital Imaging Plates

INDUSTREX Flex Digital Imaging Plates (IPs) are designed for computed radiography in nondestructive testing (NDT) applications. These plates employ storage phosphors, which capture and retain a latent image in direct proportion to an exposure of ionizing radiation. This latent image is subsequently read out by scanning with a red laser, which stimulates the emission of blue light, in a phenomenon known as photostimulated luminescence.

The imaging plate can be loaded into a flexible or rigid cassette and used with metal screens of appropriate thickness. These plates offer the flexibility of film without the need for wet processing, so you can capture and read images quickly and easily, both in the field and in the lab. The images can be optimized, if needed, and stored and shared digitally. These imaging plates work with INDUSTREX Computed Radiography (CR) Systems.

INDUSTREX Flex GP, HR, HR-PRO and XL Blue Digital Imaging Plates are:

- Flexible—Wrap around most shapes.
- Sharp—Better resolution than high-speed films and a suitable replacement for many applications.
- Available in multiple sizes—To cover a wide range of applications.
- Portable—With an INDUSTREX Digital System, image capture in remote areas is easier than ever.
- Versatile—Use in a rigid or flexible cassette.
- Efficient—Phosphor plates can be erased and reused thousands of times, require less exposure than film, and provide faster image access.
- Certified—When used with INDUSTREX Digital Systems, all plates meet requirements for the highest CR System class according to EN 14784-1 and ASTM E 2446.

  BAM-certified:

  - INDUSTREX HPX-PRO Portable Digital System with INDUSTREX Flex XL Blue Digital Imaging Plates and HR-PRO Imaging Plates
  - INDUSTREX HPX-1 *Plus* Digital System with INDUSTREX Flex XL Blue Digital Imaging Plates and INDUSTREX Flex HR Digital Imaging Plates

Recommended Uses

INDUSTREX Digital Imaging Plates are available in many sizes, and are designed for a wide variety of NDT applications, including:

- Castings
- Erosion and corrosion
- Pipeline inspection
- Welded fabrication
- Ordinance

Storage and Handling

The lifetime of the plates is hundreds or thousands of exposure/readout/erase cycles, determined primarily by the care in handling and environmental conditions. Careless handling and very dirty environments can shorten the useful lifetime of an imaging plate.

Important! Inspect phosphor plates every week and replace when wear is evident. Clean when necessary as directed in the cleaning sections of this document.

Handling the plates between exposure and reading and operating the INDUSTREX CR Systems must be done in a darkened room that is free of light contamination. It is not necessary to have complete darkness, but the room must have subdued lighting. Excessive light levels in the processing room during handling or scanning of the exposed imaging plates may bring poor results.

Under normal-use conditions, phosphor plates will eventually show wear. Plate wear can result in artifacts on radiographs. This may occur from abrasion of the protective overcoat or inadvertent physical damage to the surface or edge. Certain chemical agents, such as non-approved plate cleaners, hand lotions, topical medications, food, and so forth, may also damage the plates.

Handle flexible phosphor plates with care. Hold plates by the edges and by the black side. Avoid contact with the plate's white or blue (phosphor) side. Make sure hands are clean and dry. For best results, wear nitrile rubber or latex gloves.

Cutting

Cutting the plates is not recommended, as this will compromise the edge seal and make the plates prone to moisture damage at the edges.

Temperature Ranges

The normal temperature operating range is –5 to 30 ˚C (23 to 86 ˚F), although lower temperatures for short periods (several hours) will have no detrimental effect on the performance or physical integrity of the plates. In very hot environments, exercise care in bending or flexing the plates, as the phosphor layer could crack if flexed at temperatures exceeding 65 ˚C (149 ˚F). From 65 to 100 ˚C (149 to 212 ˚F), minor distortions of the polyester support may occur, and over 100 ˚C (212 ˚F), damage to the phosphor layer (blistering/buckling) may occur.

When radiography of very hot objects (such as hot welds) is necessary, a thin fire-resistant insulating layer may be placed between the cassette and the object, if experimentation shows it does not negatively affect image quality. Again, as a practical matter, the upper temperature limit will be determined by the point at which the cassette begins to burn, or the lead identification letters begin to melt.

Cleaning Plates

INDUSTREX Digital Imaging Plates employ a phosphor that is moisture sensitive. When exposed to water (either liquid or vapor form), the phosphor breaks down and liberates iodine. The iodine can become trapped within the phosphor layer at the interface between the overcoat and phosphor layer. The yellow-brown color in the iodine strongly absorbs the blue light emitted by the phosphor. This results in a loss in plate speed, which causes image quality problems.

New imaging plates should be cleaned before the first use. This will impart the necessary anti-static properties and prevent the attraction of dust and dirt, which can result in image artifacts.

Important!

- Water, isopropyl alcohol (isopropanol or rubbing alcohol) and plate cleaners containing isopropyl alcohol are not recommended.
- Read and follow instructions in Material Safety data Sheets (MSDS) for CARESTREAM Screen Cleaner (CAT No. 845-4977).

Note: Plates should be wiped routinely to remove any dust and loose dirt. It is also a good idea to clean the interior of flexible cassettes to avoid transfer of dirt or dust to the plate. Other cleaning solutions can contain chemicals that cause damage to the plate and could result in immediate or future image artifacts.

Cleaning Methods

For routine cleaning, place the plate with the black (non-phosphor) side down on a clean, dry, non-abrasive surface, such as the cassette's cleaned tube side. Wipe the plate gently to remove dust. For other dirt, use CARESTREAM Screen Cleaner:

1. Fold a non-abrasive, lint-free wipe or cloth, and dampen with a small amount of the solution.

Important!

- Do not pour the solution directly onto the plate. Excessive amounts of the screen cleaner may damage the plate. Moisture can cause immediate or future screen damage and image artifacts. Minimize contact with moisture and always dry plates immediately.
- Never insert a storage phosphor plate into a cassette unless the plate is thoroughly dry.

2. Wipe the plate thoroughly, one section at a time. Fold the cloth to expose a fresh area for each section of the plate.
3. If necessary, for the removal of persistent dirt, apply pressure while cleaning.
4. Thoroughly dry the plate with a clean and dry, non-abrasive, lint-free cloth to remove residual cleaner. Do not leave the plate to air dry.

Characteristics

Physical Properties: Nominal Thickness (microns)

	Total	Overcoat	Phosphor	Support	Backing
XL	436	4	160	254	18
HR	436	4	160	254	18
HR-PRO	443	11	160	254	18
GP	584	11	290	254	29

INDUSTREX Digital Imaging Plates are comprised of a layer of barium fluorobromoiodide doped with divalent Europium (BaFBr/I:Eu2+), coated on a 10-mil polyester support. A polymer overcoat provides protection against normal handling such as fingerprints and moisture.

For the HR-PRO digital imaging plate, a polyethylene terephthalate (PET) laminate overcoat is applied over an adhesive layer to improve the plate physical properties.

A black polycarbonate backing layer provides anti-halation protection and curl control. It also contains slip agents for optimum transport through the CR reader hardware.

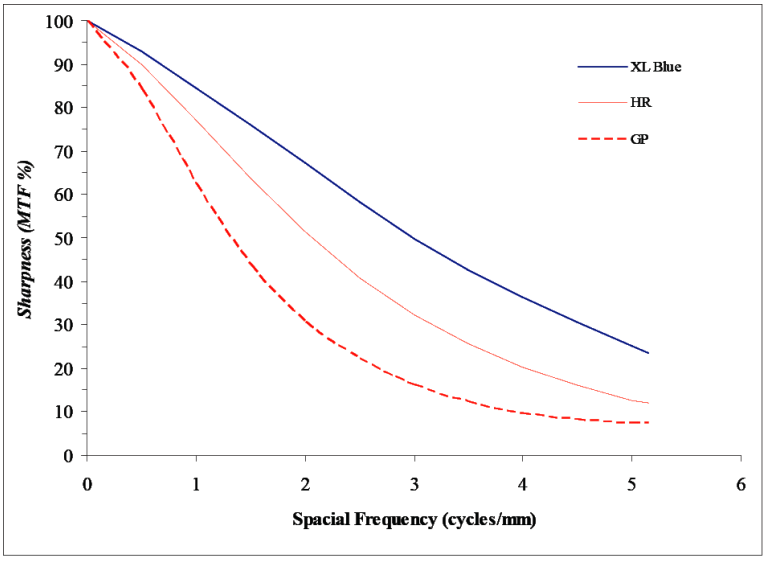
Flexibility

The plates can be bent around pipes and other curved surfaces down to a radius of one inch, although as a practical matter, the bend radius will be much more limited by the configuration of the cassette and the lead screens when used.

Sharpness

Sharpness is typically characterized by Modulation Transfer Function (MTF), a measure of signal or image modulation as a function of spatial frequency.

The figure shows the MTF curves for all imaging plates and highlights the improved sharpness of the HR and XL Blue plates.



Signal Retention

The stored energy in the imaging plate phosphors will decay over time, resulting in some signal loss. This effect is known as image fading. This loss is also a function of temperature and will be greater at elevated temperatures.

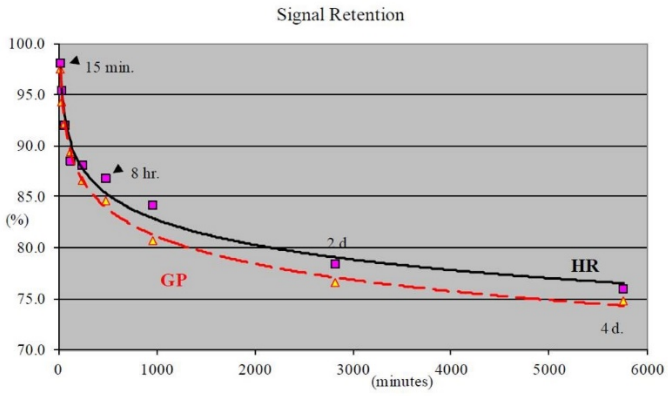
In most applications, this signal decay will be of little importance, given the very wide latitude of storage phosphor imaging plates.

In critical applications, there are a few measures that can be taken; when the interval between exposing and readout is more than a few hours, the plates can be exposed with a higher radiation dose to compensate for signal decay.

For shorter intervals, simply keeping the time between exposing and readout constant will eliminate any decay-induced variability.

The figure shows the percent signal retention at ambient temperatures after an exposure 120 kV in accordance with ASTM E2445.

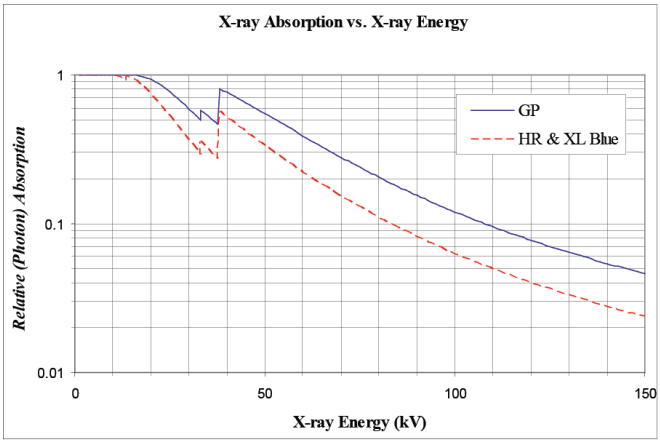
The plot is representative for INDUSTREX Flex Digital Imaging Plates. The signal retention remains above 75 % at 4 days.



Absorption

Imaging plates are quite sensitive to low-energy scatter, as shown by their X-ray energy absorption curves.

For this reason, the use of lead screens, especially at energies greater than 100 kV, is important in controlling scatter to produce optimum image quality.



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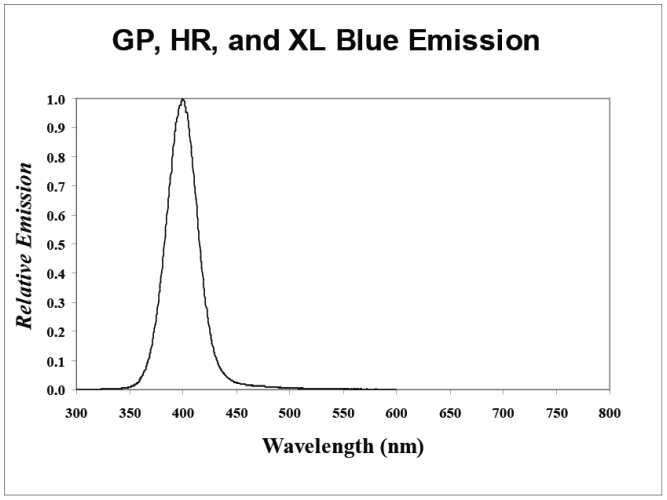
Emission

The wavelength of light needed to stimulate phosphor luminescence is different from the wavelength of light released by the phosphors. This enables the stimulating light to be filtered from the phosphor luminescence.

The emission is typically stimulated with a red laser diode, while the photostimulated emission of the INDUSTREX Digital Imaging Plates is a narrow band of blue light near 400 nm.



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Disposal

Due to the presence of barium, this plate may be considered a hazardous waste at the end of its useful life.

For disposal or recycling information, please contact local authorities.

To locate the Article Information Sheet (AIS) for each plate, go to www.carestream.com and scroll to the bottom. Click **Support** > **Safety Data Sheets** (or use this link: https://www.carestream.com/en/us/company/environmental-health-and-safety/safety-data-sheets). From there, enter the plate type to locate the file.

NOTICE: While the data in this publication are typical of production coatings, they do not represent standards which must be met by Carestream Health, Inc. Varying storage, exposure, and operating conditions will affect results. The company reserves the right to change and improve product characteristics at any time.

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Rev A (PLI): Rev 1 is released into PLI. Going forward, releases will follow PLI (letter) revisioning.