LANEX Fast Screens for Industrial Imaging

LANEX Fast Screens are intended to be used with double-coated, ortho-sensitive X-ray films[1] —and the spectral sensitivity of INDUSTREX HS800 Film matches the spectral output of LANEX Fast Screens.[2] **Using LANEX Fast Screens together with INDUSTREX HS800 Film results in high-quality images and the fastest system available from Carestream for industrial applications.**

LANEX Fast Screens incorporate:

- Rare-earth phosphor from the lanthanide series, which results in significantly higher X-ray absorption and X-ray energy conversion than $CaWO_4$ screens. Accordingly, LANEX Fast Screens permit a much greater reduction in exposure than $CaWO_4$ screens.[3]
- Phosphor terbium-activated gadolinium oxysulfide, Gd_2O_2S:Tb (the same phosphor that contains metals from the lanthanide series of elements), coated in a transparent binder.
- Thin clear overcoat (approximately 0.3 mil) that resists surface abrasion.
- Backing layer to eliminate curl.

LANEX Fast Screens are provided in asymmetrical pairs. The phosphor coverage of the non-tube-side (back) screen is more than twice that of the tube-side (front) screen, which allows for equal light output from each of the screens during exposure. The screen base is a 10-mil reflective polyester support.

Two sizes of LANEX Fast Screens are available:

- CAT 8619553: 30 x 40 cm
- CAT 8613176: 35 x 43 cm

[1] Ortho-sensitive (or orthochromatic) X-ray films use an emulsion that is sensitive only to blue or green light and can therefore be handled and processed under a red, yellow, or orange inactinic lamp.

[2] INDUSTREX Films use silver bromide (AgBr) emulsions with an intrinsic spectral sensitivity comprising only the blue range of the visible spectrum.

[3] Most industrial X-ray films incorporate emulsions that are predominantly sensitive in the blue region of the electromagnetic spectrum. Calcium tungstate ($CaWO_4$) is the oldest substance that was chosen as the luminescent material in intensifying screens because it emits light in the blue range with an emission maximum at about 420 nm.

Today, phosphors such as oxysulfides of the rare-earth elements are used to produce ultra-fast screens. Rare-earth phosphors also emit light in the blue range to which the emulsion is mostly sensitive. Gadolinium oxysulfide (Gd_2O_2S:Tb, or GOS) screens are more efficient than calcium tungstate screens at both absorption of ionizing radiation and in converting the radiation into emitted light. GOS screens, such as LANEX Fast Screens, for which the primary X-ray absorber is gadolinium, are more responsive to gamma rays than calcium tungstate screens.

Fluorescent Screens

Fluorescent screens can sometimes be used with advantage for industrial radiography. The normal calcium tungstate type screens will not reduce scatter, and the image quality of radiographs where the exposure has been made using these screens is not as good as that obtainable with lead screen exposures. However, fluorescent screens permit a considerable reduction in exposure, being most responsive to X-rays and intensifying by a factor of approximately 100-800 times. $CaWO_4$ fluorescent screens are much less responsive to gamma rays (approximately 20-40 times), and the inherent low contrast of gamma radiographs plus the unsharpness caused by these screens will result in poor sensitivity and fault detection.

Percent X-ray Absorption

Measurements were made at 80 kV with 3 mm of aluminum total filtration using a chest test object with scatter at the detector. The design of this chest test object is described in ANSI Standard PH2.43-1982 for sensitometry of medical X-ray screen-film-processing systems. The absorption value given for the screen is "percent X-ray absorption," which is the percent of the incident X-ray photons that are absorbed by the screens. This statement of absorption is probably more generally descriptive of screen performance than is "energy absorption" as reported previously in intensifying screen documents.

X-ray Absorption:

LANEX Fast Screen:

- Front and Back 73 %
- Front Screen Alone 30 %
- Back Screen Alone 61 %

Emission Spectrums

LANEX Fast Screen

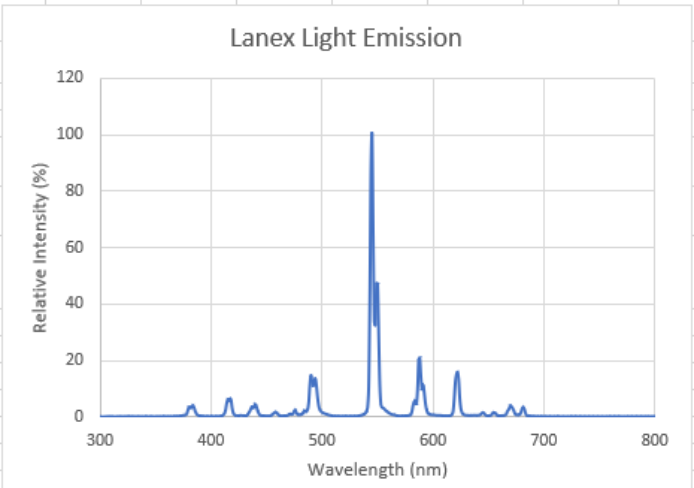
Wavelength (nm)	Relative Power Output*	
	Front Screen	Back Screen
382	0.13	0.11
416	0.17	0.13
440	0.09	0.08
492	0.26	0.23
545	1.00	1.00
587	0.17	0.22
622	0.08	0.13

*Integrated peak power over the series of peaks in the particular wavelength region.

The 545 nm peak has been arbitrarily assigned a value of 1.00.

NOTE: The emissions from the front and back screens are similar, but the peak heights would have to be adjusted by using the information provided in the table.

The following graph represents the approximate spectrum for LANEX Fast Screens:



Resistance to High Ambient Humidity

The phosphor and binder used in LANEX Fast Screens are highly resistant to the effects of high relative humidity. Representative screens have been incubated at 32 ˚C (90 ˚F) / 90 % RH for periods up to 16 weeks with no detectable loss in speed or change in physical properties.

Care and Cleaning

The temperature encountered in most industrial radiography laboratories does not significantly affect screen emission. However, it is noteworthy that screen emission increases as screen temperature is lowered.

Intensifying screens must be kept away from chemicals and other sources of contamination. Every effort should be made to avoid soiling intensifying screens. Should they become dirty, they must be carefully cleaned according to the manufacturer's recommendations.

Under normal use conditions, intensifying screens will deteriorate. The deterioration may occur from abrasion of the protective overcoat or inadvertent physical damage to the surface. Certain chemical agents—such as non-approved screen cleaners, hand lotions, topical medications, foodstuff, etc.—may also damage the screens. Some screen deterioration may result in artifacts on processed radiographs. As a general rule, intensifying screens in cassettes should be replaced at least every 5 years.

When screens are replaced for normal wear and tear, the cassette should also be considered for replacement; installing new screens in well-worn cassettes may not improve image quality. All cassettes and screens should be inspected systematically for screen-film contact, lighttight integrity (including hinges) and general condition. To inspect screens, make a uniform exposure on a film sufficient to produce a density of 1.9 to 2.5. Examine the processed film for screen-related artifacts.

X-OMAT Screen Cleaner is recommended for the care of all Carestream intensifying screens.

Directions for Use:

1. Dampen a small, clean, soft lint-free pad with the screen cleaner.
2. Wipe one screen at a time with the soft, lint-free pad. After cleaning, wipe each screen with a dry, soft, lint-free pad to remove the dislodged dirt and/or grime.
3. Leave cassettes open until the screens are thoroughly dry.

NOTE: Experience indicates that the best results are obtained by cleaning with the above product. Some other screen cleaning agents may leave residues that will seriously affect the emission of these screens. The use of any cleaning agents other than those specifically suggested for cleaning Carestream screens is not recommended.

If this recommended product is not available, a mild soap-and-water solution may be used following steps 1 through 3, as described above. DO NOT USE SOAPS OR DETERGENTS CONTAINING BRIGHTENING AGENTS.

Isopropyl alcohol may be used in step 1; do not use an excessive amount, and confine alcohol to the screen surface only. It is essential that screens cleaned with isopropyl alcohol also receive the antistatic treatment in order to avoid static on films (see section on *Antistatic Treatment* below).

All cleaning methods MUST avoid pressure and/or excessive rubbing, which may damage the screen surface.

Antistatic Treatment

Carestream screens and films are designed to minimize static marks on the processed radiograph. If static should occur, the use of X-OMAT Screen Cleaner is recommended.

Initially, clean the screens as recommended above. Apply a second uniform coating of the solution to the screens with a clean, soft, lint-free pad. DO NOT WIPE SCREENS DRY. Leave the cassettes open until the screens are completely dry.

Exposures with Fluorescent Screens

The reciprocity law is accurate for direct X-ray and lead screen exposures.

When determining exposure conditions for radiography without screens or with lead screens, relationships such as mA/time and the inverse square law for time/distance calculations are such that a known change of mA or distance will result in a precise change of time.

However, for exposures to the light emitted from fluorescent screens, the reciprocity law fails to apply. Because of this, it is not possible to give an intensification factor that applies to all exposure conditions.

Film Characteristics: Fluorescent Screens

EXPOSURE CONDITIONS: 80 kV, fluorescent screens, INDUSTREX Single Part Developer Replenisher and INDUSTREX LO Fixer and Replenisher, M43ic processor, 8 min (26 ˚C) (79 ˚F) cycle.

Film Characteristics (Sensitometric)

Screen	Base + Fog	Relative Exposure	Contrast
RENEX screens	0.23	1*	4.1
LANEX Fast Screens	0.23	0.25	4.8

*INDUSTREX HS800 Film used in combination with RENEX screens is assigned a relative exposure of 1.

Replacement of Screens

Use isopropyl alcohol to remove any residue of foam or adhesive when replacing screens in X-OMAT Cassettes. Use the materials sparingly, minimizing solvent contact with the plastic parts of the cassette. Avoid prolonged contact with the skin and use with adequate room ventilation. The use of impervious gloves is recommended. Wipe the cassette completely dry before proceeding with the installation of new screens.

Basic Instructions for LANEX Screen Installation

Requirements: One cassette, two screens, one thick foam, one thin foam

1. Place one screen on the THIN foam (centered).

   NOTES:

   - Best practice: Laminate to prevent and remove air pockets.
   - The thin foam should be perforated to prevent air pockets, which can cause density spots on the image.
   - The foam has full adhesive. You can cut away part of the release liner if needed.
2. Place the back screen on the THICK foam (centered).
3. Place the screen with THIN foam on the tube side (front). Carefully center it for good screen contact / to prevent pinching the screen.
4. Place the screen with THICK foam on the back side. Again, carefully center it for good screen contact and to prevent pinching.

Basic Instructions for LANEX Screen Replacement

Neither the screen nor the foam can be reused.

1. Remove the screen/foam by gently pulling off the cassette.
2. Carefully clean the inside of the cassette, removing any leftover adhesive, especially on the front.
3. Follow the instructions above in *Basic Instructions for LANEX Screen Installation*.

   NOTE: You can use isopropyl alcohol to clean the cassette if needed.

Basic Instructions for Select Cassette Installation

Requirements: One cassette, two screens. The foam is already mounted in the cassette when purchased.

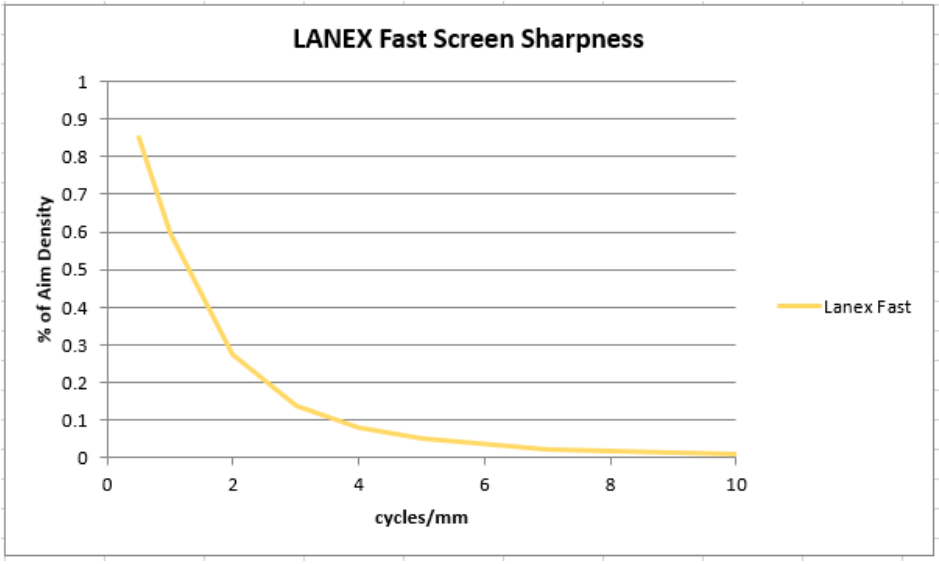
1. Apply two-sided tape along the perimeter of the screen.
2. Open the cassette.
3. Place the screen directly on the tube side (front) and center it. Make sure the foam is not on the tube side of the Select Cassette.
4. Apply two-sided tape along the perimeter of the second screen.
5. Place the second screen on the first screen (phosphor to phosphor) and align it with the first screen.
6. Gently, while holding the second screen in position, slowly lower the back side panel down until it touches. Carefully remove your hand to close.
7. Open the cassette, and check that both screens are now in place.

Modulation Transfer Function (MTF)

LANEX Sharpness:

NOTE: MTF is measured by the Screen Sharpness Tester at 90 kVp.

LANEX Fast	
Wide Roll Code	**SO-660**
Event ID	**3839**
0.5	0.8503
1	0.6004
2	0.2753
3	0.14
4	0.0809
5	0.0518
7	0.0242
10	0.0116



NOTE: While the sensitometric data in this publication are typical of production coatings, they do not represent standards that must be met by Carestream. Varying storage, exposure, and processing conditions will affect results. The company reserves the right to change and improve product characteristics at any time. The contents of this publication are subject to change without notice.

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CHSP-8996, rev 2

Publication History:

Rev 1: Dec 2020 - Initial release in TI DB.

Rev 2: Mar 2021 – Updated the coating from 7-mil to 10-mil polyester.

Rev A (PLI): Rev 2 is released into PLI. Going forward, releases will follow PLI (letter) revisioning.