Typhoon™ FLA 7000 biomolecular imager

Fig 1. Typhoon FLA 7000 biomolecular imager provides fast, sensitive imaging, and high versatility.

Typhoon FLA 7000 (Fig 1) is a fast and versatile laser scanner for biomolecular imaging applications including sensitive and quantitative measurements of radioisotopic labels by storage phosphor, chemifluorescent Western blots, and single fluorescence, as well as digitization of colorimetric stains (e.g., Coomassie™ Blue and silver-stained gels).

Typhoon FLA 7000 delivers:

- **Versatility:** the system images radioisotopic, visible fluorescent, chemifluorescent, and colorimetric samples
- **High resolution and quantitation:** 16-bit images are generated at up to 25 µm pixel resolution. A linear signal response over a span of five orders of magnitude gives precise quantitation in gels, blots, and tissue sections.
- **High speed:** a 24 x 25 cm gel can be scanned in less than two minutes at 100 µm resolution without compromising sensitivity
- **High sample throughput:** a scanning area of 24 × 40 cm enables simultaneous imaging of up to 12 gels or blots, measuring 10 × 8 cm in size. This facilitates comparisons among blots, and reduces workload and waiting time.

Typhoon FLA 7000 is a nonconfocal variable mode laser scanner offering high speed and resolution for precise quantitation of proteins, nucleic acids, and other biomolecules. Four lasers are preinstalled in the system: blue (473 nm), green (532 nm), red (635 nm), and red (650 nm). The system can image a sample measuring 24 × 40 cm in 2.5 min, offering high throughput for the multiuser lab environment.

The system provides several imaging modes, such as fluorescence, filmless autoradiography, and digitization of colorimetrically stained gels (e.g., Coomassie Blue and silver stain). Since the system is fast and includes predefined methods, Typhoon FLA 7000 is well-designed for meeting the various imaging demands of different applications.

Applications include phosphorimaging of radioisotopes, and fluorescence detection, such as 1-D and 2-D gels post-stained with Deep Purple™, SYPRO™ Ruby or SYPRO Red, chemifluorescent Western blot imaging with Amersham™ ECL™ Plus, and DNA imaging by SYBR™ Green or Cy™5.

Fig 2. Filters are easily exchanged by the user.

Table 1. Typhoon FLA 7000 specifications

Imaging modes:	Fluorescence, phosphorimaging, and digitization
Excitation wavelengths:	473 nm (blue LD laser), 532 nm (green SHG laser), 635 nm (red LD laser), and 650 nm (red LD laser)
Radioisotopes:	^{3}H, ^{14}C, ^{32}P, ^{33}P, ^{35}S
Dynamic range:	5 orders of magnitude
Bit depth:	16-bit
Max scanning area:	Phosphorimaging: 20 × 40 cm Fluorescence: 24 × 40 cm
Pixel sizes:	25, 50, 100, and 200 µm
Standard filters:	IP (phosphorimaging), Y520, O580, R670
Dimensions (W × H × D):	940 × 556 × 360 mm
Weight:	62 kg
Line frequency:	50 to 60 Hz
Temperature:	15°C to 30°C
Humidity:	30% to 70% (no condensation)
Supply voltage:	100 - 240 VAC ± 10%
Power consumption:	Approx. 0.3 kVA

Table 2. Emission filters

Filter type	Wavelength range (nm)	Fluorophore examples
IP	BP390	Phosphorimaging
Y520	≥ 520	Cy2, Amersham ECL Plus, SYBR Green, SYBR Gold, FAM™, FITC, SYPRO Orange, Alexa Fluor™ 488, EGFP, AttoPhos
O580	≥ 580	Cy3, Deep Purple, HEX, Alexa Fluor 532 and 546, SYPRO Ruby, SYPRO Red, EtBr, Pro-Q Diamond, ROX
R670	≥ 670	Cy5, Alexa Fluor 633, TOTO™-3, DDAO Phosphate

Technical features

Fast, simple, and high quality imaging

Scanning is rapid and detection is sensitive for laser-induced fluorescence, radioisotopic imaging by storage phosphor, and digitization of colorimetrically stained gels or blots.
The system provides a linear signal response over five orders of magnitude with 16-bit resolution. This enables precise quantitation of proteins, DNA, and other labeled biomolecules.

The system is equipped with blue 473 nm, green 532 nm, red 635 nm, and red 650 nm lasers.

Emission filters are easily accessed and exchanged without tools for attaining optimal imaging conditions (Fig 2 and Table 2). Long pass filters (Y520, O580, and R670) separate laser light from fluorescence and the band pass IP filter transmits the emission from the phosphorimaging plate. The system accommodates up to four computer-controlled filter positions at any time. Filters can be easily installed by the user.

Two stages (Fig 3) give the correct positioning and stability for optimal imaging. Samples that can be scanned include agarose and polyacrylamide gels, membranes, and radioisotope-labeled samples using a phosphorimaging plate. The optional Multi Stage enables imaging of polyacrylamide gels with glass plates. For imaging purposes, the accompanying titer plate (TP) plug-in holds up to three titer plates. All stages are easily removed from the system for cleaning.

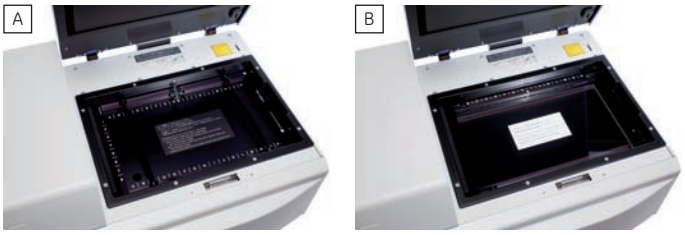

Fig 3. (A) The Phosphor Stage and **(B)** Fluor Stage are designed for convenient placement of phosphorimaging plates, gels and membranes during scanning, and for easy cleaning. The membrane weight prevents curling of membranes on the stage.

Optimal chemifluorescent Western imaging

Laser scanning systems are not optimal for imaging chemiluminescence. Typhoon FLA 7000 does, however, perform well with Amersham ECL Plus by imaging its stable chemifluorescent signal, which is emitted upon excitation by the 473 nm laser. This provides a means to obtain optimal imaging performance from a chemifluorescent reagent.

Imaging

For the detection of radioactivity, fluorescence and chemifluorescence, emitted light is collected and transformed to an electrical signal by a photomultiplier tube (PMT). The electrical signal is then converted into digital information by A/D conversion for image display and analysis.

Detection of radioactivity

Samples containing radioactive probes are exposed to a storage phosphor screen. Light is emitted from the screen in proportion to the amount of radioactivity in the sample upon laser-induced stimulation.

Fluorescence

Upon excitation, light is emitted from a fluorescently labeled sample in proportion to the amount of labeled compound in the sample.

Chemifluorescence

Upon excitation, light is emitted from a fluorescent product generated in an enzyme-catalyzed reaction, in proportion to the amount of labeled compound in the sample.

Digitization

Excitation light passes through the sample and excites a fluorescent plate. The emitted light from the plate passes through the sample again and is collected and converted to an electrical signal. The method is suitable for documentation of colorometrically stained gels.

Data storage

Data are stored either in linear 16-bit grayscale TIFF (.TIF file format) or in square root encoded 16-bit TIFF (.GEL file format). The .GEL format encoding provides higher dynamic resolution than .TIF at lower signal levels to exploit the low signal detection capability of the phosphorimaging technology.

Image analysis

Designed for seamless data transfer and quantitative gel and blot analysis, we provide image analysis software for use with Typhoon FLA 7000 (Table 3).

Table 3. Image analysis software

Software	Analysis
ImageQuant™ TL	1-D gel electrophoresis, dot blots, arrays, user-defined gel analysis
ImageMaster™ 2D Platinum	2-D gels, including single stain and 2-D DIGE

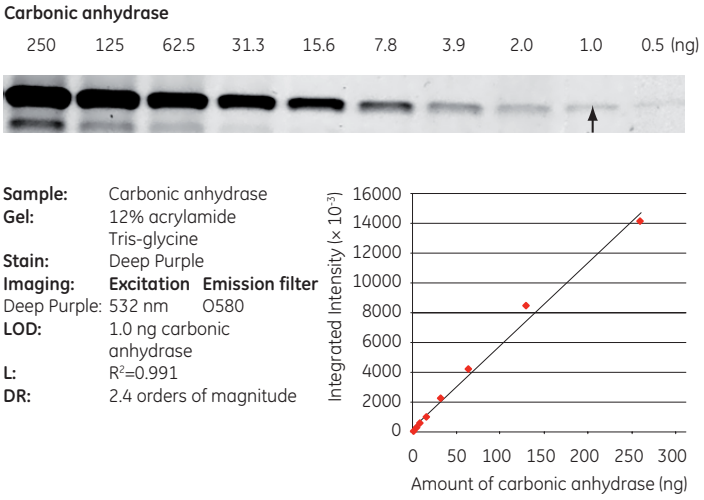

Fig 4. Different concentrations of carbonic anhydrase were subjected to 1-D electrophoresis and post-stained with Deep Purple Total Protein Stain. The gel was imaged with Typhoon FLA 7000. The limit of detection (LOD) was 1.0 ng carbonic anhydrase and the linear dynamic range (DR) was 2.4 orders of magnitude. Arrow indicates the LOD.

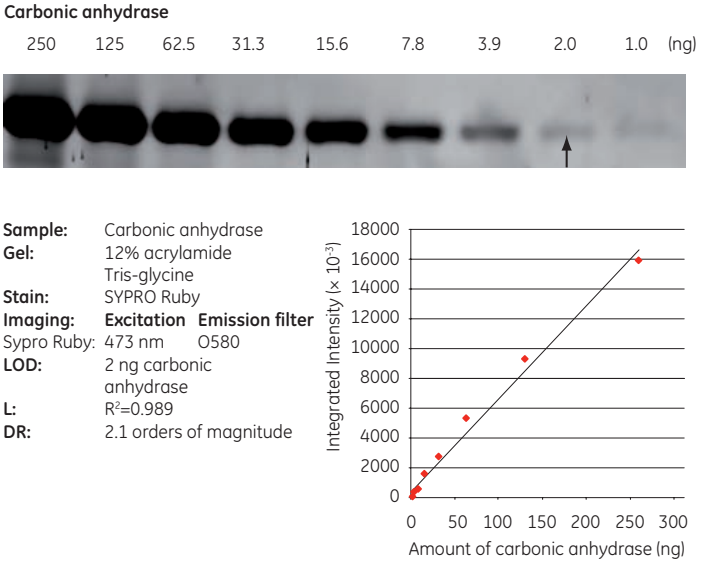

Fig 5. Different concentrations of carbonic anhydrase were subjected to 1-D electrophoresis and post-stained with SYPRO Ruby. The gel was imaged with Typhoon FLA 7000. The LOD was 2 ng carbonic anhydrase and the linear DR was 2.1 orders of magnitude. Arrow indicates the LOD.

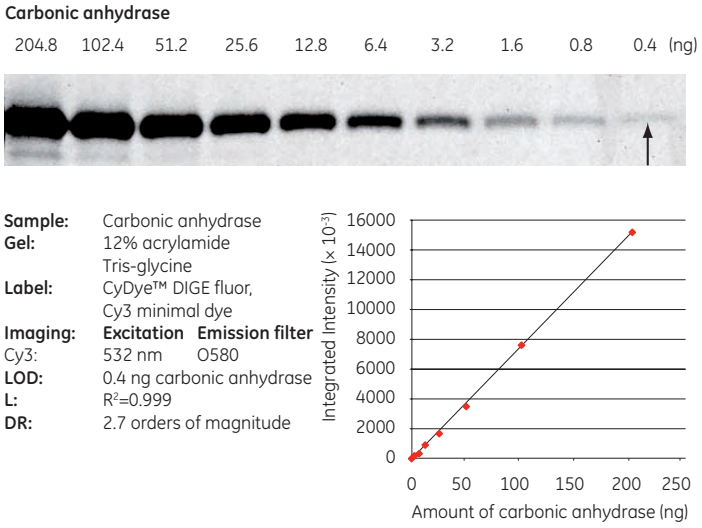

Fig 6. Different concentrations of carbonic anhydrase were labeled with CyDye DIGE fluor, Cy3 minimal dye and subjected to 1-D electrophoresis. The gel was imaged with Typhoon FLA 7000. The LOD was 0.4 ng carbonic anhydrase and the linear DR was 2.7 orders of magnitude. Arrow indicates the LOD.

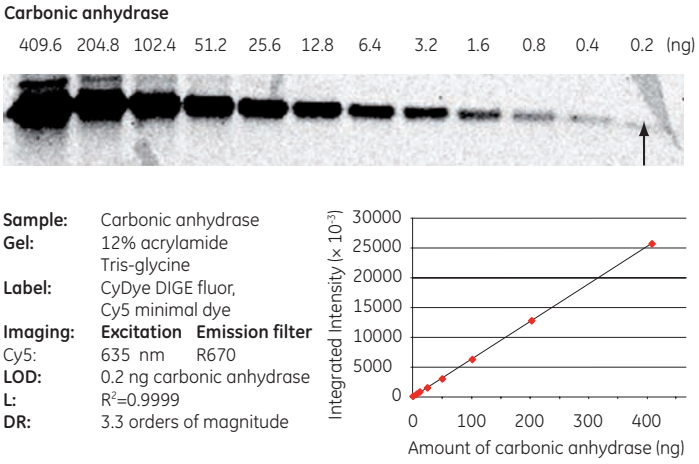

Fig 8. Different concentrations of carbonic anhydrase were labeled with CyDye DIGE fluor, Cy5 minimal dye and subjected to 1-D electrophoresis. The gel was imaged with Typhoon FLA 7000. The LOD was 0.2 ng carbonic anhydrase and the linear DR was 3.3 orders of magnitude. Arrow indicates the LOD.

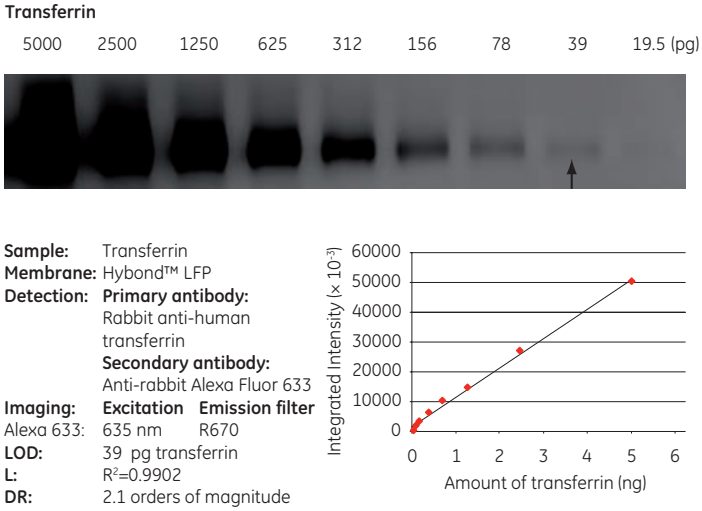

Fig 7. A two-fold dilution series of transferrin starting at 5 ng was subjected to Western blotting and detected with a rabbit anti-transferrin primary antibody and anti-rabbit Alexa Fluor 633 secondary antibody. The LOD was 39 pg transferrin and the linear DR was 2.1 orders of magnitude. Arrow indicates the LOD.

Imager performance

	Typhoon 9400/9410	Typhoon FLA 9000	Typhoon Trio/Trio+	Typhoon FLA 7000
Storage Phosphor				
^{32}P, ^{125}I, ^{14}C, ^{35}S, ^{33}P, ^{3}H	++++	++++	++++	++++
Macroarray (radiolabeled)	++++	++++	++++	—
Fluorescence—Proteins				
CyDye DIGE Fluors				
Cy2	++++	+++	++++	—*
Cy3	++++	++++	++++	—*
Cy5	++++	++++	++++	—*
ECL Plex™ Fluors				
Cy2	++++	+++	++++	—*
Cy3	++++	++++	++++	—*
Cy5	++++	++++	++++	—*
Protein Stains				
Deep Purple Total Protein Stain	++++	++++	++++	++++
SYPRO Ruby	++++	++++	++++	+++
NanoOrange™ (solutions)	+++		+++	
Pro-Q Diamond (phosphorylated proteins)	++++	+++	++++	++
Pro-Q Sapphire 532 (Histidine-tagged proteins)	++++	+++	++++	++
ELISA				
AttoPhos		++++		+++
Fluorescence—Nucleic acids				
Cy3 and Cy5	++++	++++	++++	+++
Alexa Fluor 532 and Alexa Fluor 633	++++	++++	++++	+++
Nucleic acid stains				
Ethidium Bromide (post stain)	++++	+++	++++	+++
Vistra Green, SYBR Gold, SYBR Green I and II	++++	++++	+++	+++
PicoGreen, RiboGreen	+++		+++	
Chemifluoresence (enzyme-catalyzed)				
Amersham ECL Plus Western blotting	++++	+++	+++	++
ECF, AlkPhos direct ECF	++++	++	++++	++
DDAO Phosphate	++++	++++	++++	+++
Other applications				
Cy2	++++	+++	++++	++
Cy3	++++	++++	++++	+++
Cy5	++++	++++	++++	+++
Fluorescein, FAM, FITC, Alexa Fluor 488	++++	++++	++++	+++
TET, HEX, ROX, TAMRA	++++	+++	++++	++
Green fluorescent protein	+++	+++	+++	++
Chemiluminescence	+	+	+	—
Amersham ECL Amersham ECL Plus Amersham ECL Advance™				

++++ Superior performance +++ High performance ++ Good performance + Acceptable performance — Not compatible

Ratings are based on overall system performance including model-specific features, versatility, and sensitivity (limit of detection). Blank fields indicate that data are not available.
* Multiplex experiments (e.g., 2-D DIGE and Amersham ECL Plex) cannot be performed on Typhoon FLA 7000. CyDye DIGE Fluors and Amersham ECL Plex conjugates can be imaged in single probe experiments on Typhoon FLA 7000 (i.e., experiments where there is only one dye or conjugate on the gel or membrane).

Ordering information

System	Quantity	Code no.
Typhoon FLA 7000*	1	28-9558-09

*Includes 473 nm, 532 nm, 635 nm and 650 nm lasers, bialkali PMT, filter holder, IP filter, Y520 filter, O580 filter, R670 filter, Fluor Stage, Membrane Weight, Phosphor Stage, Fluorescent plate for digitization, capture software, USB cable, mains cables (EU and USA), User manual, Getting Started Guide, and Control Software User Manual.

Accessories	Quantity	Code no.
Multi Stage Set *Multi stage and Multi stage TP plug-in*	1	28-9589-09
Fluor Stage Set *Fluor stage and Membrane Weight*	1	28-9589-08
BAS-IP MS 2040 E *Phosphorimaging plate, 20 × 40 cm, multipurpose*	1	28-9564-74
BAS-IP MS 2025 E *Phosphorimaging plate, 20 × 25 cm, multipurpose*	1	28-9564-75
BAS-IP SR 2040 E *Phosphorimaging plate, 20 × 40 cm, high resolution*	1	28-9564-77
BAS-IP SR 2025 E *Phosphorimaging plate, 20 × 25 cm, high resolution*	1	28-9564-78

Accessories	Quantity	Code no.
BAS-IP TR 2040 E *Phosphorimaging plate, 20 × 40 cm, for Tritium detection*	1	28-9564-81
BAS-IP TR 2025 E *Phosphorimaging plate, 20 × 25 cm, for Tritium detection*	1	28-9564-82
FLA Image Eraser	1	28-9564-73

Related literature	Code no.
Typhoon FLA 9000 biomolecular imager, Data file	28-9610-72

Minimum computer requirement

OS: Windows™ XP™ SP3 (32-bit) or Windows Vista™ Business SP1 (32-bit), RAM: more than 1 GB, Processor: Intel™ Core 2 Duo processors, Hard disk: more than 80 GB, USB Ports: USB 2.0, Optical drive: DVD-ROM or Super Multi Drive, Monitor: 1280 × 1024 pixel resolution or higher

Please contact your local sales representative for the latest recommended computer configuration.

For contact information for your local office, please visit
www.gelifesciences.com/contact

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imagination at work

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