

SOFT TISSUE ENGINEERING



HARDWARE
PRODUCTS





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TISSUEFAXS AUTOMATED SYSTEMS OVERVIEW

TissueFAXS systems, Tissue Cytometry and Multiplexing

TissueGnostics vision to replace the visual evaluation of histological sections with easy, reliable, observer-independent and automated quantification, led to the development of its very own Tissue Cytometry technology.

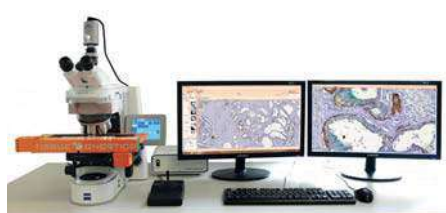
Shortly thereafter, it became evident that to leverage the advantages of this new technology, a matching scanning system was necessary. In 2005, TissueGnostics began producing fully integrated TissueFAXS systems, based on off-the-shelf cost



TISSUEFAXS HISTO



P. 7 - 8



- Brightfield scanning & analysis system for 8 slides
- Generic, TMA & CISH scanning & analysis
- StrataQuest Histo & HistoQuest analysis software
- Automatic Tissue Detection
- Extended Focus, Stitching & Illumination Correction



TISSUEFAXS FLUO



P. 7 - 8



- Fluorescence scanning & analysis system for 8 slides
- Generic, TMA & FISH scanning & analysis
- StrataQuest Fluo & TissueQuest analysis software
- Automatic Tissue Detection
- Extended Focus, Stitching & Illumination Correction



TISSUEFAXS FLUO



P. 7 - 8



- Fluorescence/brightfield scanning & analysis system for 8 slides
- Generics, TMA & FISH/CISH scanning & analysis
- StrataQuest PLUS, TissueQuest and HistoQuest analysis software
- Automatic Tissue Detection
- Extended Focus, Stitching & Illumination Correction



TISSUEFAXS SL



P. 5 - 6



- Slide Autoloader
- 40, 80 or 120 slides, scalable
- Available in histo, fluo and PLUS configurations with respective capabilities
- Four scanning modes



= Upgradable



= Scan Only option



= Details

effective microscopes, motorized light sources and illumination systems. This open architecture has made it possible to meet the versatile requirements of research and routine workflows for methods such as immunohistochemistry, immunofluorescence, cell culture monolayers and live-cell imaging, using well plates, petri-dishes and even oversized slides.

Today TissueFAXS provides confocal and multi-spectral Tissue Cytometry, with dozens of automated Analysis-APPs for research and diagnostics – we will always continue to push the technological boundaries.



TISSUEFAXS I FLUO/HISTO



P. 9 - 10



Capabilities as **TISSUEFAXS FLUO/HISTO**, with these additions:

- 8 slides or 1 Micro Well Plate or 1 Petri Dish
- Time Lapse scanning, Live Imaging capable



TISSUEFAXS I PLUS



P. 9 - 10



Capabilities as **TISSUEFAXS FLUO**, with these additions:

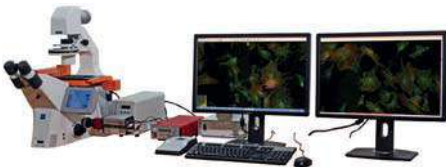
- 8 slides or 1 Micro Well Plate or 1 Petri Dish
- Time Lapse scanning, Live Imaging capable



TISSUEFAXS SPECTRA



P. 8 - 17



Capabilities as any **TISSUEFAXS** with additionally:

- Multispectral Brightfield Imaging
- Multispectral Immunofluorescence Imaging



TISSUEFAXS CONFOCAL



P. 3 - 4



- Fast, cost-effective Spinning Disc Confocality
- Available in SL (Slide Loader), **FLUO** and **PLUS** upright and inverted configurations

TISSUEFAXS CONFOCAL SYSTEMS

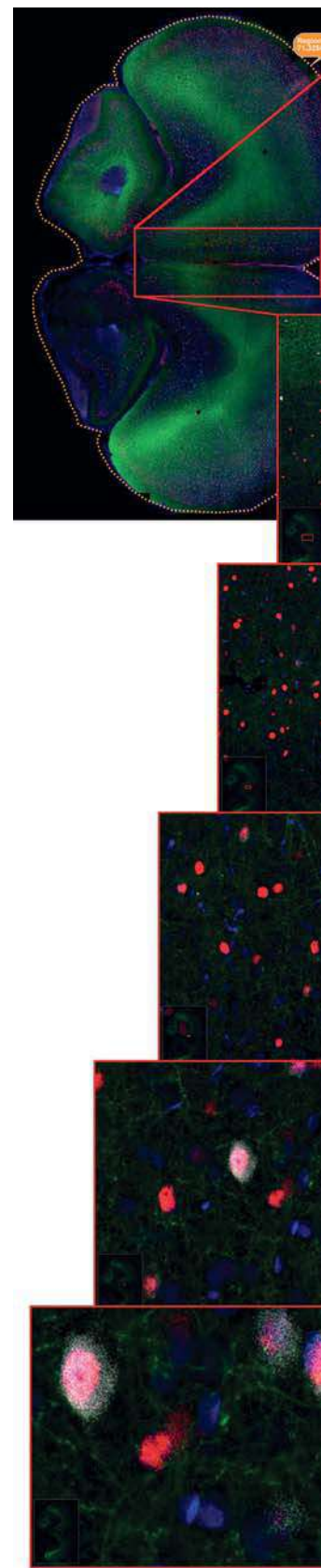
S

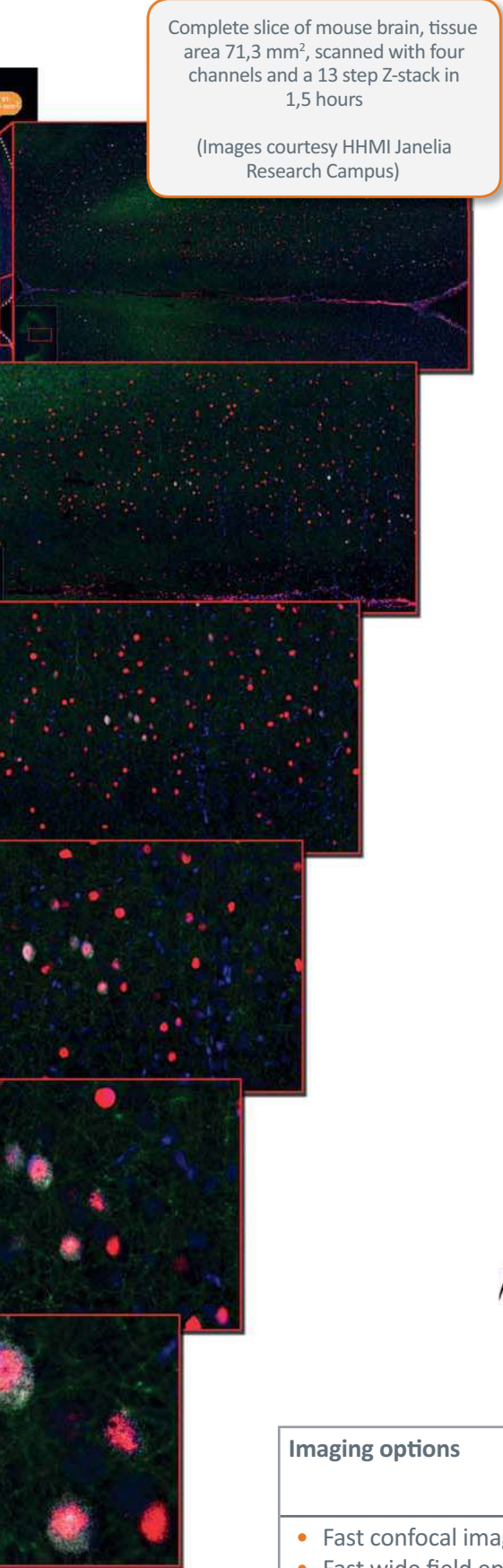
Cost Effective Confocality



All **TissueFAXS Fluo and PLUS systems**, upright or inverted, can be equipped with a Spinning Disc Confocal package to turn them into TissueFAXS Confocals. They provide the benefits of stage and autoloader based automated microscopy and laser free fast confocal imaging, and make optical sectioning available for Tissue Cytometry analysis.

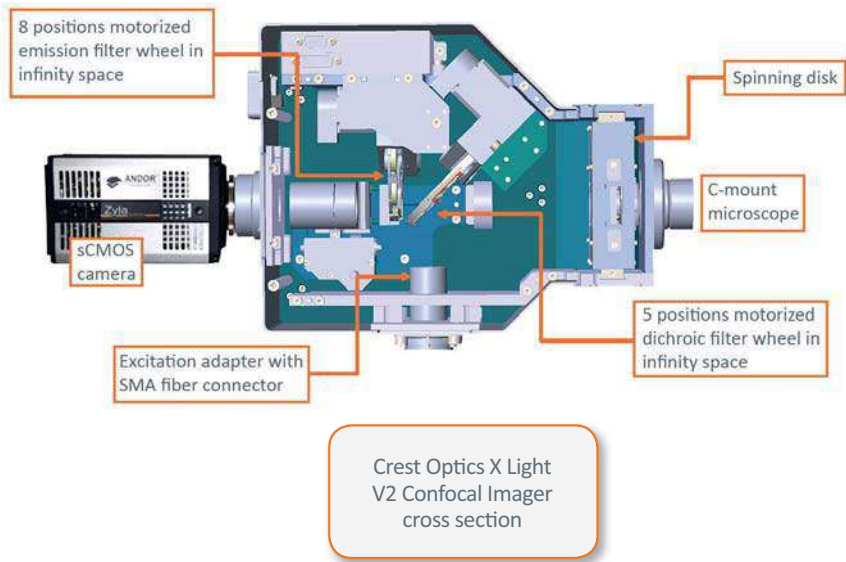
TissueFAXS SL Confocal system
(actual appearance of the product may differ)





Complete slice of mouse brain, tissue area 71,3 mm², scanned with four channels and a 13 step Z-stack in 1,5 hours

(Images courtesy HHMI Janelia Research Campus)



TissueFAXS SL Confocal is the most capable and versatile TissueFAXS system.

It combines the cost-effective Crest Optics X Light V2 Spinning Disc Confocal Kit, with TissueFAXS SL autoloader capabilities and with TG image analysis software.

It is the ideal tool for Neurology researchers needing to process large amounts of samples with confocality on a limited time budget.



TissueFAXS i Confocal system (actual appearance of the product may differ)

Imaging options	Available in all TissueFAXS system configurations	Confocal upgrade kit for existing TissueFAXS systems
<ul style="list-style-type: none"> Fast confocal imaging Fast wide field epifluorescence imaging Very fast wide field multi-spectral or classic bright-field imaging 	<ul style="list-style-type: none"> TissueFAXS (upright) TissueFAXS i (inverted) TissueFAXS SL slide loader, upright 	<ul style="list-style-type: none"> Crest Optics X Light V2 Confocal Imager Upgrade 4.X MP camera Filters, evtl. light engine TissueFAXS Confocal scanning software

TISSUEFAXS SL



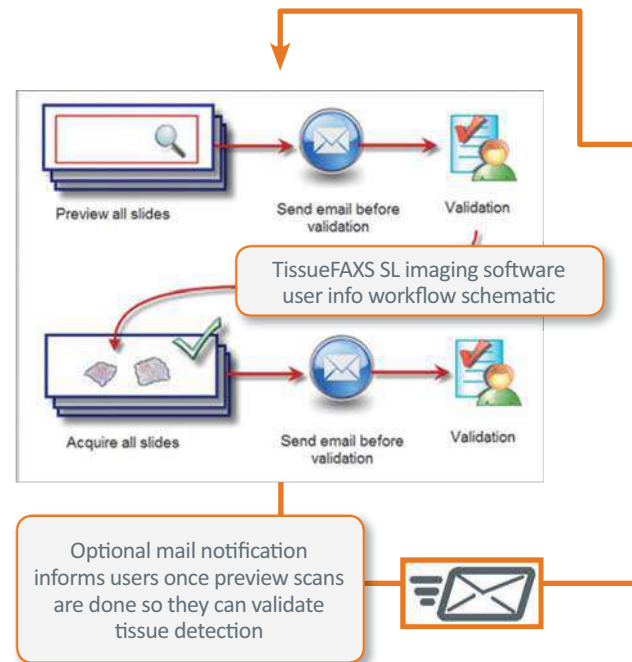
TissueFAXS SL – not your typical sportster...



While in this case “SL” is short for “Slide Loader”, TG likes to think that the evocation of the famous German gull wing door sports coupés, reflects on the ease of use, speed and quality of this system.

It is an autoloader system for the automatic scanning of up to 120 brightfield and/or fluorescence slides and TMA. TissueFAXS SL scanning software combines TG’s integrated high-speed cameras with two workflows reflecting the systems use for more archiving oriented or scientific sample scanning users. It optimally represents the two most used workflows for a system of this type.

The integrated slide label reading system digitizes barcodes and alphanumerical printed slide labels and also stores and displays high resolution label images, always providing traceability. TissueFAXS SL is capable of automatic oil immersion scanning using TG’s simple yet highly capable oiler.



TissueFAXS SL PLUS upgraded
(actual appearance of the product may differ)



Gentlemen, start your profiles.

In the scientifically oriented TF SL workflow, each group of slides (e.g brightfield, brightfield TMA, fluorescence TMA, fluorescence) in a scanning job gets its own automation profile. In this way, the most can be made of the system’s versatility while optimizing scanning speed.

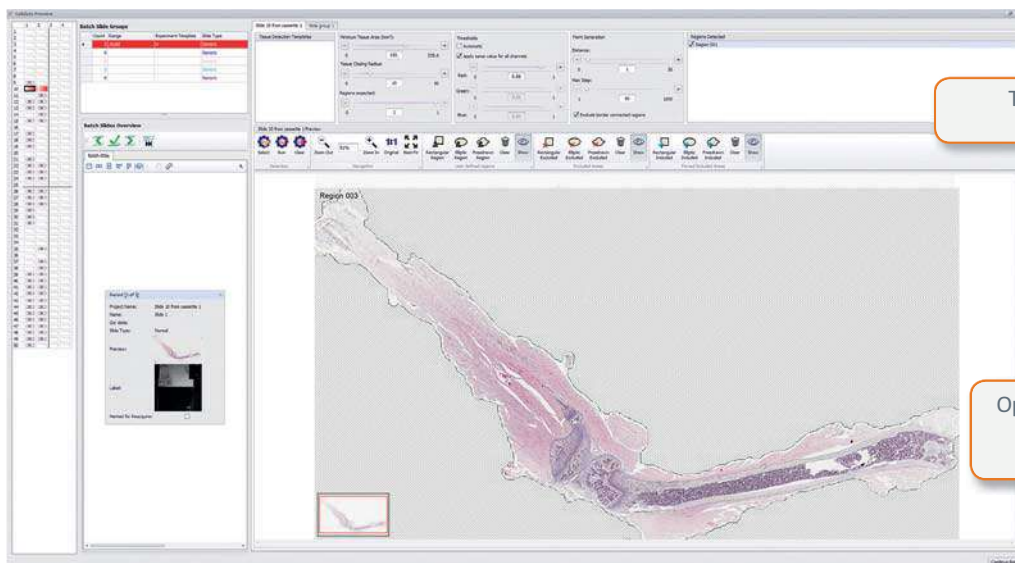
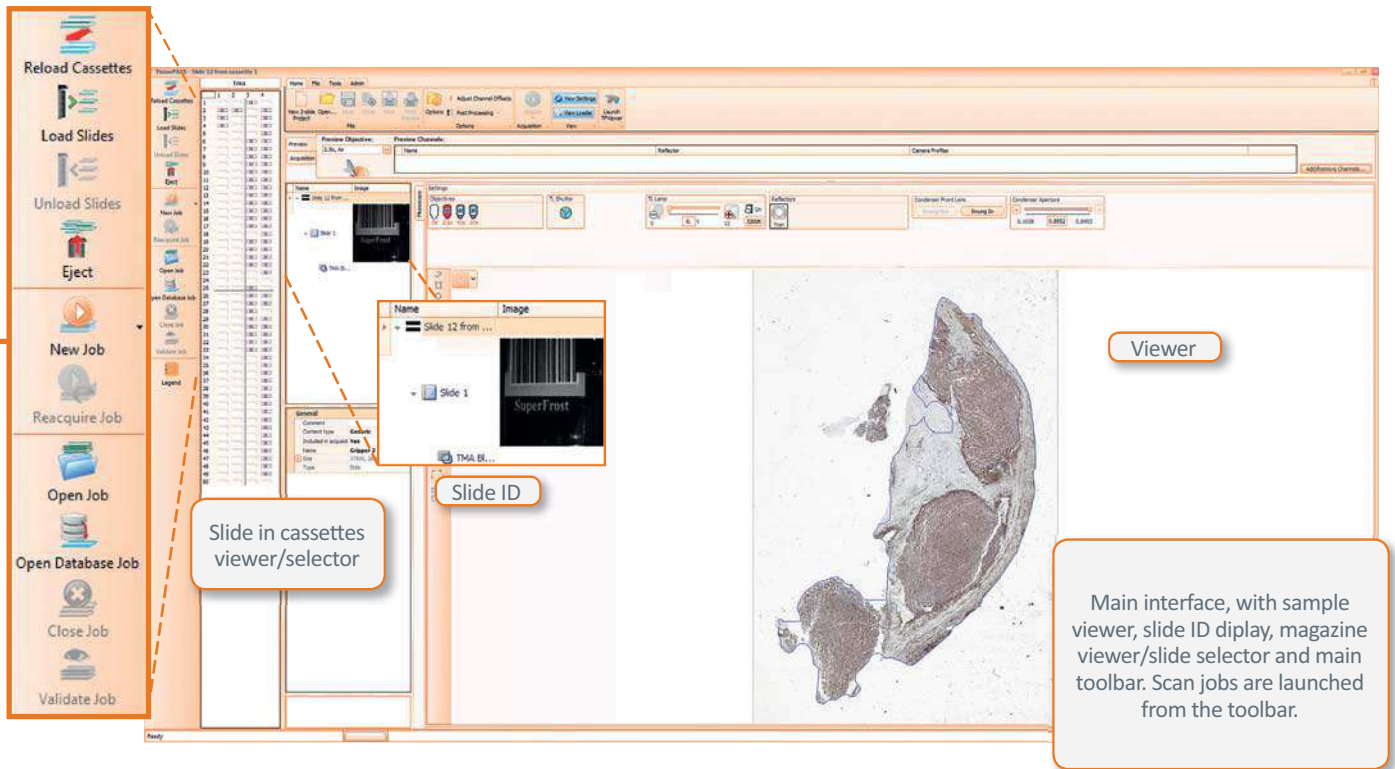


Always in Focus

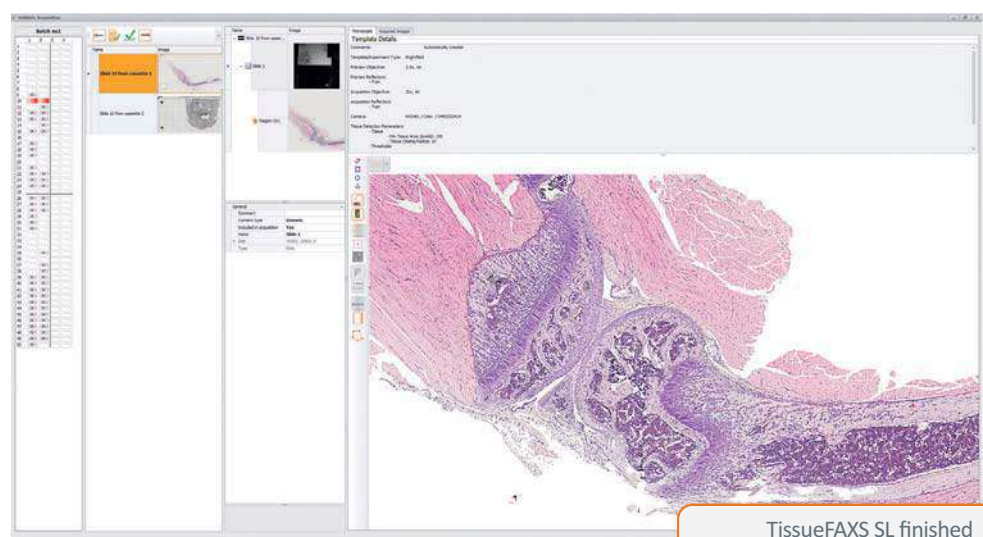
The TissueFAXS focus map technology provides optimally focused scans at high speed. However, artefacts on the slide can lead to false focus point values for the map. To safeguard against this, a validation algorithm evaluates each scanned field of view for sharpness on the fly. Clusters of out of focus fields of view are detected in this way and are automatically rescanned using newly defined map focus points for each cluster.

The user can control the final result visually in the last validation window.





Optional mail notification informs users once scans are done so they can validate scan results



TISSUEFAXS UPRIGHT SYSTEMS



TissueFAXS systems – the TG workhorses



TissueFAXS upright systems are hard at work in many research groups and core facilities, with worn stages and other parts regularly going to be refurbished. They often are the most booked instruments. In this respect, it is fair to call them “TG workhorses”.

They are upright microscope-based systems for the automatic scanning of up to eight brightfield or/and fluorescence slides, TMA and slide – based cell culture containers.

Their stage carrying capacity is technically limited to an eight slide stage. They can take 7 objectives in their motorized turret as well as 10 reflectors in their filter turret.

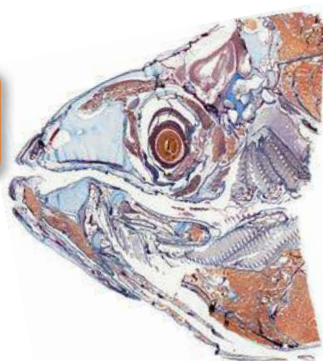
Stage inserts for oversized slides, up to very large dimensions, are optionally available.



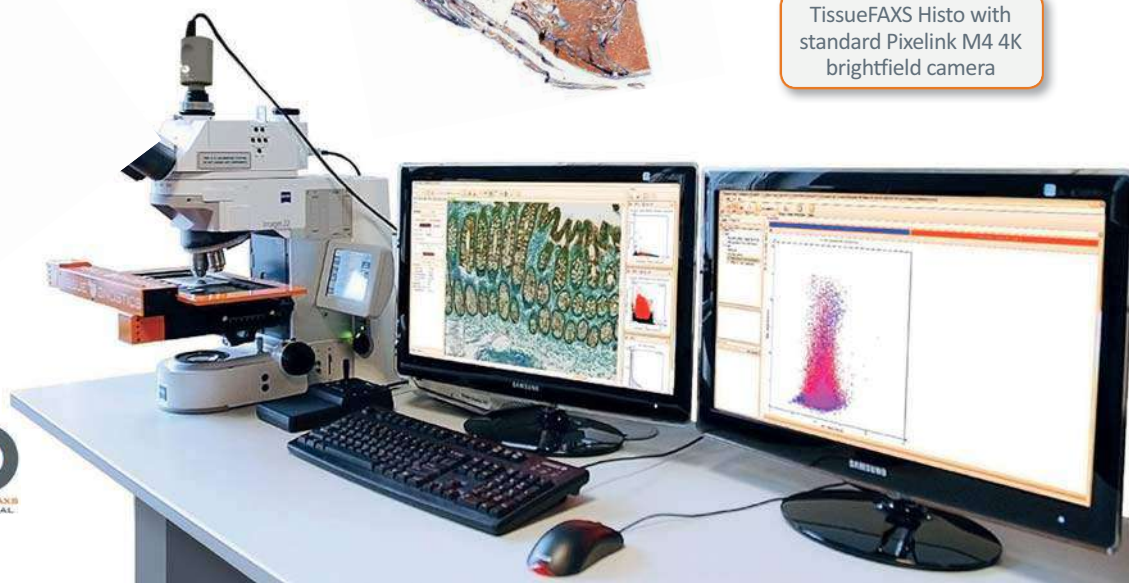
TissueFAXS PLUS
with standard cameras



TissueFAXS oversized slide
scanning: Whale brain and
fish head, 10x



TissueFAXS Histo with
standard Pixelink M4 4K
brightfield camera





TissueFAXS high precision eight slide stage on TissueFAXS Fluor

TissueFAXS systems are available in two basic configurations: “Histo” (brightfield only) and “Fluo” (fluorescence only) and can be upgraded to any configuration in the TissueFAXS line.

They are equipped with the StrataQuest PLUS or FLUO or HISTO analysis software as well as with TissueQuest and/or HistoQuest analysis software packages (see p. 20 and/or TG Analysis Software folder). The supplementary TissueQuest and HistoQuest licences enable the users to perform analysis not requiring StrataQuest capabilities with these SW packages in parallel.

The systems are also available in “S” configuration, scanning only without analysis software.

TissueFAXS SPECTRA systems provide multispectral imaging via a adjustable liquid crystal filter.

TissueFAXS SPECTRA functionalities are available on all TissueFAXS configurations (shown here on a TissueFAXS i PLUS inverted system) and can be added to existing systems as an upgrade.

The filter is controlled by the TissueFAXS software (see page 17) and used to scan a Lambda Stack for each brightfield or fluorescence field of view.



Tunable liquid crystal filter & Andor camera



TISSUEFAXS INVERTED SYSTEMS



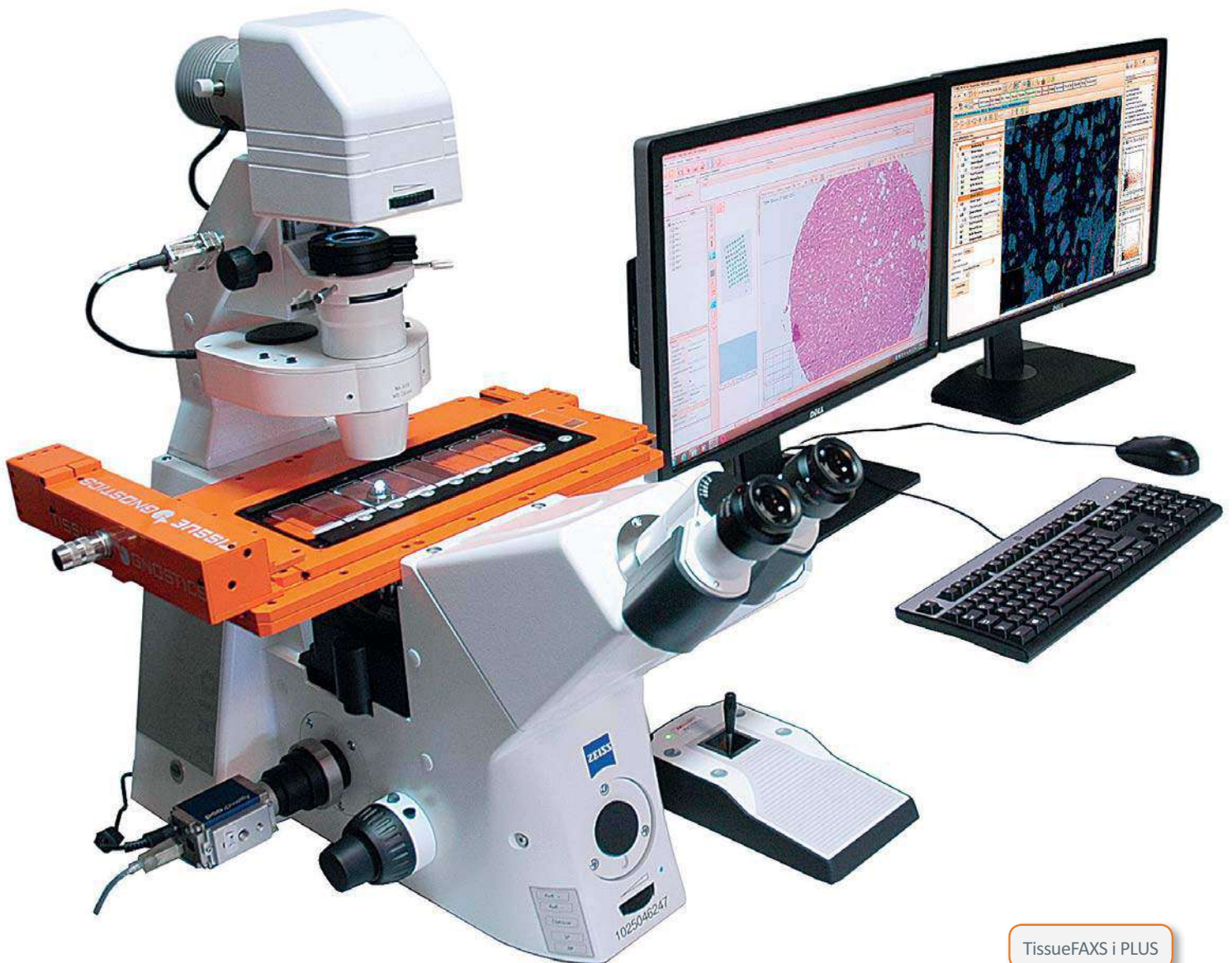
“i” is for “inverted”, of course...



TissueFAXS i systems are globally appreciated for their versatility. They provide scan and analysis of slides, microtiter plates, Petri dishes and other cell culture recipients. TissueFAXS i systems are mainly used for low to medium throughput automated scanning on the research group level, in core facilities and in CROs.

TissueFAXS i systems are automated and based on inverted microscopes. The standard stage is for eight slides or one microtiter plate insert in the standard configuration (Petri dish and other inserts are available).

They take six objectives in their motorized turret as well as six reflectors in their filter turret.



TissueFAXS i PLUS

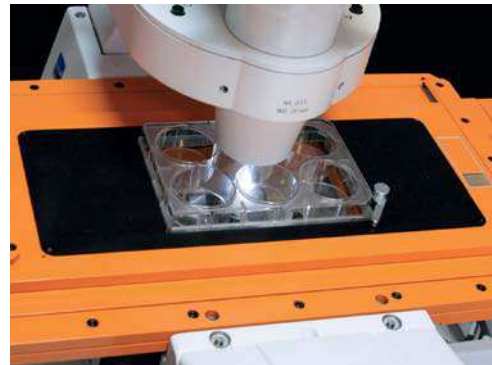


TissueFAXS i is also available in “S” configuration, scanning only without analysis software.

They come in two basic configurations: “Histo” (brightfield only) and “Fluo” (fluorescence only) and can be upgraded to any configuration in the TissueFAXS line.

They are equipped with the StrataQuest PLUS or Fluo or Histo analysis software as well as with TissueQuest and/or HistoQuest analysis software packages (see p. 20 and/or TG Analysis Software folder). The supplementary TissueQuest and HistoQuest licences enable the users to perform analysis not requiring StrataQuest capabilities with these SW packages in parallel.

Live imaging is fully supported with either on-stage incubators or full enclosures both with full environmental control.



TissueFAXS i stage with 8 slides or one microtiter plate



TissueFAXS i PLUS live imaging with stagetop incubator

TG OBJECTIVES, CAMERAS & ILLUMINATION

Fiat lux – let there be light!



TissueGnostics is continuously surveying the market for cutting edge technology and the most cost effective objectives, cameras and illumination systems for its scanning systems.

The aim, on the one hand, is to provide components with an acceptable price tag and excellent performance as standard for TissueFAXS systems.

On the other hand, we also integrate top-notch equipment for those users that need it.



Objectives with any magnification and of any class fitting to the system configuration (e.g. not all objectives will work with a motorized stage) can be used.

Standard cameras are chosen for their cost effectiveness.



Pixelink M4
color camera
CMOS global
shutter
2048x2048 pixel
resolution
USB 3.0



pco.pixelfly USB
monochrome camera
14 bit dynamic range
1392x1040 pixel resolution
Quantum efficiency up to 62%
Temperature compensated
USB 2.0

TissueFAXS PLUS with
standard Pixelink M4
and pco.pixelfly USB
cameras

TG integrated high performance monochrome cameras are used for their fluorescence scanning speed and image quality characteristics. They are part of the TG Speed & Speed XL upgrade packages.



Hamamatsu ORCA-Flash 4.0 V2
monochrome camera
16 bit dynamic range
2048 x 2048 pixel resolution
Quantum efficiency 82% peak
30 fps @ full frame (USB 3.0)
100 fps @ full frame
(Camera Link)

Andor Zyla 5.5
monochrome camera
12 & 16 bit dynamic range
2560 x 2160 pixel resolution
Quantum efficiency 60%
40 fps @ full frame (USB 3.0)
100 fps @ full frame
(Camera Link 10-tap)

Light sources have been selected for their intensity, speed and durability of their illuminants. The Lumencor Spectra line is part of the TG Speed XL upgrade as it provides the intensity and switching speed for the use of multiband filters and for confocality.



Lumencor Spectra 3 light engine
with eight solid state light sources

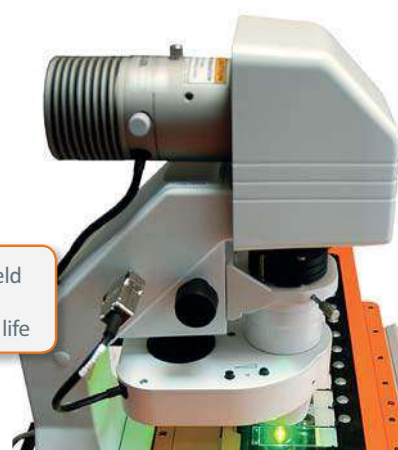


Exfo X-Cite 120 PCQ standard
fluorescence metal halide light
source
optical light guide
2.000 hours of illuminant life

Lumencor Spectra X light engine & solid state light source
emission wavelengths



VIS-LED standard brightfield
light source
60.000 hours of illuminant life



TISSUEFAXS SPEED PACKAGES



Faster fluorescence scanning!



Users that scan larger amounts of fluorescence material may need a faster solution than TG's cost effective standard fluorescence setup.

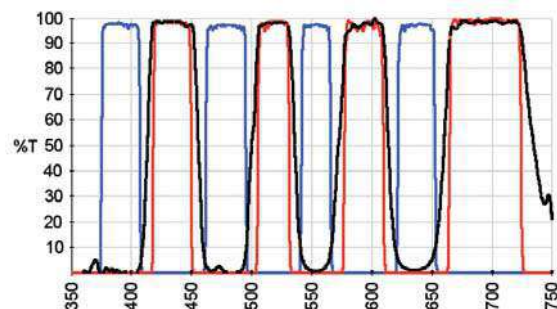
We provide two upgrade packages for this, TissueFAXS SPEED and TissueFAXS SPEED XL.

Of course, either configuration can also be used to modify a TissueFAXS system for more fluorescence speed when it is ordered.



TissueFAXS SPEED Upgrade Package

The TissueFAXS SPEED Upgrade Package substitutes the standard pco usb monochrome camera with either of the integrated 1" sensor camera models and uses them with the standard Exfo X-Cite 120 PCQ metal halide light source and the standard filter cubes. The speed increase is mainly provided by the larger camera sensor and higher sensitivity.



TissueFAXS SPEED XL Upgrade Package

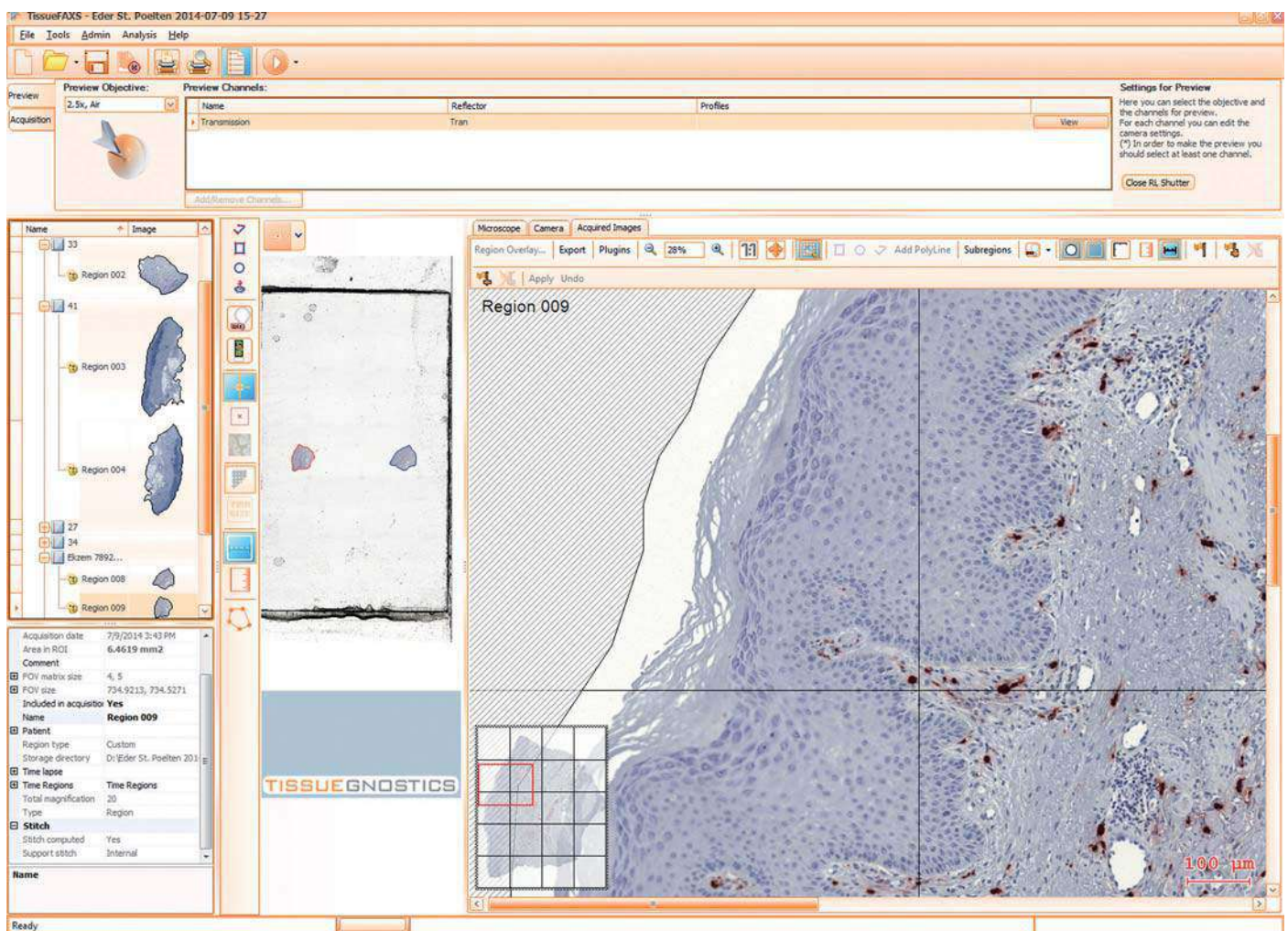
The TissueFAXS SPEED XL Upgrade Package adds a Lumencor Spectra line light engine to the 1" sensor camera. As the light engine has emission filters, it in turn allows the use of one or several quadband filters. The quadband filter allows the scanning of several channels without rotation of the filter wheel, with camera exposure time and the extremely fast switching time of the light engine the defining factors for the speed.

The Ghost in the Machine – Scanning & data management software



TissueFAXS is TissueGnostics easy-to-use, yet powerful scanning and image management software, running the TissueFAXS systems and all of their components: i.e. cameras, illumination systems, the motorized microscope and the stages.

TissueFAXS software is often appreciated for its simplicity in comparison to classical microscope imaging software.



The uncluttered and intuitive interface gives new users quick access to slide scanning and allows them to rapidly progress to more advanced capabilities of the software as needed.

Besides the cost-efficient hardware components, this is the other reason why TissueFAXS systems are among the most used “workhorses” in many imaging core facilities.

From “Two Steps” to “Full Auto”



On the basic level, TissueFAXS scans are based on a preview scan, done rapidly at low magnification and mainly serving for Automatic Tissue Detection or manual region drawing on slides.

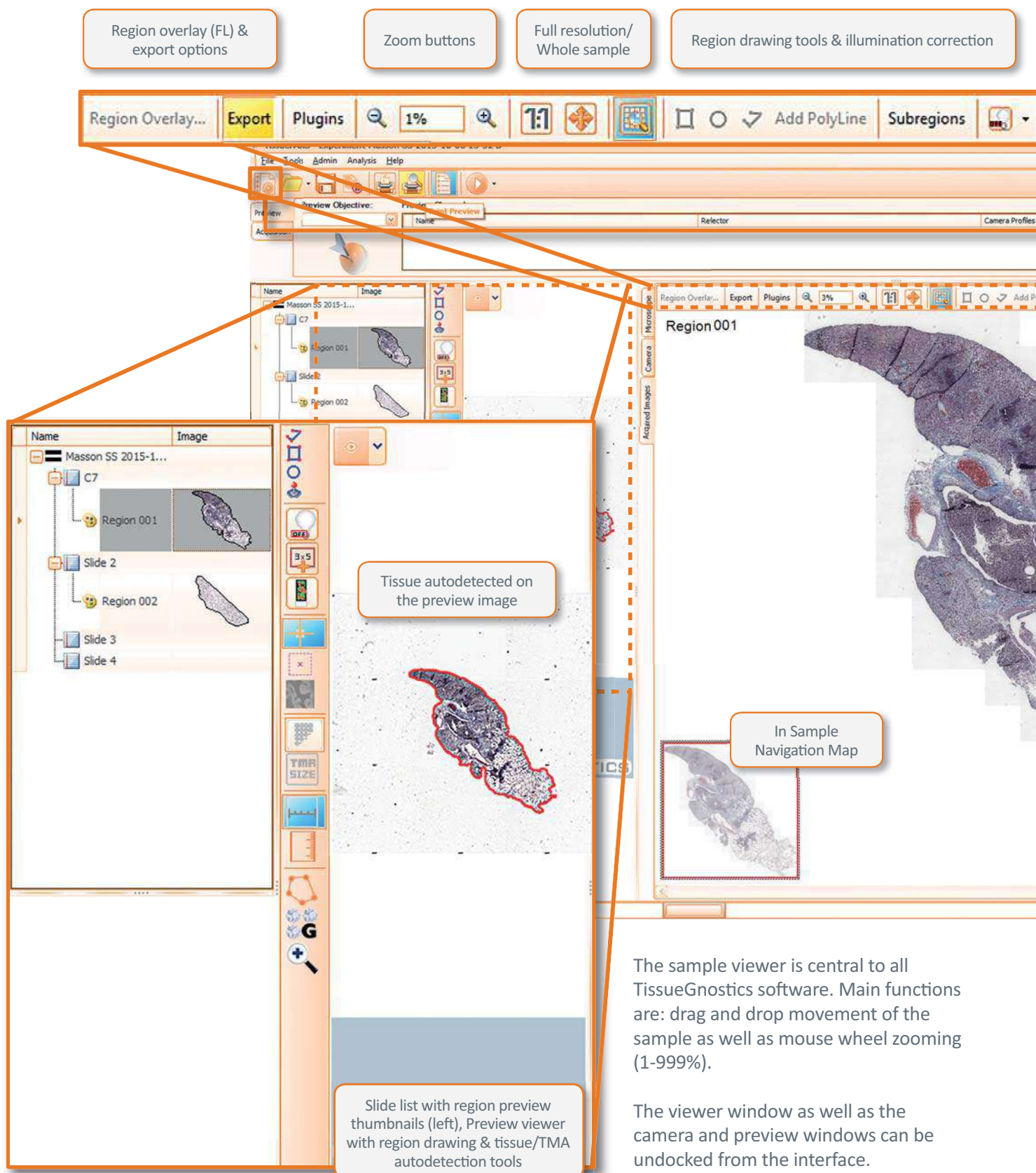
The autodetected or drawn regions are then scanned at the required final magnification. Once a workflow is established, scanning can be done in full auto mode (also see p. 16).

TISSUEFAXS SOFTWARE



Scan, View, Control, Export – the TissueFAXS main interface

The main interface of TissueFAXS software is organized around the sample viewer, with the slide list and the preview viewer to the left of it.



The sample viewer is central to all TissueGnostics software. Main functions are: drag and drop movement of the sample as well as mouse wheel zooming (1-999%).

The viewer window as well as the camera and preview windows can be undocked from the interface.



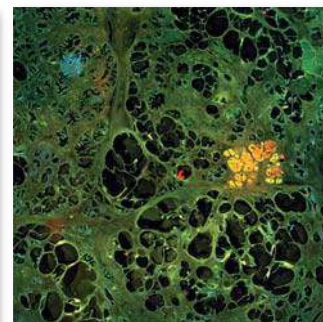
TissueFAXS software optimizes all system components for the highest possible scanning speeds.

Show/hide ROI & FOV outlines, rulers, scale bar

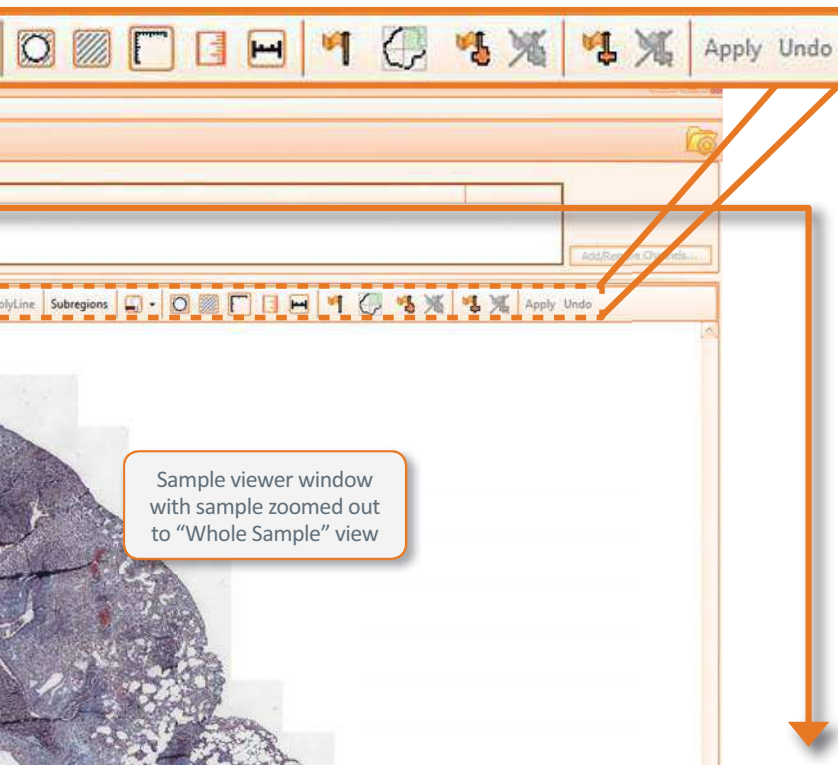
Reacquire/export flags & focal plane visualisation



15 x 15 mm square at 20x in Brightfield: 185 seconds.



1 cm² in Fluorescence, 4 channels, at 20x in 7 minutes and 3 seconds.



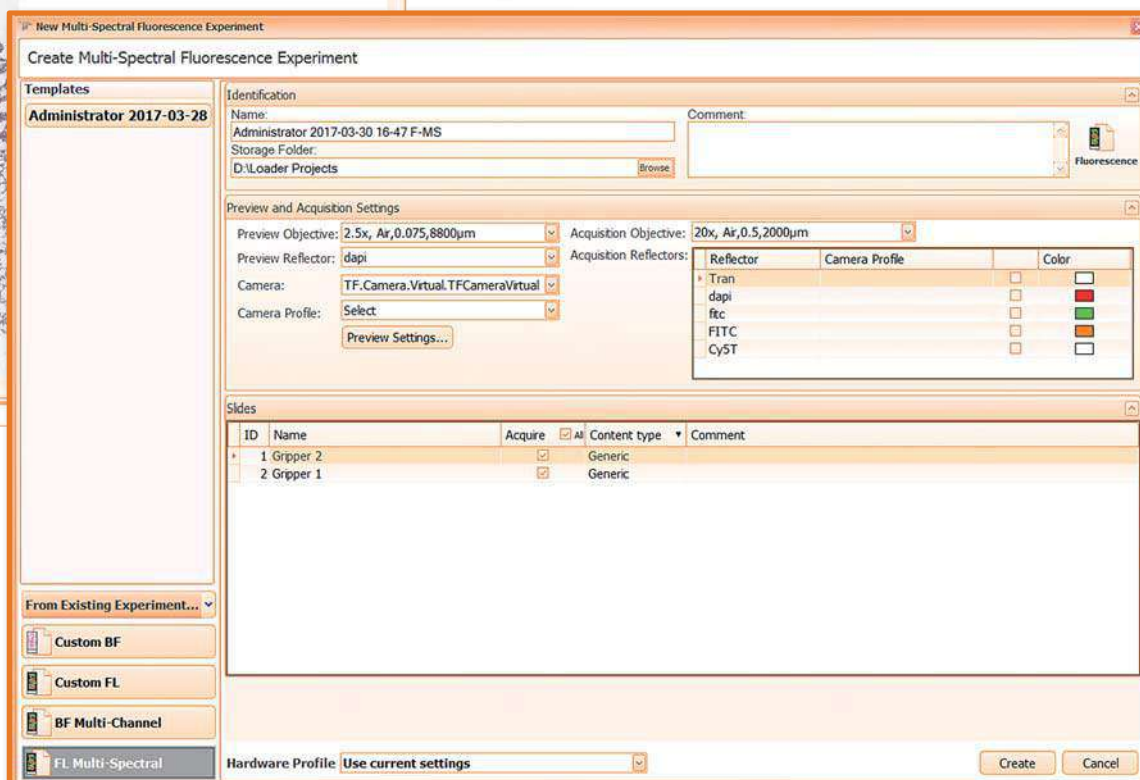
Sample viewer window with sample zoomed out to "Whole Sample" view



Automation profiles

As in all TG software, the TissueFAXS software can be run via user defined profiles (called APPs in StrataQuest analysis software).

These can be easily established for specific scanning jobs, by simply saving a manually defined scanning setup as a profile. The profiles can then be selected and loaded using a specific interface.



TISSUEFAXS SOFTWARE

Stacked FOR you for once... 

Z-Stacking in TissueFAXS software offers both a definable number of z-levels and step size. Stack images can either be saved as is, transformed into an Extended Focus Image, or both. Extended Focus Images combine all sharp image parts of a Z-stack into one single optimal image. The function is available in brightfield and fluorescence.

Choose the extended focus method for each reflector

Reflector Name	Extended Focus Method
Transmission	None

☒ Use Extended Focus ☐ Save Z Stack

Extended Focus Options

Steps above: 10

Step size above: 0.5 μ m

Focus position:

Steps below: 10

Step size below: 0.5 μ m


Near the objective

Far from objective

Extended Focus interface

	Step -5	Step 0	Step +5	Ext. Foc.
DAPI				
FITC				
TEXAS Red				

Triple stained brain image, Steps -5, 0 (Autofocus plane), + 5 of 10 steps & Extended Focus image shown



The TissueFAXS software manages the Brightfield Multi-Channel as well as the Fluorescence Multi-Channel scanning modes, which scan extra images with the tunable liquid-crystal filter, to make a Lambda Stack. All images are then used for Spectral Unmixing in the StrataQuest analysis software (see p. 20 and TG SW brochure).

Custom BF

Custom FL

BF Multi-Channel

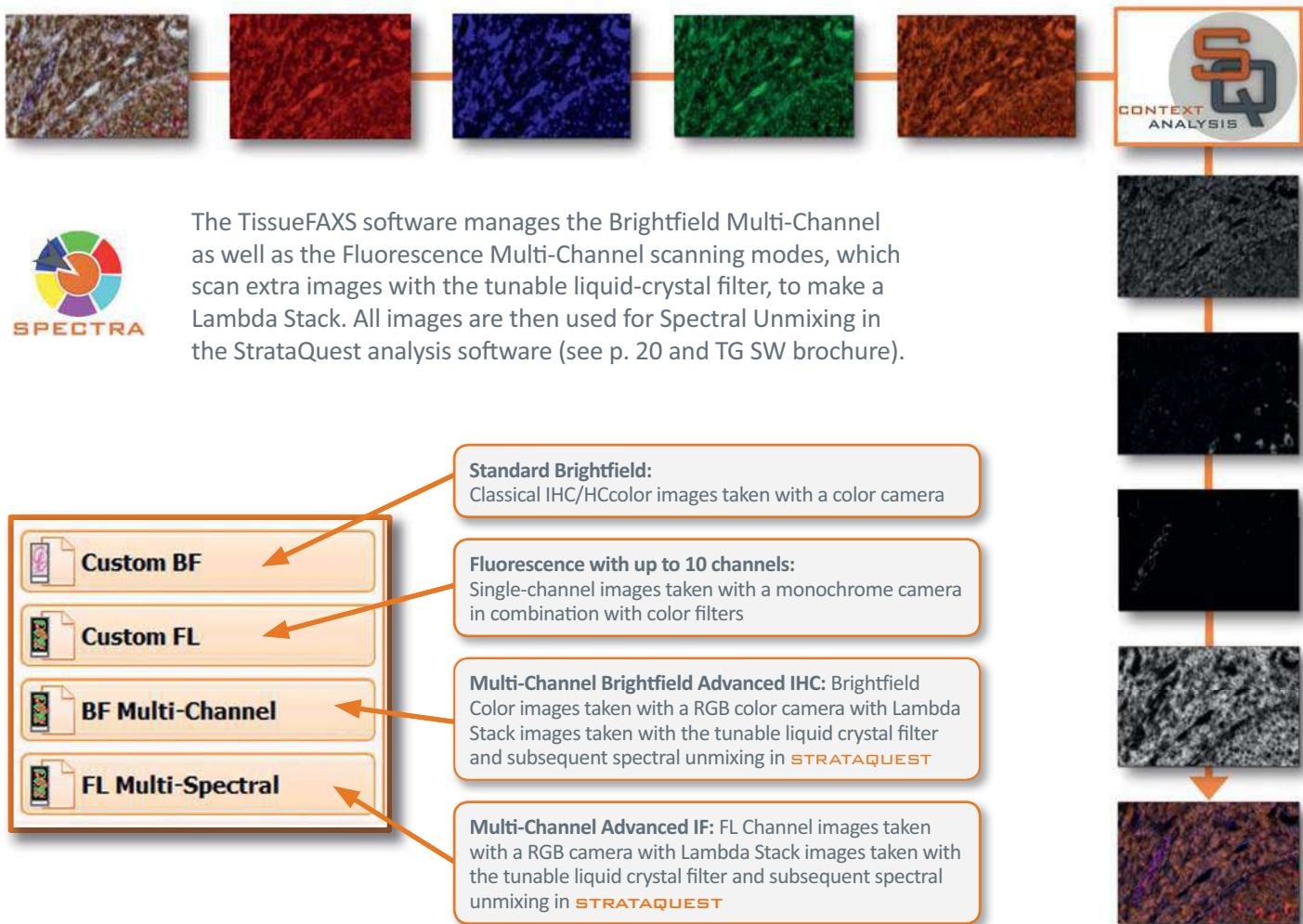
FL Multi-Spectral

Standard Brightfield:
Classical IHC/HColor images taken with a color camera

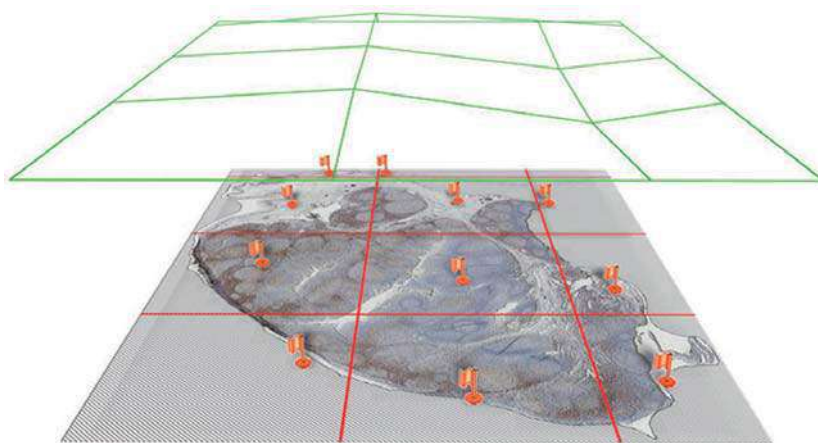
Fluorescence with up to 10 channels:
Single-channel images taken with a monochrome camera in combination with color filters

Multi-Channel Brightfield Advanced IHC: Brightfield Color images taken with a RGB color camera with Lambda Stack images taken with the tunable liquid crystal filter and subsequent spectral unmixing in **STRATAQUEST**

Multi-Channel Advanced IF: FL Channel images taken with a RGB camera with Lambda Stack images taken with the tunable liquid crystal filter and subsequent spectral unmixing in **STRATAQUEST**



In addition to its proven focus matrix autofocus system, TissueFAXS now also features a robust focal map mode. The map is calculated for a defined number of focus points with a subsequent continuous scan following the map z-values.



Tissue detection is by automatic algorithm and can detect large numbers of tissues per slide on the preview image.

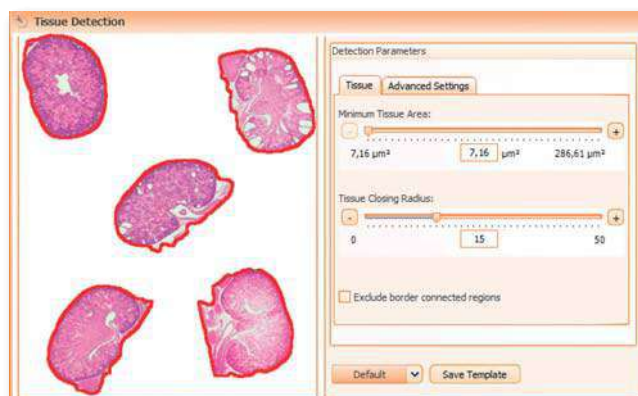
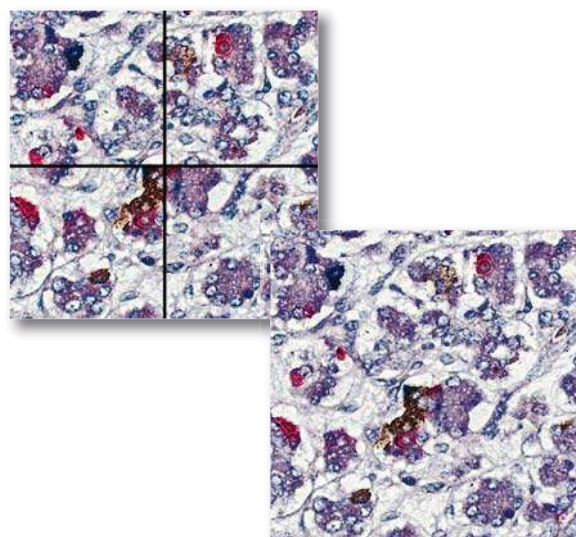
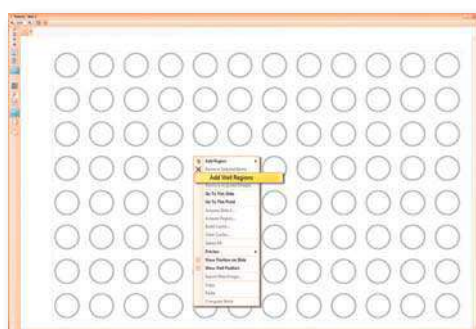


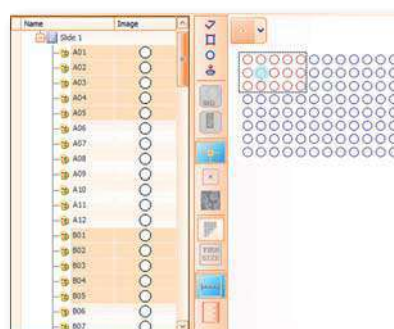
Image Stitching is standard and provides faultless digital slides.



TissueFAXS software integrates templates for the most common microtiter plate standard formats. A wizard permits building more plate templates interactively.



Standard round well regions can be added to the template by one click. Alternatively, custom regions can be drawn in one well and propagated to other or all wells.



Well regions are automatically named and can be resized and moved either in groups or individually.

TISSUEFAXS SOFTWARE

TMA to the core

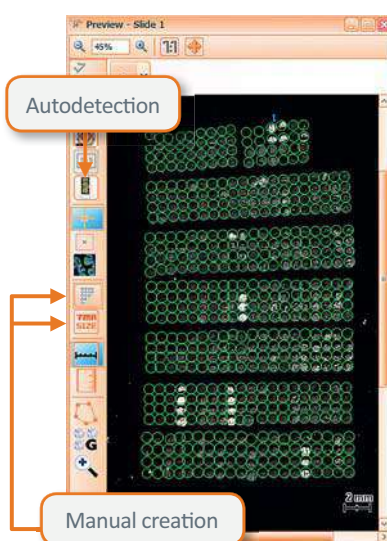


TissueFAXS software provides an integrated Tissue Microarray (TMA) workflow. This makes the scanning of these highly manipulation intensive samples very accessible. The workflow applies to brightfield and fluorescence TMA.

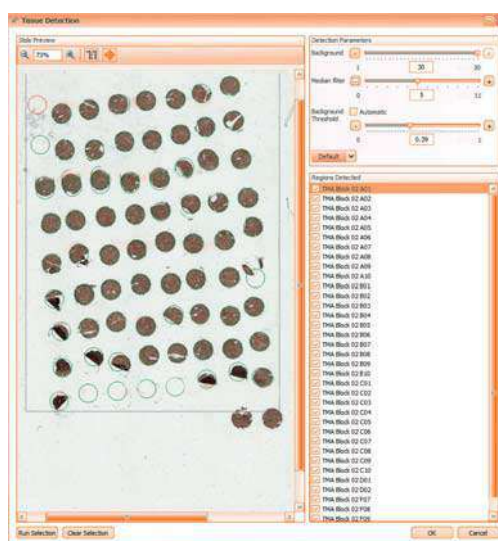
GALILEO Tissue Microarrayers are fully integrated into this workflow.



GALILEO CK4500 automated TMA arrayer

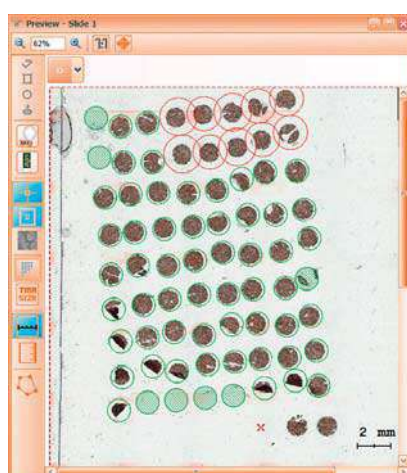


TMA detection tools

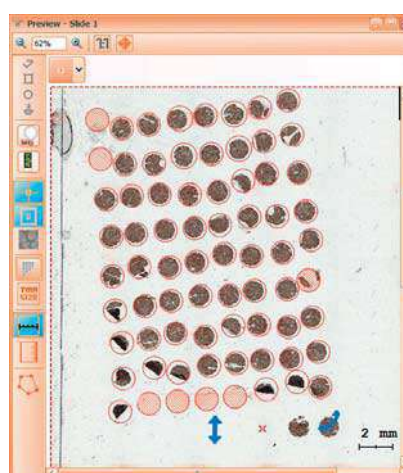


TMA autodetection results

TMA autodetection is done on the preview scan and detects TMA blocks, inserting placeholders for lost or damaged cores (striated). Manual block creation is also available. Naming of cores is automatic and logical.



Resizing cores



Rotating and scaling cores

Whole blocks can be selected, rotated and scaled in x/y for fast rough adjustment. Cores can be resized and repositioned in groups or individually. Throughout this process, the ID of any core can be verified at any time.

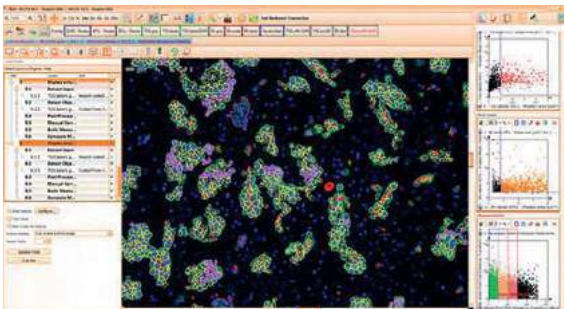
Once positioning is done, scanning using automation templates can begin. The finished scan project contains each core with its ID. They can be handed over to TissueGnostics analysis software, which also fully supports TMA.

TG ANALYSIS SOFTWARE

At a glimpse...  TG Image Analysis software

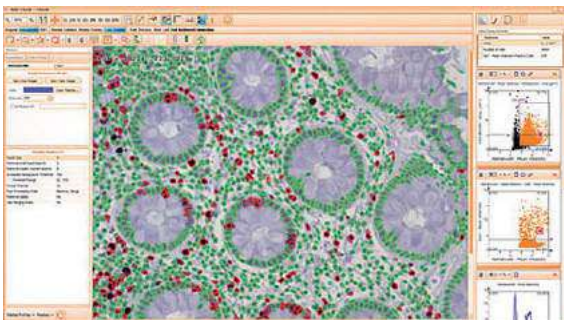
Image Analysis software has been TGs first product. The emphasis has then been on performance and exemplary ease of use – this has never changed.

TG Image Analysis software is included into the complete systems and is available as a standalone product. All provide full template based automation.



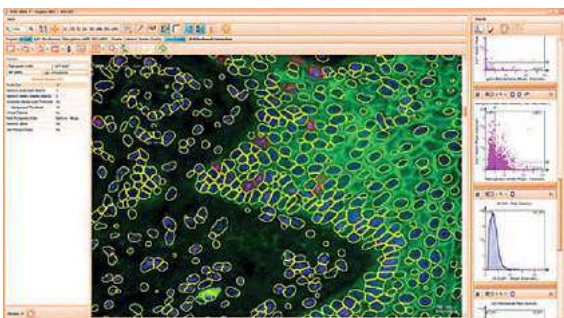
StrataQuest – Contextual Tissue Cytometry software

StrataQuest is TGs most evolved image processing solution. It automatically detects most tissue structures on a digital slide. It integrates detected objects into detailed context-based quantitative analysis. More than 50 APPs (solutions) are available for user-friendly analysis.



HistoQuest – Brightfield Tissue Cytometry software

HistoQuest provides three analysis modes for brightfield scans: Cell-based (nucleus, cytoplasm, membrane), Stained Areas, Small Dots (e.g. CISH). TMA are supported fully.



TissueQuest – Fluorescence Tissue Cytometry software

TissueQuest provides the same analysis capabilities as HistoQuest for fluorescence scans. Please see our Analysis Software Products brochure for more details.



TG DATASTORE



Store. Archive. Share.



TG-DataStore is a set of scalable solutions for image and metadata storage, management and archiving as well as for online image viewing.

Image management requirements ranging from single workgroups to complete research facilities or hospitals can be met.

Supported formats

XML
SAP
HL7 MDM
DICOM
SMTP
HTTP
CIFS
NFS

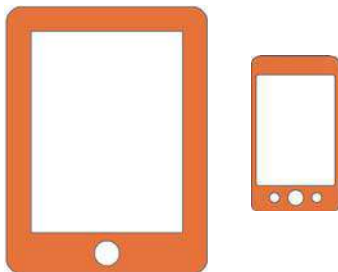
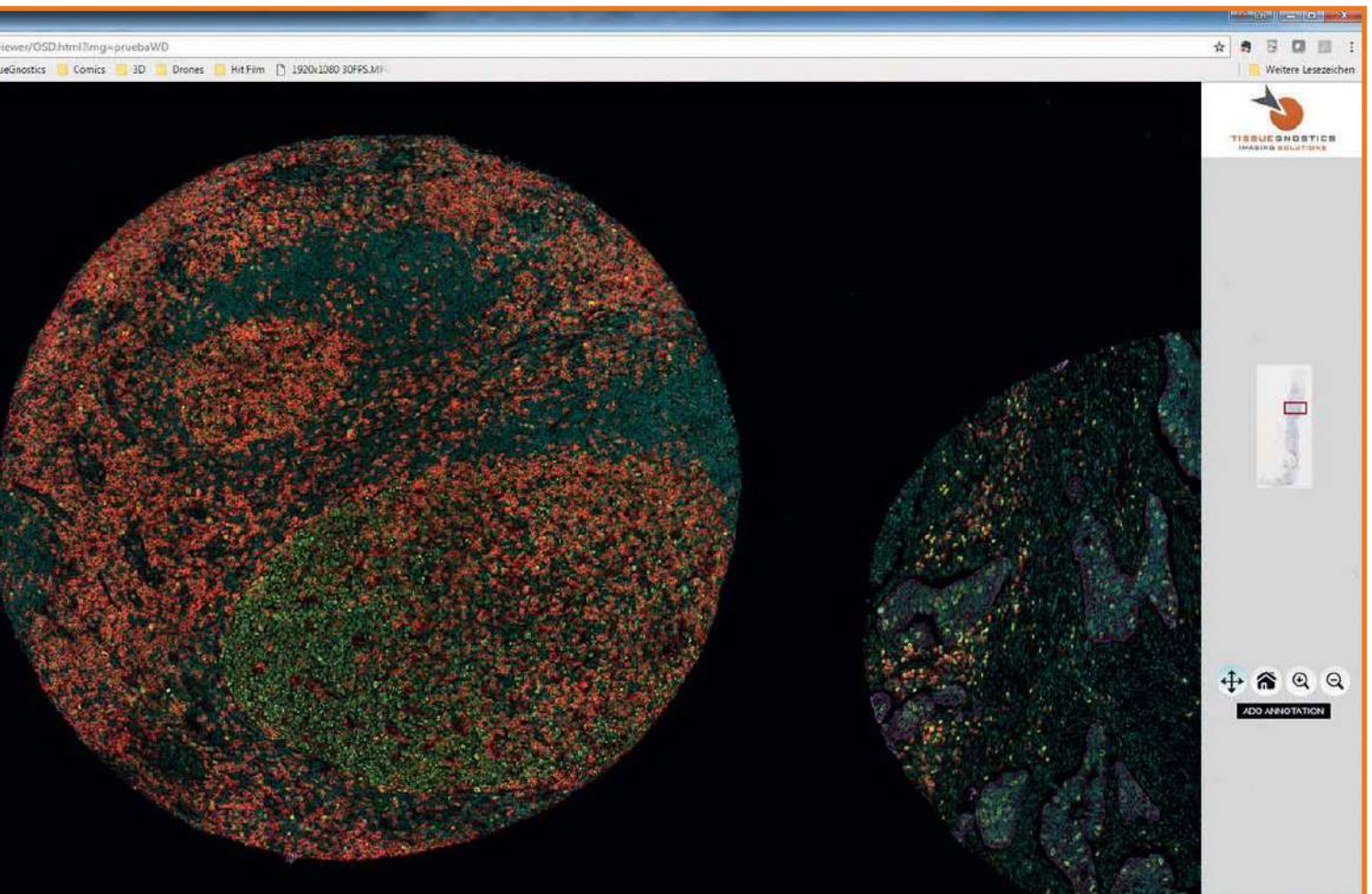
TG-DataStore has the capability to receive unstructured data from the productive storage of devices in many different formats.

Storage allows for direct data retrieval.



Data archiving can have several tiers.





The TG WebViewer provides very high transfer speeds as well as annotation and measurement functions. It is one of the few web viewers which also can display fluorescence images.

Other than in webbrowsers, images can also be viewed at high transfer speeds on smartphones and tablets.



The communication server retrieves and combines images, patient and research metadata for transfer to the TG WebViewer.

SUPPORT MAINTENANCE UPGRADES

TG Support

TissueGnostics support is rendered worldwide based on a 09 to 17:30 hours workday in the UTC+2 timezone. Response time to support calls typically is between 30 minutes and 24 hours. Support can be based on a yearly contract (12 months) or a per case /time scheme.



Support response usually consists of mail or phone contact, a short consultation to start diagnostics and, typically, an online session on the installation to be supported using Teamviewer software and audio. Depending on the issue, support activity can be as short as 15 minutes.

Hardware support is usually rendered from Vienna once diagnostics have been done. Response time can be within seven days, depending on the issue.

TG Maintenance

Yearly maintenance is performed in coordination with the client. It covers complete service and recalibration of the microscope installation and of the computer(s). After the appropriate yearly maintenance, CE-conformity of the systems is assured for the period.



TG Upgrades

Upgrades for TG software are available as a yearly service. They provide one software capability enhancement and all updates of the respective year.



V. 7.0

V. 6.5

V. 6.0

TG CUSTOMER EXPERIENCE

TissueGnostics has customers in 28 countries – here is what some of them say:

The TG System provides the highest quality images of tissues in immuno-oncology projects that are stained in a multiplex format. With the TG StrataQuest software we can extract unique data from the images and test for correlation with response to immunotherapeutics. Therefore, the TG System is ideally suited for translational research questions to develop novel drug response biomarkers and for analysis of tissues in immunotherapy clinical trials.

Beatrice Knudsen, M.D., Ph.D.

Professor of Biomedical Sciences and Pathology, Scientific Director of Translational Research Core, Cedars-Sinai Medical Center, Los Angeles, USA



TissueFAXS 200 Plus was installed in our center in August 2015, but I got to know and experienced TissueGnostics systems more than three years ago. Since entering the Chinese market, TissueGnostics always has focused on the customers experience. Its software comes with many user-friendly features and is improved very quickly. TissueFAXS 200 Plus provides high quality images and the patented analysis software for cell identification has high reliability, which greatly improved our research quality in histomorphology. I am really looking forward to the TissueFAXS SL PLUS Confocal upgrade with 3D reconstruction software. I believe that this will bring us more surprises.

Yu Yang, M.D

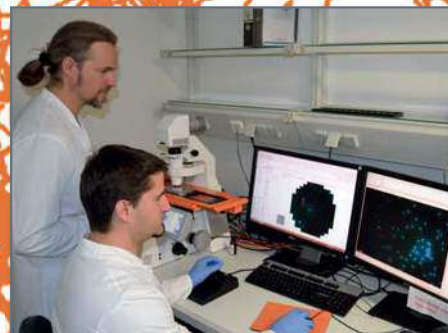
Director of Histomorphology Platform, Research Center of Shanghai Public Health Clinical Center Affiliated to Fudan University



We are working with the TissueFAXS i Plus system to quantify distinct cell populations in situ. Based on our experience we can strongly recommend that technique. The advantages are: i) automated image acquisition, ii) software based data analysis, and iii) 3 color phenotyping of cell subsets in situ.

Prof. Dr. Uwe Ritter

Institut für Immunologie, Universität Regensburg



Taken together, we find that the TissueGnostics system provides superior cellular biomarker quantitation within the context of the existing tissue histology for both traditionally stained tissue sections (single, color IHC analyzed by brightfield) and tissue sections stained by multiparametric immunofluorescence.

Scott J. Rodig, M.D. Ph.D.

Associate Professor of Pathology, Harvard Medical School
Tissue Microarray and Imaging Core Facility, Harvard, USA

