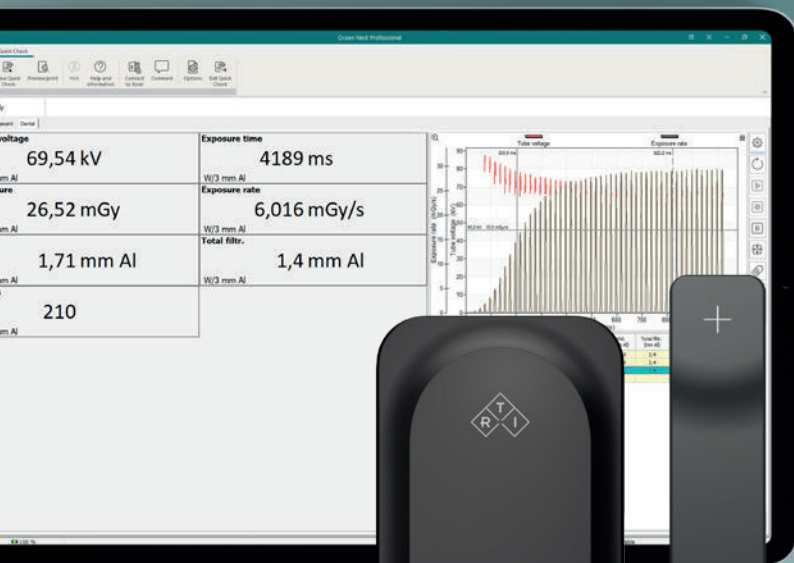


# Mako meter



INDEPENDENT X-RAY  
QUALITY ASSURANCE



# Let's work together to ensure X-ray safety and quality



## **A world-leading manufacturer of QA solutions.**

**In 1981, we invented the first X-ray QA system for diagnostic radiology. Since then, innovation has been at the heart of our corporate philosophy and we have pioneered many QA procedures. We continue to invest heavily in R&D to push forward the very edge of X-ray QA, across all modalities.**

Longer and more active lives, combined with a string of new examination techniques, have made diagnostic radiology the most widely used medical imaging technology.

Diagnostic imaging growth can be seen throughout the healthcare sector, including orthopaedic and vascular imaging, plus full body scanning. This will be a continuing trend, thanks to a shift in focus to more advanced healthcare globally.

As X-ray examinations increase, there is a higher risk of patient and staff exposure to levels of X-ray radiation that could result in negative health implications. As a long-standing member of, among others, IEC, AAPM, and MITA, we participate in work to research, develop, and evolve diagnostic radiology standards.

RTI is dedicated to educating customers and partners, sharing our deep knowledge of X-ray QA best-practice to protect patients and staff in an ever more complex operational environment.

Today, we are represented globally by subsidiaries in Europe, the USA, and Asia, and more than 100 distributors worldwide.

# Mako meter

The Mako System	5
Mako Probes	8
Mako Modules & Accessories	10
Mako Selection Guide	12
Service & Warranty	13
Ocean Next™ Software	14
myRTI	15



# A meter and a milestone.

Unlock time, efficiency, and cost savings by harnessing the power of a single tool across the entire range of X-ray systems and applications. Integrate Mako into Radiography, Fluoroscopy, CT, Dental and Mammography X-ray QA workflows, ensuring no detail goes unchecked. Experience the unrivaled accuracy in measuring kVp, Time, HVL, Total Filtration, Dose, Dose rate, and revel in the captivating presentation of Waveform data.

Mako is a platform-based design, ensuring a future-proof solution that will evolve through continuous innovation and seamless updates.

Outside of developing world-class meters and software, RTI invests heavily in providing an ecosystem that nurtures the highest level of compliance. Whether it be training, calibration, support or general knowledge-sharing – we're here for you.

Our complete portfolio is available at [www.rtigroup.com](http://www.rtigroup.com), or contact one of our Sales teams for more information.

## Enjoy a workflow of excellence.

Mako is the epitome of a super kit. A pioneering solution to revolutionize your way of work.



# The Mako System

## Stay ahead with unparalleled performance and versatility

Mako adapts to your needs with plug-and-play simplicity. It's the most efficient meter, with the highest practical accuracy and the broadest application range.



**Art. No: 9765001-00**  
**Mako Base Unit**

**Unbox limitless potential**  
Mako is the all-in-one X-ray testing solution, neatly encased for your ultimate convenience. Gear up and stay ahead. Mako can be configured with a wide range of industry-leading probes, and is your comprehensive solution for non-invasive mAs (MAS-2) and DAP chamber applications.

Mako reigns as the most precise meter with the ultimate user experience, from orientation-independent probe positioning to fully wireless capability and live display of your measurement data.

Choose Mako, and join us in raising X-ray quality assurance and testing to new heights.

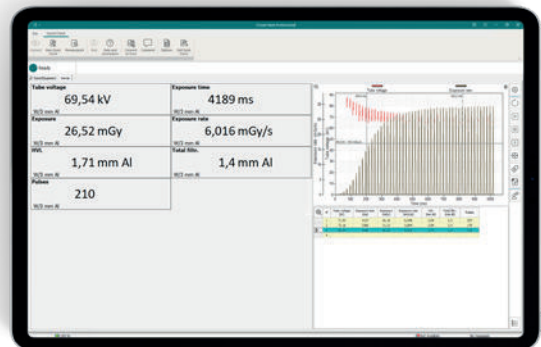
## Count with us

Mako is your path to the lowest cost of ownership, a choice of quality of everlasting value. A statement of taking proactive measures against downtime, caring for the doctors, patients, and your community.

## For you to truly excel

Beyond the hills of spreadsheets, Ocean Next™ awaits. Step into a world of streamlined routines and complete traceability. With our pre-defined templates, you will always hit the ground running, fueling seamless collaboration.

Ocean Next™ gathers data in real time from Mako and its probes.



# The Mako System



## Mako System

Mako is meticulously designed for modern X-ray equipment, adjustable to your precise requirements. Inside our full solution, a super case kit, you'll find the Mako Base Unit, Mako display device, Ocean Next software, and our full probe line-up, to empower you with the most versatile, accurate, and convenient tools on the market.

Mako is also your comprehensive solution for non-invasive mAs (MAS-2) and DAP chamber applications.

Mako is not just a tool; it's your complete tool belt.

### Key features

#### Efficiency

- Orientation independent. Place in the X-ray beam in any orientation.
- Auto-configuration. The display adapts to connected meter.
- One-click reporting. Generates fully traceable reports automatically.
- Double the power. 20-hour battery life in practical measurements.

#### Accuracy

- Made to measure. Spans the widest range, from 18-155 kVp.
- Top practical accuracy. kVp accuracy  $\pm 1.5\%$ . Unique in the market.
- Superior dynamic range. From lowest to highest dose rates.
- Sleek and sensitive. Advanced detector design with 0.9 mm sensor.

#### Application Range

- Broadest ever application range with modular, future proof design.
- Wireless as standard. Integrated Bluetooth for seamless data streaming.
- Multi modal tool. Including non-invasive mAs (MAS-2) and DAP chamber.
- Standard flexibility. Choose the configuration that suits your needs.





# The Mako System

## General specifications

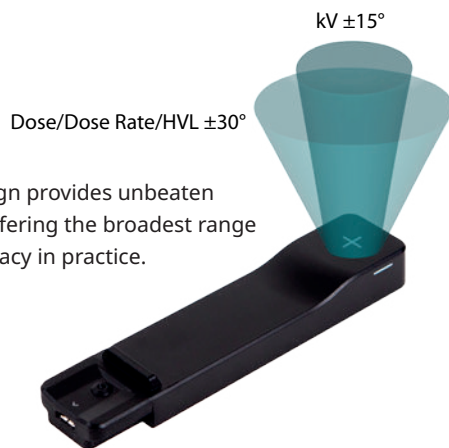
Widest kVp measurement range	18 – 155 kV
Best ever kVp accuracy statement	±1.5% or 0.5kV
Enhanced battery life	Up to 20 hours intense measurement
Wireless as standard	100 m Bluetooth range
Exposures needed for measurement	One
Memory	Unlimited (via Mako display)
Warranty	2-year (industry leading)
Calibration Cycle	2-year (industry leading)
Extended Warranty Program	10-year (industry leading)



Mako Base Unit with Ion Chamber Module docked, and CT Ion Chamber attached.



Mako Base Unit with R/F Probe docked, mAs Module connected and mAs cable.



Unique detector design provides unbeaten angular sensitivity, offering the broadest range of use and best accuracy in practice.



# Mako Probes



## Mako R/F Probe

The groundbreaking new Mako R/F Probe offers industry-leading accuracy ( $\pm 1.5\%$  kV measurement uncertainty) and sensitivity from lowest to highest dose rates. The unique design provides a no-fuss experience, with simple setup in the X-ray beam, flexible connection to the Mako Base Unit and a low radiological footprint, perfect for measurement without affecting the AEC.

**Art. No: 9765011-00**

### Specifications with Mako

Size	122.5 x 28 x 14.5 mm (4.82 x 1.1 x 0.57 in)
Weight	55 g (1.94 oz)
Exposures needed for measurement	One
Standard measurement parameters	kVp, dose, dose rate, HVL, TF, exposure time, pulses, pulse rate and dose/pulse
Waveforms	Simultaneous kV and dose rate
<b>kV</b>	
Range	35 – 155 kV
Uncertainty	$\pm 1.5\%$
<b>Dose</b>	
Range	1 nGy – 9999 Gy
Uncertainty	$\pm 5\%$ or 5 nGy
<b>Dose Rate</b>	
Range	1 nGy/s – 500 mGy/s
Uncertainty	$\pm 5\%$ or 1 nGy/s
Trigg level	25 nGy/s
<b>HVL</b>	
Range	1-15 mm Al
Uncertainty	$\pm 5\%$ or 0.2 mm Al
Min Dose Rate	0.5 $\mu$ Gy/s

## Mako Mammo Probe

The revolutionary new Mako Mammo Probe offers best-in-class accuracy ( $\pm 1.5\%$  or 0.5kV) and performance, covering the full clinical kV range from 18-49kV, without the need to change probe above 40kV (unique in the market). The Mako Mammo Probe has been designed for ultimate performance across all Mammography systems, including the latest beam qualities with Titanium filters.

**Art. No: 9765012-00**

### Specifications with Mako

Size	122.5 x 28 x 14.5 mm (4.82 x 1.1 x 0.57 in)
Weight	55 g (1.94 oz)
Exposures needed for measurement	One
Standard measurement parameters	kVp, dose, dose rate, HVL, exposure time, pulses, pulse rate and dose/pulse
Waveforms	Simultaneous kV and dose rate
<b>kV</b>	
Range	18 – 49 kV
Uncertainty	$\pm 1.5\%$ or 0.5 kV
<b>Dose</b>	
Range	1 nGy – 9999 Gy
Uncertainty	$\pm 5\%$ or 5 nGy
<b>Dose Rate</b>	
Range	2 nGy/s - 1 Gy/s
Uncertainty	$\pm 5\%$ or 2 nGy/s
Trigg level	50 nGy/s
<b>HVL</b>	
Range	0.2 - 4.0 mm Al
Uncertainty	$\pm 5\%$ or 0.025 mm Al
Min Dose Rate	1 $\mu$ Gy/s



# Mako Probes

---



## Mako Dental Probe

The immaculate new Mako Dental Probe offers the ultimate test tool in Dental X-ray applications, with best-in-class accuracy ( $\pm 1.5\%$  kV) and advanced detector design. The probe is perfectly designed for CBCT and intraoral applications, in addition to panoramic dental measurements, featuring a 0.9 mm detector for full irradiation in narrow-beam X-ray fields.

**Art. No: 9765013-00**

### Specifications with Mako

---

Size	122.5 x 28 x 14.5 mm (4.82 x 1.1 x 0.57 in)
Weight	55 g (1.94 oz)
Exposures needed for measurement	One
Standard measurement parameters	kVp, dose, dose rate, HVL, TF, exposure time, pulses, pulse rate and dose/pulse
Waveforms	Simultaneous kV and dose rate
<b>kV</b>	
Range	35 – 125 kV
Uncertainty	$\pm 1.5\%$
<b>Dose</b>	
Range	1 nGy – 9999 Gy
Uncertainty	$\pm 5\%$ or 5 nGy
<b>Dose Rate</b>	
Range	1 nGy/s – 500 mGy/s
Uncertainty	$\pm 5\%$ or 1 nGy/s
Trigg level	25 nGy/s
<b>HVL</b>	
Range	1-15 mm Al
Uncertainty	$\pm 5\%$ or 0.2 mm Al
Min Dose Rate	0.5 $\mu$ Gy/s

# Mako Modules & Accessories



## Mako mAs Module

The Mako mAs Module is a small tool with big capabilities. The Module comes with the invasive Mako mAs Cable as standard, as well as supporting non-invasive mAs capabilities (via MAS-2 clamp probe) and Test Point Cables, for various purposes like mA or V measurement. Connected to the X-ray generator with no need of additional settings, it delivers the mA and mAs together with the corresponding waveform. The built-in digital rectifier handles single phase units with no need to worry about polarity.

Range: 0.1 mA - 2.0 A ( $\pm 1\%$  or 0.01 mA)

**Art. No: 9765023-00**

### Optional Accessories for mAs Module:

#### RTI MAS-2 (non-invasive mAs)



The MAS-2 Probe is a clamp-on probe for non-invasive measurement of mA and mAs. Direct readings of mA and mAs, as well as waveform, are obtained.

No connection inside the X-ray generator is needed. The simple and safe way of non-invasive measurements. The RTI MAS-2 probe is simply clamped on to the high voltage cable and then ready for measurements.

Range: 10 mA - 4.0 A ( $\pm 5\%$  or 2 mA)

**Art. No: 9730006-00**

#### Mako Test Point Cables (coming soon)



A variety of test point cables for connection in the X-ray generator are available. Pre-configured mA test point cables are available for a range of manufacturer defined test point values.

The test point conversion factor(s) is stored in the Mako mAs Module – it is simply plug-and-play.



## Mako Ion Chamber Module

The Mako Ion Chamber Module connects RTI Ion Chambers (such as CT Ion Chambers, DAP Chamber and Ion Chamber Magna 1cc) to the Mako System. Automatic temperature and pressure compensation is provided, meaning no fuss with settings to complete the measurement.

**Art. No: 9765021-00**

### Optional Accessories for Ion Chamber Module:

#### RTI CT Ion Chamber (10 cm and 30 cm – for Mako)



The CT Ion Chamber is a cylindrical pencil-shaped ionization chamber for

CTDI measurements. Intended for CTDI and dose length product measurements on CT scanners in phantom or free-in-air.

In addition to the standard 10 cm chamber, the 30 cm chamber for wide beams is available.

Range 0.3 mGycm/s to 3 Gycm/s ( $\pm 5\%$  or  $\pm 0.03$  mGycm/s)

**10 cm: Art No: 9730025-01**

**30 cm: Art. No: 9730026-01**

#### RTI DAP Chamber (86 x 86 mm and 147 x 147 mm - for Mako)



The DAP Chamber is the perfect tool for field calibration of DAP. No worries estimating field size or homogeneity. Just place the DAP chamber over the beam to get an accurate DAP value.

**86 x86 mm: Art. No: 9705070-01**

**147 x 147 mm: Art. No: 9705060-02**

#### Ion Chamber Magna 1cc (for Mako)



The Magna 1cc ionization chamber is designed for mammography dose measurement. It has an excellent energy response and can therefore be used for radiographic applications too.

Range: 0.02 mGy/s to 2 Gy/s ( $\pm 5\%$  or 0.02 mGy/s)

**Art. No: 9706100-01**

# Mako Modules & Accessories

---



## Mako Legacy Module

The Mako Legacy Module connects the current range of Piranha and Cobia probes to the Mako System. It allows seamless use of your current favorite probes. The well-known RTI CT Dose Profiler and RTI Light Probe connect to the Mako System via the Mako Legacy Module.

**Art. No: 9765022-00**

Optional Accessories for Legacy Module:

### RTI CT Dose Profiler

---



The dose is measured in every point of the X-ray beam and the total dose profile is acquired regard-

less of how wide the beam is. There is no limitation of the beamwidth. This makes it possible to measure without the drawbacks of traditional CT probes. Based on solid-state technology, the CT Dose Profiler is ideal for measuring point dose and dose rate in the CT beam.

Range: 0.5  $\mu\text{Gy/s}$  to 3 Gy/s ( $\pm 5\%$  or 0.1  $\mu\text{Gy/s}$ )

**Art. No: 9730013-00**

### RTI Light Probe

---



For calibration & brightness measurements (luminance) on monitors and film viewing boxes as well as ambient light (illuminance) measurements in the viewing room.

Range: 0.04  $\text{cd/m}^2$  - 128  $\text{kcd/m}^2$  ( $\pm 5\%$  or 0.008  $\text{cd/m}^2$ )

Range: 0.014 lx - 48 klx ( $\pm 5\%$  or 0.003 lx)

**Art. No: 9730007-00**

### Other Probes

---

Current Piranha and Cobia Probes like RTI Dose Probe, T20, MAS-1, and MAS-2 connects with the Mako Legacy Module, keeping the same excellent specifications as with the Piranha.



## Mako Holder and Stand

Holder and Stand for Mako R/F, Mammo and Dental Probes. The standard kit comes with compatible holders for RTI Dose Probe and RTI CT Ion Chamber.

**Art. No: 9765030-00**



## Mako Panoramic Holder

Holder for Mako Dental Probe.

**Art. No: 9765031-00**



## Mako PI Dongle

The PI Dongle is used together with any Ion Chamber to be connected to the Mako system.

It contains all information about the chamber; serial number, type, calibration factors, calibration date and more. The dongle is used together with the Ion Chamber Module to compensate for both temperature and pressure, thus improving all Ion Chamber measurements.

**Art. No: 9765021-05**

# Mako selection guide



## One meter, all parameters

Experience the next level of quality control and testing for any or every modality. The Mako System can be configured to suit any application, with the ability to integrate Mako R/F Probe, Mako Mammo Probe, Mako Dental Probe, Mako mAs cable, non-invasive mAs (MAS-2), Mako Test

Point Cable, RTI CT Ion Chambers, RTI CT Dose Profiler, Ion Chamber Magna 1cc, RTI DAP Chamber, RTI Light Probe & RTI Dose Probe. Mako Base Unit has Bluetooth connectivity as standard and is developed for connectivity to our powerful Ocean Next™ software.

## Compare the Mako modalities

Mako for R/F	Mako for Mammo	Mako for Dental	Mako for CT
35 – 155 kV measurement range	18 – 49 kV measurement range	35 – 125 kV measurement range	35 – 155 kV measurement range
±1.5 % kV measurement uncertainty	±1.5 % kV measurement uncertainty	±1.5 % kV measurement uncertainty	±1.5 % kV measurement uncertainty
Integrated non-invasive mAs (MAS-2 clamp probe) option	Covers the full clinical kV range up to 49kV	Integrated RTI DAP Chamber option	Integrated CT Ion Chamber option
Small radiographic footprint allows measurement without affecting AEC	Handles the latest X-ray tube configurations, including up to 1.5 mm Titanium Filters	Measure down to 0.9mm, for full exposure and reliability in narrow beam applications	CT Ion Chamber fits into standard CT phantoms and measures CT Dose Index
Mako Probe placement is orientation independent	Mako Probe placement is orientation independent	Mako Probe placement is orientation independent	Mako Probe placement is orientation independent
Measure kVp at dose rates as low as 1 µGy/s	No need to switch sensor above 40kV (unique in market)	Dedicated Mako Dental Holder simplifies positioning of the Mako Probe	Active length of CT Ion Chamber is 100 mm
The Mako System can be configured to suit any application, with the ability to integrate Mako R/F Probe, Mako Mammo Probe, Mako Dental Probe, Mako mAs cable, non-invasive mAs (MAS-2), Mako Test Point Cable, RTI CT Ion Chambers, RTI CT Dose Profiler, Ion Chamber Magna 1cc, RTI DAP Chamber, RTI Light Probe & RTI Dose Probe.			

Specifications in this guide may be changed without notice.

# A trouble free workflow

---

The best there is.  
Guaranteed.



## 10 years warranty

Game-changing innovations could use a pinch of extra reassurance. With Mako we go above and beyond by offering you the opportunity to indulge in up to ten years of warranty – most generous in the field.

Remember, Mako is developed by pioneers with 40 years of innovation, proudly leading the way in X-ray testing. If you find yourself questioning just how confident we are in our own creation, rest assured, we've left no room for doubt.



Maximize your Mako with a two-year calibration cycle, ensuring minimal downtime and peak performance. It's the effortless strategy to amplify your investment in a meter that evolves perpetually.

Our accredited laboratories offer traceable, dependable results with quick turnaround times, providing accurate testing for the safety of patients and staff. We proudly undergo reviews to maintain the highest standards of service and calibration.

### RTI Support

One of our goals is to share our deep knowledge of best practices within the field of X-ray QA and testing. Contact the RTI Support team for technical, application, and software Quality Assurance assistance.

#### Global

+46 (0) 31 746 36 28  
support@rtigroup.com

#### USA & Canada

+1 800-222-7537  
support.us@rtigroup.com





# Ocean Next™ software



The importance of dedicated software applications to conduct professional QA is growing. Microsoft Excel is flexible, but not enough to meet the growing demands for traceability, compliance, and efficiency.

By using Ocean Next™ software, you can plan the measurements in advance, create checklists, add information as a pop-up window for a specific exposure, and include instructions to simplify the work for you and your co-workers using a standardized, streamlined user interface.

Choose from the three different license levels of Quick, Advantage, and Professional.

### Quick: for swift QA

Start measuring within seconds! The application automatically detects which instruments and probes are connected to assist you the best way possible – just Plug n Play!

The interface adapts, and all measured parameters are displayed on one screen.

The results and waveforms can be retained in the database for review and compiled in a report.

### Advantage: for streamlined QA measurements

For more advanced QA measurements, the Advantage license enables customization of templates to suit your needs. Utilize standardized, predefined workflows, with automation of steps, and graphs.

In Studio View, you can design single-page templates (including analysis and checklists) and important reports, e.g. with your own logo and layout.

### Professional: complete QA system for superior efficiency and compliance

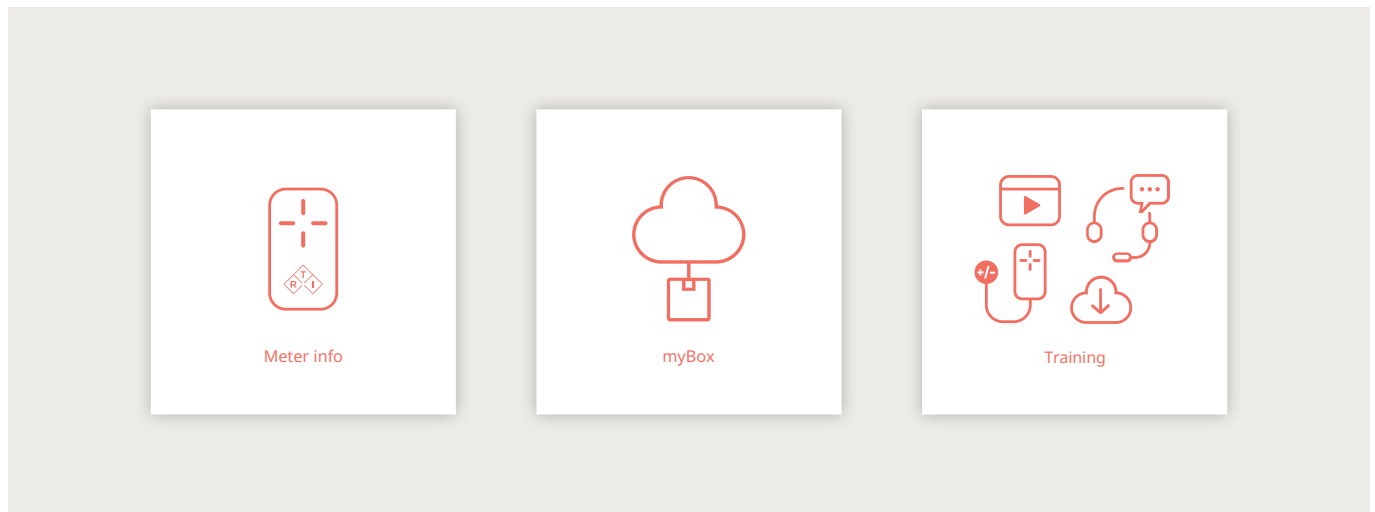
For trend analysis and full traceability of your measurements. You can build a holistic solution for your X-ray QA, by storing your measurements in a searchable database structured to your needs.





# myRTI customer portal

---



## Complete your Ocean Next experience with myRTI and myBox cloud server

myRTI is our new customer portal where you can manage your RTI devices, get calibration reminders, access your calibration certificates, and keep track of all your Ocean Next measurement data.

You will also get access to RTI Support, Resource Center and RTI Academy free online training.

### Forget about backing up your QA and testing!

Let Ocean Next™ and our cloud server **myBox**, do the work for you. When you sign up to myBox, all your Ocean Next templates and measurement data will be stored automatically and kept safe with easy access from multiple devices. So you'll never cry again over a stolen laptop, spilled coffee, or hard drive crash.

### Share it!

With Ocean Next and myBox, you can share your measurement data and templates with selected colleagues for a smooth and efficient workflow.

*myRTI is hosted by Microsoft Azure.*

### Benefits of myRTI

Manage all your RTI devices

Calibration reminders

Access calibration certificates

Ocean Next data logs

Access to RTI Support, Resource & Training

#### **myBox\***

- Automatic backup of your entire Ocean Next database.
- Run Ocean from multiple devices with one synchronised database.
- Share your data directly from Ocean-to-Ocean with your colleagues.

\*Subscription needed. One subscription per user.

# c/o RTI

What we do matters. To patients. To professionals. To us.

It is more than algorithms, technology and design.

It is about setting the standard for quality assurance  
of X-ray imaging.



INDEPENDENT X-RAY  
QUALITY ASSURANCE