

RTI MAS-2

Non-invasive Tube Current Probe for the RTI Meter

User's Manual - English - Version 2019.12A

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Intended Use of the RTI MAS-2

Together with instruments from RTI Group AB it is to be used for independent service and quality control, as well as measurements of kerma, kerma rate, kVp, tube current, exposure time, luminance, and illuminance within limitations stated below.

If installed according to accompanying documents, the product is intended to be used together with all diagnostic X-ray equipment except for:

- therapeutical X-ray sources.
- X-ray equipment with tube potential below 20 kV.
- X-ray equipment on which the instrument cannot be mounted properly, e.g. equipment where the beam field size is narrower than the active part of the detector.
- specific types of X-ray equipment listed in the instructions for use or in additional information from the manufacturer.

With the X-ray installation in stand-by conditions without patients present, the product is intended to be used:

- to provide the operator with information on radiation beam parameters that might influence further steps in an examination but not an ongoing exposure.
- for assessing the performance of the X-ray equipment.
- for evaluation of examination techniques and procedures.
- for service and maintenance measurements.
- for quality control measurements.
- for educational purposes, authority supervision etc.

The product is intended to be used by hospital physicists, X-ray engineers, manufacturer's service teams, and other professionals with similar tasks and competencies. The operator needs a short training to be able to use the product as intended. This training can be achieved either by careful study of the manual, studies of the built-in help function in measurement software or, on request, in a course provided by the manufacturer.

The product is intended to be used inside X-ray rooms ready for clinical use and can safely be left switched on and in any measuring mode in the vicinity of patients.

The product is NOT intended to be used:

- for direct control of diagnostic X-ray equipment performance during irradiation of a patient.
- so that patients or other unqualified persons can change settings of operating parameters during and immediately before and after measurements.

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Note!

For a full description of the RTI Meter, see the RTI Meter Reference Manual. That Manual can be found on the Product USB or be downloaded from RTI's website (www.rtigroup.com).

1 INTRODUCTION

1.1 General

The RTI MAS-2 is an adapter cable together with a current clamp probe for use with RTI Meter X-ray multimeter. It provides a non-invasive way to measure tube current (mA) and tube charge (mAs) on X-ray equipment. The current probe is simply clamped on the high voltage lead and is then ready for measurements.

The advantage is that the method is easy to use and that it is safe. Furthermore there is no need to disconnect the high voltage cables to be able to measure tube current. The RTI MAS-2 can measure from 10 mA to 4000 mA, when used together with the RTI Meter. By using *Free-run* or *Timed* update modes the RTI MAS-2 is able to measure even lower, with an inaccuracy of 1 - 2 mA.

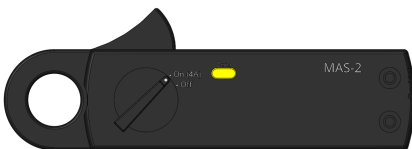
The calibration factor, stored in the cable connector, makes it possible to read current and charge directly in mA and mAs with the RTI Meter. The mA waveform can also be collected and displayed.

This method is preferred when adding an absolute mAs reference value for your mAs linearity test.

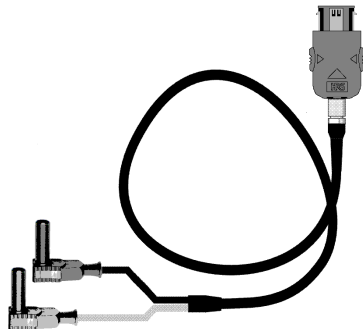
You can easily transform your relative output measurement values to absolute mAs values, even for low mAs measurements. A benefit with this method is that you avoid large measurement errors for low mAs values. This is often the case with ordinary mAs meters that are not sensitive to the current waveform.

Using the Ocean software, a certain portion of the mA waveform can be selected using the radiation waveform as reference.

The current clamp probe is also a general-purpose current meter, which can be used together with an oscilloscope or DVM. Currents between 0 - 4 A in the frequency range DC to 1 kHz can be measured.



The PROVA 15 current probe



The RTI MAS-2 adapter cable

2 FUNCTION AND CONNECTION

The overview of RTI Meter will be divided into three different main parts:

- **Function:** general overview.
- **Connection:** how to connect the probe and cable.
- **Initial Offset Adjustment:** shows how to do final adjustments before starting to measure.

2.1 Function of the RTI MAS-2

The RTI MAS-2 is an adapter cable used together with a current clamp probe and the RTI Meter electrometer.

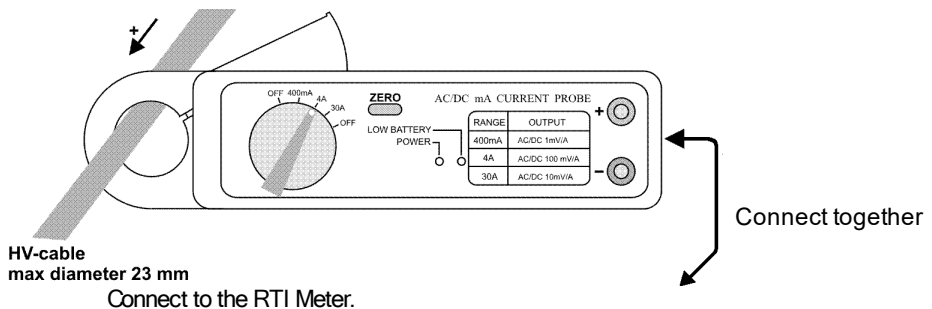
The clamp probe is powered on with the range switch.

2.2 Connection of the RTI MAS-2

The RTI MAS-2 is connected to the detector input of the RTI Meter using the round Lemo connector.

The clamp probe is connected using the two banana connectors in the other end of the cable.

NOTE! Make all connections to the RTI MAS-2, the RTI Meter, and the clamp probe before powering on the instruments. See figure below.



2.3 Initial Offset Adjustment Procedure

Make sure that all instruments are switched off.

Press the jaw trigger and clamp the jaws onto the high voltage cable. Check for correct polarity.

Connect the RTI MAS-2, the clamp probe, and the RTI Meter according to previous figure.

Power on the clamp probe, and the RTI Meter.

Press the ZERO on the clamp probe to cancel internal DC offset in the clamp probe.

In the display unit, select the appropriate Meter display, e.g. tap **Measure**, **Radiography**, **Tube Current**, and choose the EMM module to be able to read the current. It is typically shown in the unit "mA".

Tap **Reset**, then "0" should be displayed.

The offset adjustment procedure for RTI Meter is finished and the RTI MAS-2 is ready for measurements.

3 MEASUREMENTS

3.1 Measurements of the mAs and mA value

Just perform an exposure and the display will show you readings of tube current (mA) and tube charge (mAs). You may also study the tube current waveform. The RTI Meter starts to measure when the mA signal is greater than approximately 10 mA when using the RTI MAS-2. For long exposure times, the display updates continuously during the exposure. (See Settings in the RTI Meter manual).

4 SAFETY PRECAUTIONS

4.1 General Rules

- Do NOT use the RTI MAS-2 on a circuit with a voltage of higher than 600 V AC.
- Do NOT remove the battery compartment cover when attempting to measure current.
- Do NOT connect the RTI Meter to an oscilloscope/DVM and simultaneously use the same oscilloscope/DVM connected to the banana terminals of the clamp probe.
- Do NOT make battery replacement with the RTI MAS-2 powered ON.
- Do NOT expose the instrument to direct sunlight, extremes of temperature and humidity, or dew fall.
- Do NOT forget to turn the RTI MAS-2 off after use.

RTI Group AB takes no responsibility for misuse of the RTI MAS-2 or use together with products that the RTI MAS-2 is not intended for.

RTI Group AB assumes no responsibility for customers not following these safety precautions.

5 SPECIFICATIONS

For PROVA 15 specifications see the "PROVA 15 User's Manual"

5.1 General Specifications for RTI MAS-2

Specifications are valid after a warm-up time of one minute and presuming reference conditions. All specifications together with the clamp probe probe unless otherwise stated.

Reference conditions:

Temperature:	+20 °C
Relative humidity:	50 %

Specifications:

Current range RTI MAS-2 output:	10 - 4000 mA
Inaccuracy:	±3 % at 250 mA ±5 % or ±2 mA between 10 - 4000 mA
Scale factor (RTI MAS-2 output):	1 nA/mA (±0,1 %)
Maximum diameter of high voltage cable:	Appr. 23 mm
Cable length:	150 cm
Weight:	< 0,2 kg
Operating temperature and relative humidity:	15 - 30 °C at <80 % relative humidity
Storage temperature:	-10 °C to +50 °C
Battery life for PROVA 15:	Appr. one year of use or 40 hours
Battery type for PROVA 15:	2 alkaline IEC R6 (size AA) 1,5 V batteries

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