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## Strip Thickness Measurement: X-Ray Gauges RX-40 / RX-60



Rayonic X-ray thickness gauges are increasingly being installed in aluminium cold, warm and foil mills. In the steel industries the thickness gauge well suited for thin strip and are mainly installed in processing lines.

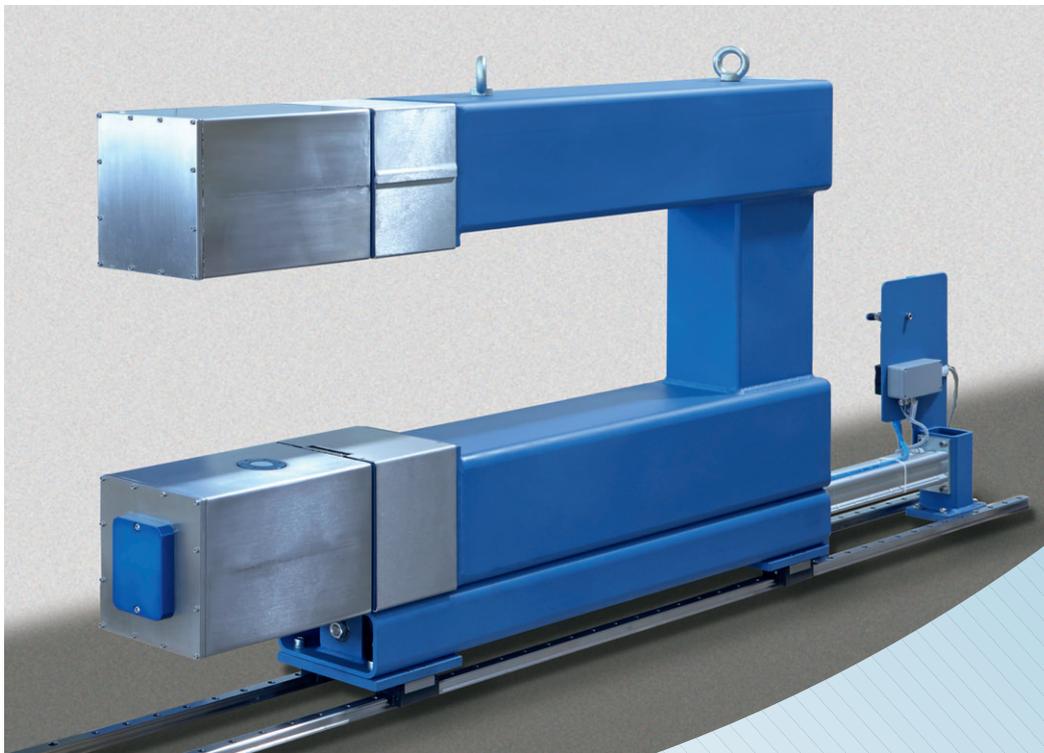
The gauge-heads of the RX-40 and RX-60 product lines are available in different dimensions to cover the space restrictions and installation requirements of the various mill types and processing lines. The available standard versions are mill mount, retractable C-frame for centre line measurement and scanning system for cross profile. Both thickness gauges differ only in the high voltage generators allowing an optimal adjustment to the required measurement range and accuracy. All models use robust metal-ceramic X-ray tubes. These and the high voltage electronics are operated far below the maximum ratings for significantly increases lifetime.

The basic version comprises the gauge with a stand-alone operator station. Even then it provides all necessary interfaces for integration into the automation environment of rolling mills and process lines. In advanced systems the use of client-server technology allows a wide variety of plant and gauge configurations including multiple operator stations, multiple measurement sites and extensive data logging.

### Technical Data

<b>Material</b>	Aluminium	Aluminium	Steel
<b>Application</b>	Foil mill	Cold mill	Process line
<b>Gauge model</b>	RX-40	RX-40	RX-60
<b>X-ray source</b>	TS40-SL	TS40-C	TS60-C
<b>Operating parameters</b>	12.8 kV / 0.6 mA	40 kV / 0.3 mA	60 kV / 0.5 mA
<b>Measurement range</b>	0.002 - 0.2 mm	0.1 - 8.0 mm	0.1 - 4.0 mm
<b>Measurement gap</b>	100 mm	300 mm	300 mm
<b>Accuracy</b>	0.05%	0.05%	0.05%

Characteristic measurement materials are metal strip, coated metal strip, web and strip of composites, non-wovens, ceramics, etc.



## Principle of Radiometric Thickness Measurement

The radiometric thickness measurement is based on the partial absorption of ionizing radiation in matter. In X-ray thickness gauges the beam of an X-ray source is directed perpendicular at the material to be measured e.g. the steel or aluminum strip. On the other side of the material the intensity of the radiation that passes the strip is measured with a suitable detector. The measured radiation intensity depends on the absorbing material (Al, Fe, Zn, etc.), on the energy of the radiation and on the thickness of the absorbing material:

$$I = I_0 e^{-\mu d}$$

Where

- $I$  is the intensity measured with the material present,
- $I_0$  is the intensity without material in the device,
- $\mu$  is the absorption coefficient and
- $d$  the thickness of the material.

The absorption coefficient  $\mu$  depends on the material to be measured and its composition and on the energy distribution of the X-radiation. A big advantage of an X-ray source is the possibility to adjust the radiation energy and thereby the absorption coefficient to the required measurement range and material properties.

For this reason the radiometric non-contact measurement method provides very precise thickness values at a very high measurement rate for automatic control and quality assurance. X-ray thickness gauges are therefore the first choice for online non-contact thickness measurement in production facilities e.g. rolling mills in the steel and Aluminium industries.

X-Ray Beam

Material to be measured

Detector

X-Ray Source

## Fast Return on Investment

Rayonic Sensor Systems GmbH designs, manufactures and services innovative measurement and control solutions for the continuous, non-contact measurement of thickness and coating thickness of metal and non-metal strip, web and sheet.

The fast and very precise measurement data continuously monitor the product quality. In connection with the automation system the thickness measurement improves and guarantees the quality of your product and saves raw materials. Further economic benefits result from the reduction of scrap and energy consumption.

## State of the Technology at Rayonic

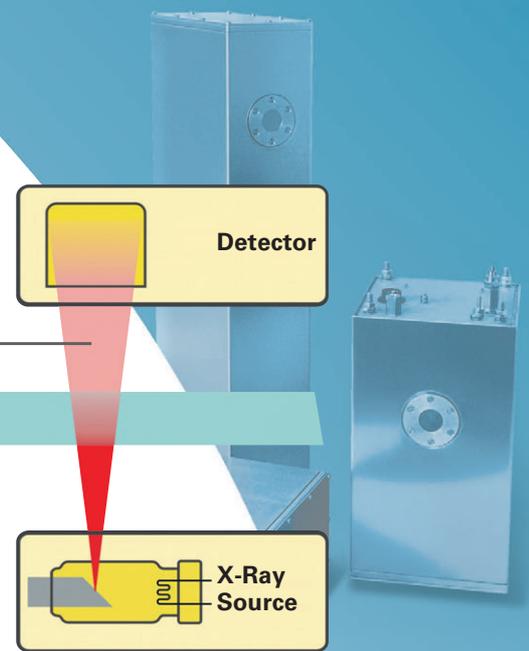
- Process electronics based on an Industrial PLC with all standard interfaces (Ethernet, Profibus etc.) facilitate a fast and cost effective adaption to the mill requirements and integration into the automation system.
- X-ray sources and sensors in sealed stainless steel housings with thermal insulation and cooling
- Metal-ceramic X-ray tubes operated at about 30% of the maximum ratings (voltage and power consumption) guarantee high stability and lifetime.
- Cables and hoses of fire retardant type and resistant to mill coolant and other aggressive fluids
- Electrical shutter for radiation with monitoring of stop positions and movement time
- Ionization chambers with noble gas filling for fast, stable and precise response, long lifetime and high availability
- 24 VDC operation of X-ray sources and sensors because of internal high voltage generation
- Client-server technology for visualization and long term data storage for the required plant and gauge configurations

## What Rayonic Can also Do

The RLC-40 is a newly designed X-ray gauge for continuous and contact-free measurement of basis weight and thickness for production processes and machines that for economic reasons previously could not use online measurement technology. With the new cost-effective system Rayonic offers an ideal solution process control and quality assurance e.g. for non-woven, technical textiles, insulation materials, ornamental glass and cast glass, flooring material etc. The RLC-40 could also be turned into a mobile system for use at different production lines or in industrial vehicles e.g. harvesters.

The essential features are:

- Compact size
- Ideal for upgrading existing lines
- Robust design for harsh environmental conditions
- Up to 50 °C ambient temperature with passive cooling
- X-ray source with max. 40 kV, 0.25 mA
- Proven high stability emission control
- Customization on demand



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