

# MAHLO FMX

## a revolutionary control concept for Calenders

by  
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### Abstract:

Basis weight / thickness measurement and control of calendered sheet material is widely recognized as a must in this industry, to save raw material and to guarantee a high product quality. Automatic calender left/right gap control is vital to reduce out-of-range product after a material change or machine maintenance.

Conventional BETA transmission weight gauging units, with either one or two scanning measurement heads, have proven to be the method of choice because of their extremely high measurement accuracy (typically < 0.25%) in combination with fast scanning speeds, to allow for fast control.

However as these are transmission units, requiring access to the web from both sides, they can only be installed about 3 – 5 m downstream of the calender, thus wasting precious reaction time.

MAHLO GmbH & Co. KG, the well known measurement and control specialist for all web based products and active since 1945 in these industries, has recently developed a unique gauging system for very accurate and fast measurement of all web based material, directly on calender rolls:

### MAHLO FMX: contact-less X-ray measurement on steel rolls:

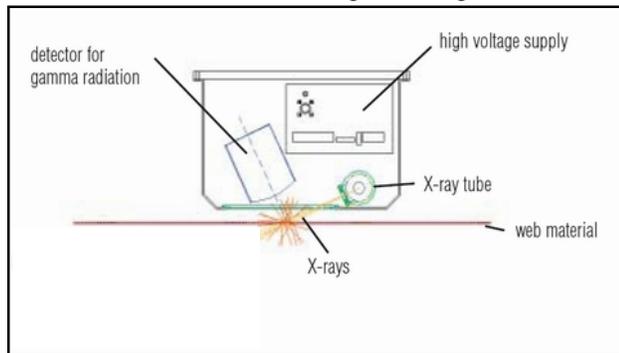
MAHLO's newest weight gauging unit is single sided, using the x-ray backscatter principle. It is not using isotopic sources, but a high-energy x-ray tube operated



at 65 KV for minimum product composition sensitivity and best possible measurement accuracy in combination with small time constants, to allow for fast scanning across the web. For maintenance or transport of the unit, the x-ray tube can easily be powered off, avoiding any kind of exposure of machine or service personnel to unwanted radiation.

The measurement accuracy of the backscatter unit will typically get better to higher weights, and can be as good as  $\pm 0.1$  % of reading! Here a short description of the x-ray backscatter principle:

X- rays from a tube are directed onto the web material, and a certain amount of them are backscattered by interaction with its atoms (COMPTON effect). Most of the radiation will pass through the material and has to be absorbed by using a special beam collector facility. However, the backscattered fraction is large enough to generate a sufficient count rate in the detectors for a very precise measurement of the materials basis weight. Other than for a transmission measurement, the x-ray induced detector signal corresponds linearly to the basis weight of the web. The system can compensate for effects caused by variations in the product's pass-line, temperature and self-absorption. For products with a known density, the system can also be used to determine product thickness with a very good measurement accuracy (cast film, PVC, etc.).



Schematic drawing of the MAHLO FMX



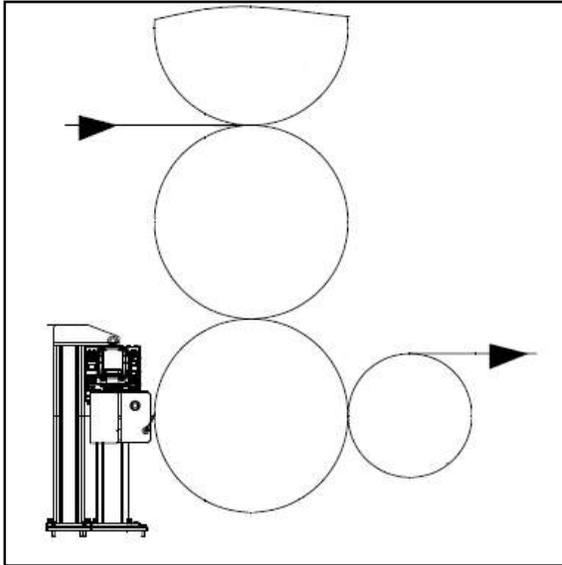
Installation picture of a MAHLO FMX sensor with Uniscan, working against a precision steel roll

A special feature of this type of weight (and thickness) measurement is the ability to measure the product directly on steel rolls, such as calender rolls. The backscattered photons from the steel can clearly be differentiated from those being reflected from the product itself from their energy level, and thus be filtered out. The very small disadvantages resulting from a slightly higher noise level of the measurement are easily compensated by the very precise positioning of the web, when running on the precision rolls.

**The new Calender Control Concept (CCC): measuring as soon as possible!**

MAHLO's new control concept is based on the idea, to improve the control performance significantly by moving the measurement head as close to the calender rolls as possible, minimizing the reaction time between measurement and sheet creation substantially and thus allowing for much faster control reactions.

The following schematic drawing is showing the huge advantage from an installation of the gauging system so close to the calender:

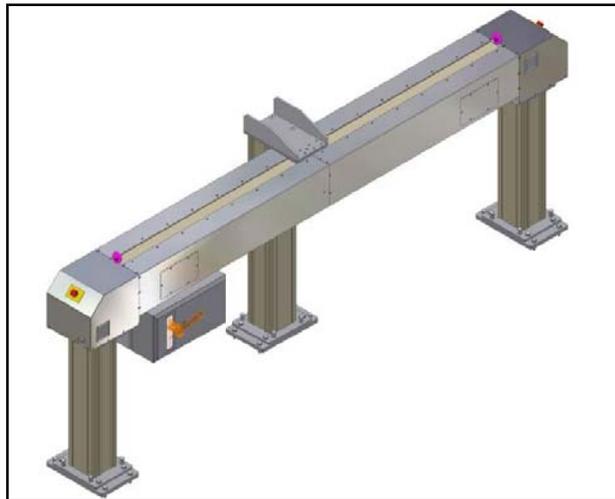


Example of an installation schematic of a MAHLO FMX on a 3-roll calendar

Conventional BETA gauges cannot compensate this huge advantage of the MAHLO FMX, not even by using more than one measurement heads! At a line speed of 20 m/min, the sheet will be measured **after less than 5 seconds** typically, while the time delay will be about 4 – 5 times higher for a BETA gauge, installed several meters downstream. In other words, the FMX will have the chance to react to deviations from target, adjusting the calendar gap or the extruder speed, already long time before any other gauging system will even be able to see them. The slower the web, the bigger this advantage, and vice versa.

As the perfect combination to this revolutionary measurement principle, MAHLO designed a new series of single sided scanners for it, known as the UNISCAN series.

These new scanners can accommodate web width of up to **12 meters**, by using heavy-duty extruded aluminium beams of high stiffness and low weight, in combination with additional support stands in the middle (only possible because of the single sided layout). These scanners are designed for continuous scanning speeds of up to 500 mm/sec, making it possible to scan a 2500 mm web in less than 6 seconds (left to right, including break down time).



**Summary:**

With the MAHLO FMX system, MAHLO is offering a superior measurement and control system for all calendered sheet products, resulting in better control of the product and thus for less rejects and a higher product quality overall. Installations of the new system will allow better to quantify these advantages, proving that the MAHLO FMX will achieve better ROI cycles than any other system on the market today.