

COATING MEASUREMENT (BASIS WEIGHT/THICKNESS) ONE- OR TWO SIDED MEASURING GAUGES

Application : Painting, coating measurement on metal strips as it is often encountered in the aluminium or steel processing industry.

To measure the painting material basis weight the beta-rays in backscattering method is applied as shown in Fig.1.

As source material is utilized either Promethium (Pm(47) o Krypton (Kr85).

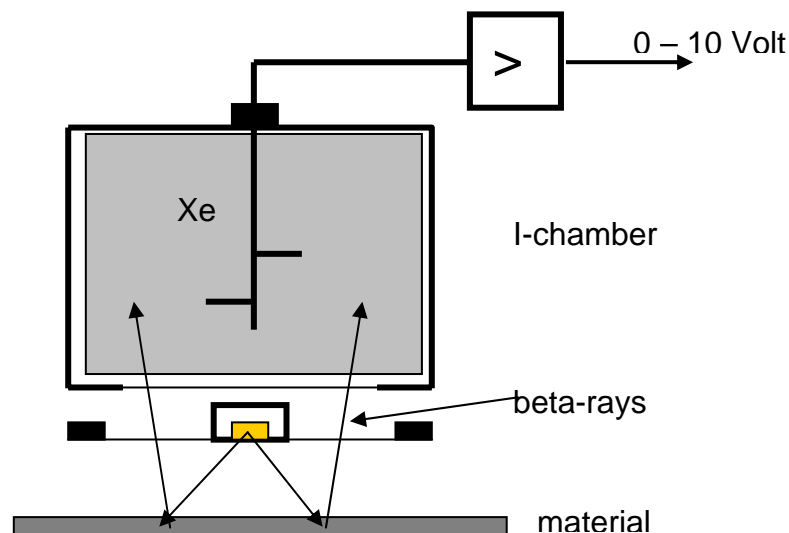


Fig.1 : Backscattering scheme of beta-rays

As depicted the radiation source -placed in the center of the ionization chamber- emits the beta particles toward the painting layer whereby they become backscattered at angles between 0 and 180 and reach the chamber generating a measuring signal 0-10 Volts in direct relation to the coating thickness or basis weight.

The gauge has to be calibrated according to the atomic number of material.

The greater the atomic number and the thickness of painting material the stronger is the measuring signal.

The measuring effect follows the typical exponential relationship (1)

$$V = V_o * [1 - \exp(-a*Q + b)] \quad (1)$$

With Q = the basis weight of painting

a , b = calibration constants for atomic number of material and backscattering of the rays in the air

V_o = constant considering infinite thickness or signal at saturation weight.

Typical saturation weights are 40 gsm for Pm147 and 400 gsm for Kr85..

The relationship is depicted in Fig.2

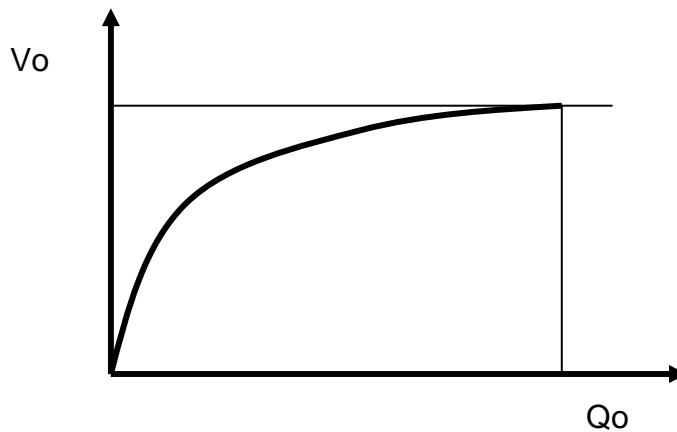


Fig.2 : typical calibration curve of backscattering rays

When painting is applied on aluminium or steel sheets -due to the different atomic numbers of aluminium or steel as base materials to the atomic number of painting- the calibration signal becomes the shape shown in Fig.3.

In Fig.3 $Z1$ is the atomic number of painting and $Z2$ the atomic number of the base material (aluminium or steel)

The receiving measuring signal is always typical for the base material under saturation and the painting. Different paintings result in different calibration curves.

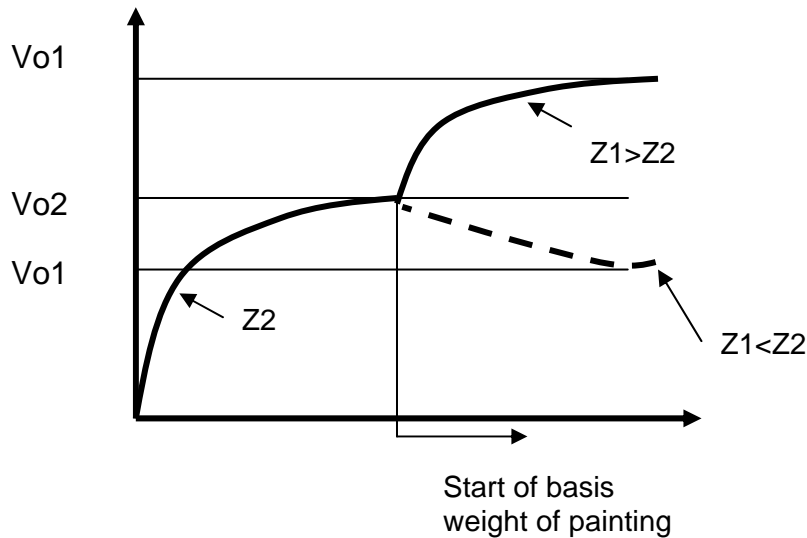


Fig.3 : Signal shape of painting measurement on aluminium or steel

In case of base material changes (e.g. variation in aluminium alloys or steel compositions), these changes have to be compensated. In order to compensate a difference measurement has to be applied. To do that the base material has to be measured and the difference before and after the painting has to be determined.

A same spot synchronization measurement between the gauges may become necessary.

To minimize errors attention should be paid to the gauge measurement geometry.

Typically the measuring gap between gauge and material should be kept constant (± 0.5 mm) which can be accomplished when the measurement occurs against a fixed guide roll or the gauge operates between stabilizing guidance rolls.