EMG

VISION FOR AUTOMATION

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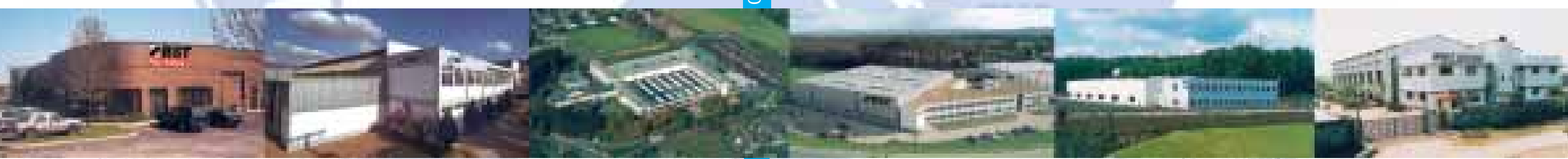
elexis Group



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EMG/ST-V/Quality during continuous strip processing/EN/Docu-Index: 29098-00/06.2003/Printed in Germany/Subject to modification

Quality

during continuous strip processing ...

EMG

EMG Servo-Technique

Guarantees:

- up-to-date technology
- low-cost solutions
- maintenance-free components
- high reliability
- satisfied customers worldwide

Quality

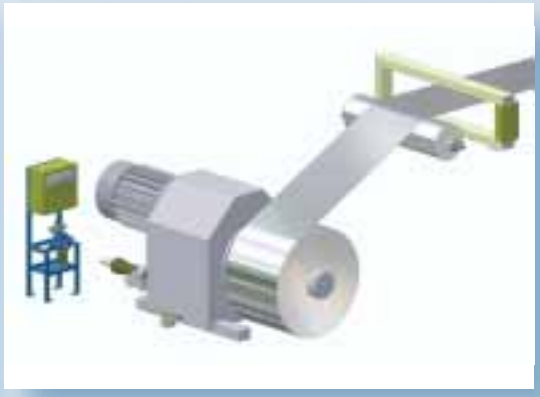
during continuous strip processing...

is the core principle of our company,
from development via design, production and
final inspection up to installation on site.
Within the contents of this brochure we would
like to present to you this quality during
continuous strip processing

please accompany us!

Guiding on the uncoiler

... with the sensor mounted after an anchor point



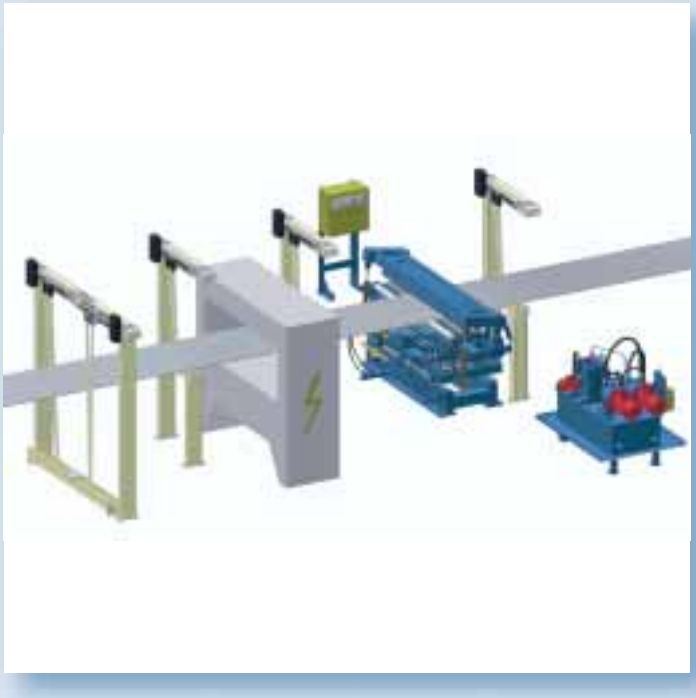
Modern fully automated lines, with coil handling equipment in close proximity to the mandrel, frequently leave insufficient space for the sensor, and it has to be positioned after the deflector roll (anchor point). Thus a time delay between the movement of the mandrel and an answer in the sensor is generated. This leads particularly at slow strip speeds to control loop instability. By using a method patented by EMG which takes into account the strip speed which holds the mandrel in a position control loop a stable control system is possible. Fast dynamic errors cannot be compensated for due to a small degree of indolence in the system.

If a strip centre or strip edge guiding system is provided on the uncoiler, the uncoiler moves the coil, from which the strip is being uncoiled, transversally to the line axis and thus acts against lateral deviation of the strip.

Deviation of the strip from the reference position is detected by the sensing equipment and transmitted to the electronic control amplifier. The output of the amplifier continuously activates a servo valve which moves the hydraulic cylinder of the uncoiler accordingly, so that the uncoiled strip is returned to the position preselected on the sensing equipment. For control reasons, the sensing equipment should detect any strip deviation close to the uncoiler. The high-frequency alternating light sensing equipment, which is impervious to ambient light, allows a maximum distance between the receivers and the light source of 4 m. For production lines with a side trimmer or slitter installed immediately downstream of the deflector roll, we can offer an alternative by coupling the uncoiler and the deflector roll mechanically or electrohydraulically. This has the advantage that guiding with a very high degree of precision is achieved when using a precise sensing system, e. g. a BMIH inductive strip centre sensing system.

In lines where the distance to the trimming or slitting knives is greater, an additional steering unit should be installed upstream of the knives and connected to the uncoiler control system, see: HQT-System (page 16).

Strip centring on welding and strip joining machines



In the entry area of continuous strip processing lines the tail end and the head end of two strips are joined together, this being carried out using welding or strip joining machines, depending on the material and gauge of the strip and on the line design.

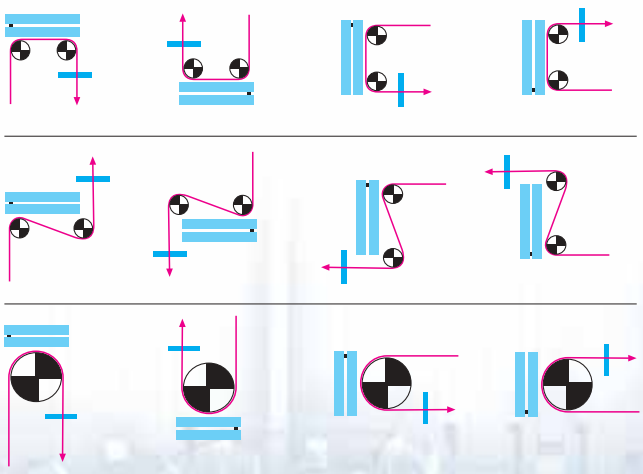
Modern welding or strip joining machines include systems for fully automatic centring upstream and downstream of the welding or strip joining machine. Mechanical centring devices are mainly used but there is a high risk of damaging the strip edge.

The space-saving EMG system which brings the strip tail end in line with the strip head end has often proved to be a suitable method, especially in the case of a retrofit. The sensor system installed upstream of the welding or strip joining machines senses the width and position of the new strip. Based on these values and on the registered width of the tail end of a processed coil, the photocells downstream of the welding or strip joining machine are positioned accordingly. Centring of the strip tail end in respect to strip axis and angularity is then carried out by the centring unit which positions the strip to suit the photocells downstream the strip joining machine by using a clamping beam. The tail end must be isolated from the strip in the following process to allow alignment in respect of centre axis and angle. This can be assured by an external strip accumulator device or suitable use of existing drives.

Depending on available space in existing processing lines the system can also be designed for bringing the strip head end in line with the strip tail end.

Strip Control by Guide Frames - Proportional Guide

The two deflector rolls required for bridging strip pass line between accumulator and strip process section are used together with the SRD steering unit, which acts merely proportionally. This type of steering unit can be installed in tight line areas, as it only requires very short free entry and exit spans to the next deflector rolls.

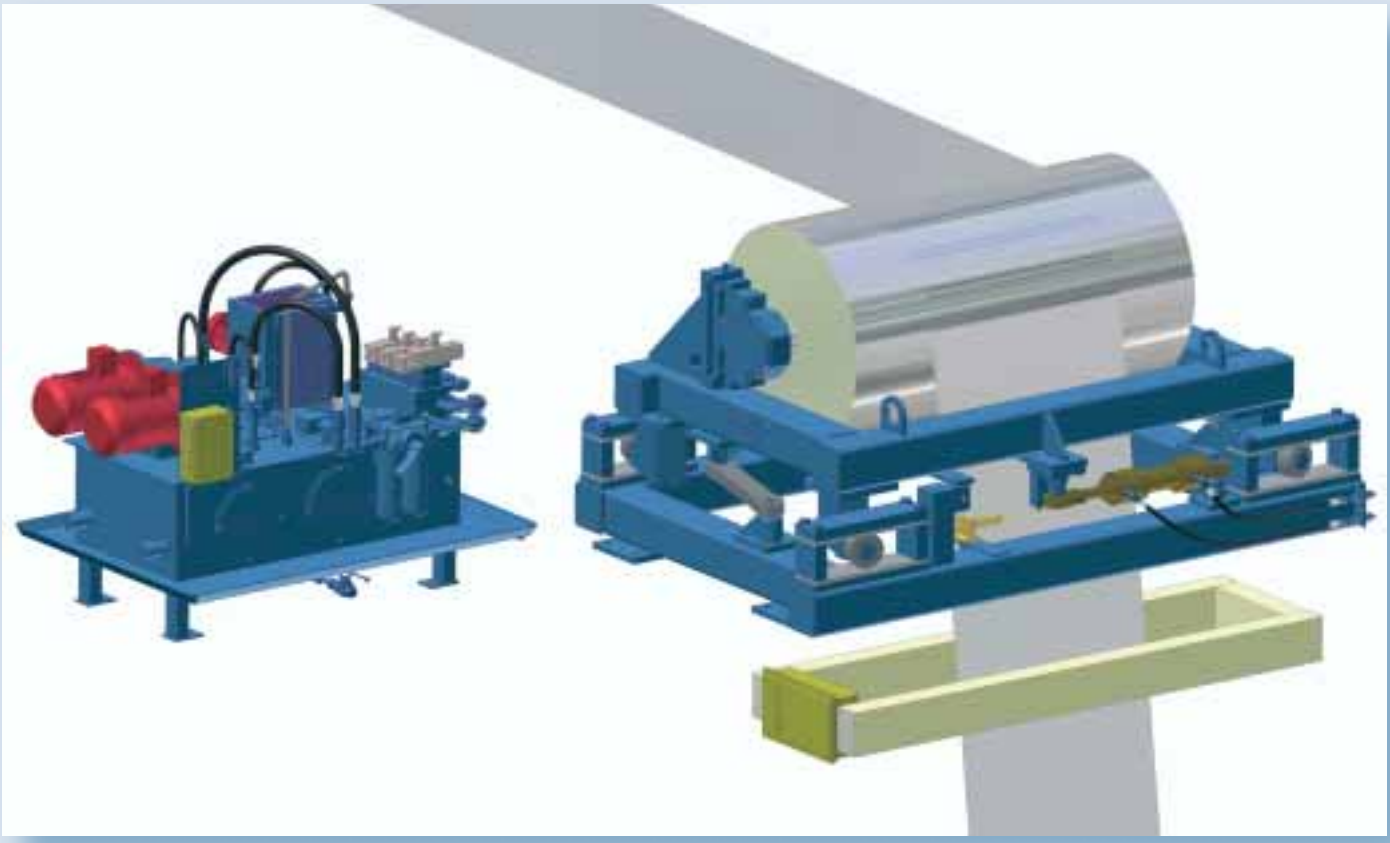


The strip centring effect is such that the steering unit rotates around a pivot in the plane of the incoming strip, whereby the outgoing strip is shifted laterally. If the incoming strip is misaligned, the correction cannot be seen on the steering unit rolls but the outgoing strip will be corrected to the predetermined point.

Movement of the strip is corrected proportionally to the regulating distance of the adjusting frame - the incoming and the outgoing strip forms a right angle with the swivelling plane. The maximum correction capability is determined by the distance between the incoming and the outgoing strip pass line level.

The maintenance-free inductive strip centre sensing system type BMI is installed immediately downstream of the steering unit.

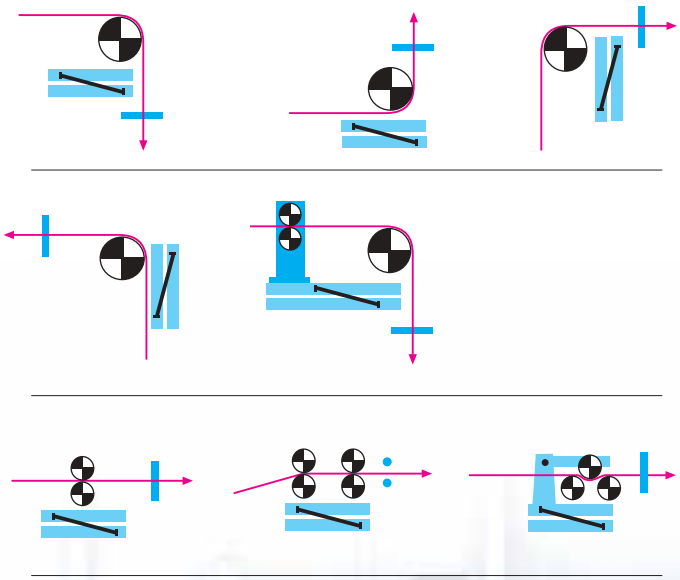
Strip Control by Guide Frames - Proportional Steering Guide



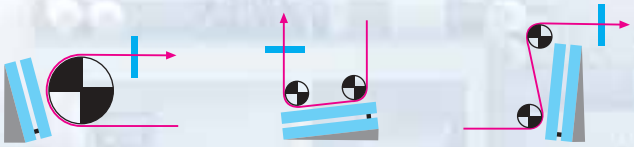
The function of the SRH steering unit is to feed the strip in a well centred manner into the strip accumulator. Following travel over a long free strip entry span, major strip deviations may be corrected on a 90° deflector roll equipped with this guiding system, making use of the advantages of the wrapping effect. For the exit span, twice the maximum strip width is sufficient. In the case of long entry and exit span, the system can also be used together with a 180° deflector roll.

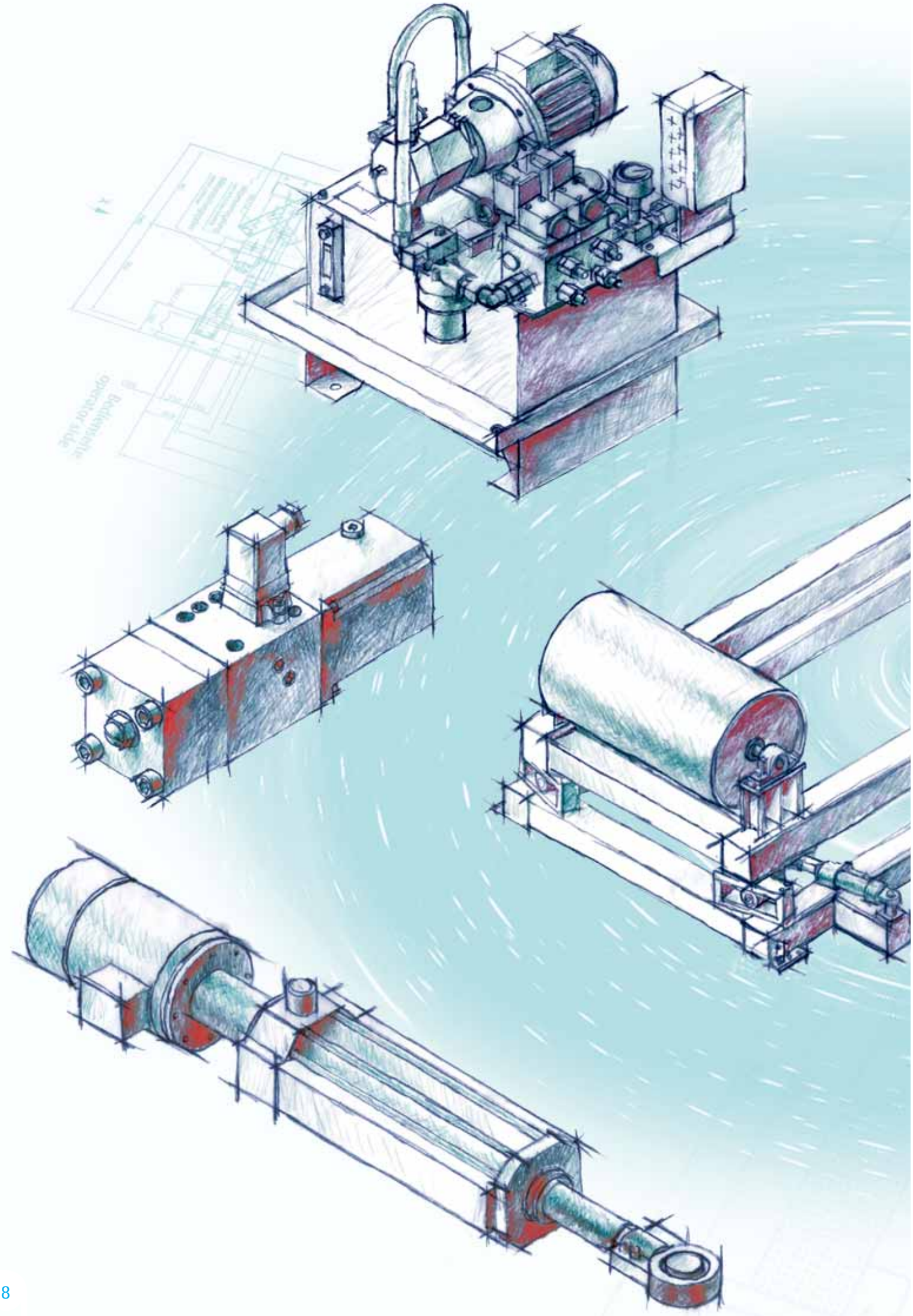
The tilting frame with its deflector roll is guided by two steering levers so that a suitable combination of the angle between the strip and the roll axis (I portion) and lateral displacement of the strip (P portion) is achieved. In addition to obtaining the exact position of the strip at the exit, a centring effect is also achieved at the entry span.

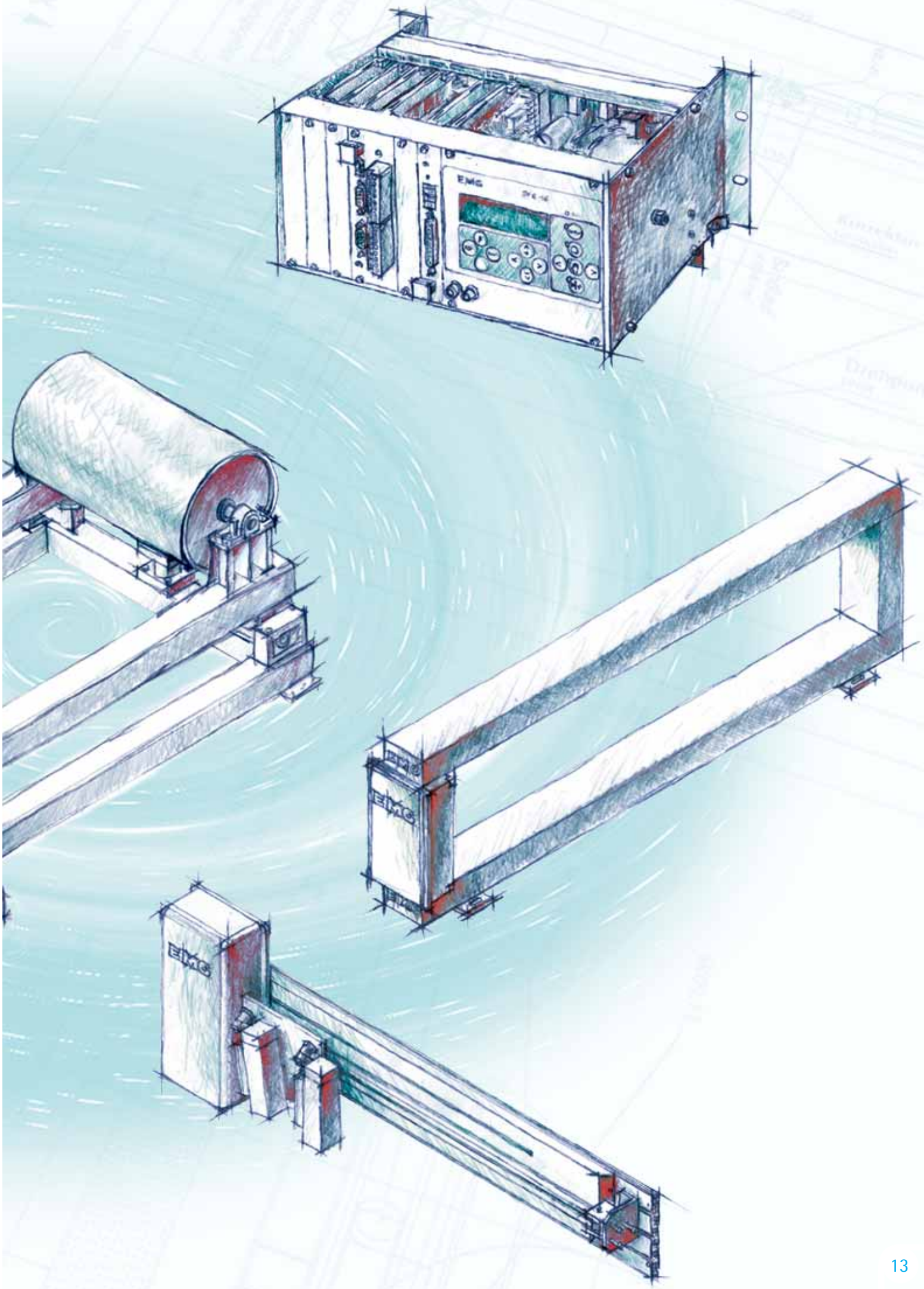
The maintenance-free inductive strip centre sensing system type BMI is installed immediately downstream of the steering unit.



Proportional steering (PI) behaviour by proportionall guides mounted at an angle



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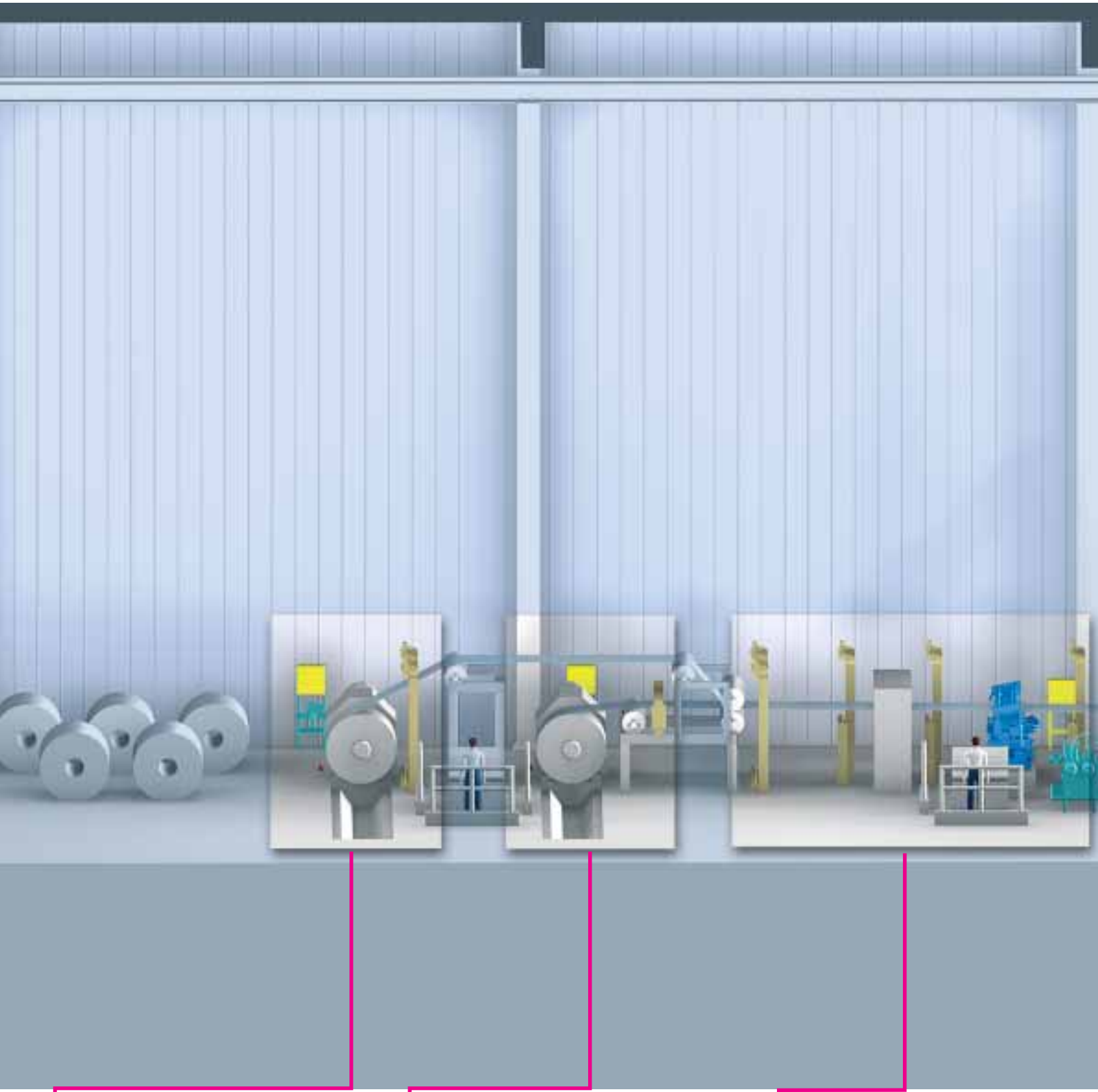


Guiding on the uncoiler

Strip centre or strip edge guiding directly on the uncoiler with optical detection of the strip position.

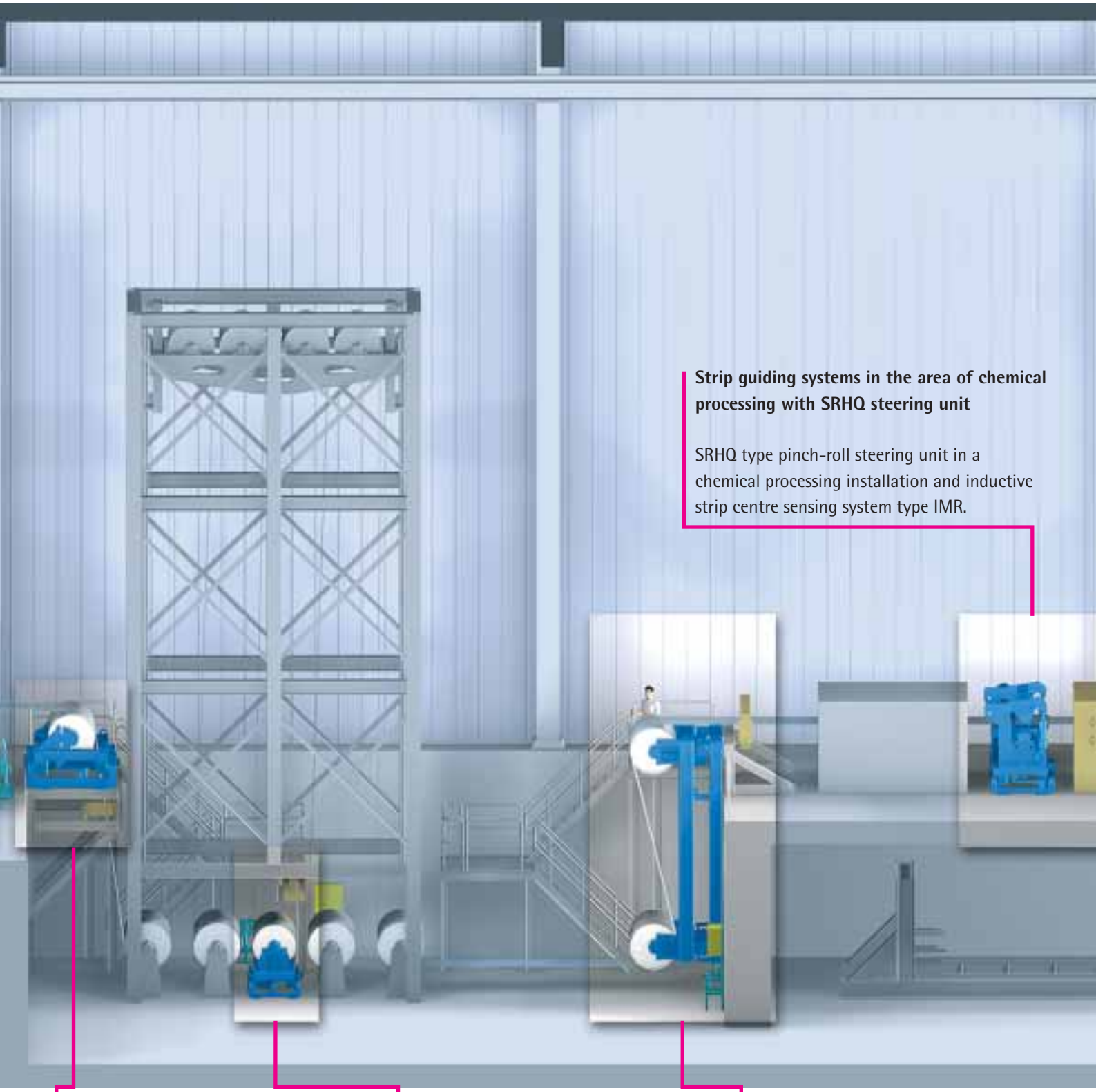
Strip guiding on the uncoiler with remote sensing position

Strip centre guiding system on the uncoiler with inductive strip centre sensing downstream of the stationary deflector roll.

Strip centring on welding and strip joining machines

Space-saving strip centring for welding and strip joining machines.

Virtual Line Layout with



Strip guiding systems in the area of chemical processing with SRHQ steering unit

SRHQ type pinch-roll steering unit in a chemical processing installation and inductive strip centre sensing system type IMR.

Strip guiding system upstream of the strip accumulator with SRH steering unit

SRH steering unit used on a 90° deflector roll.

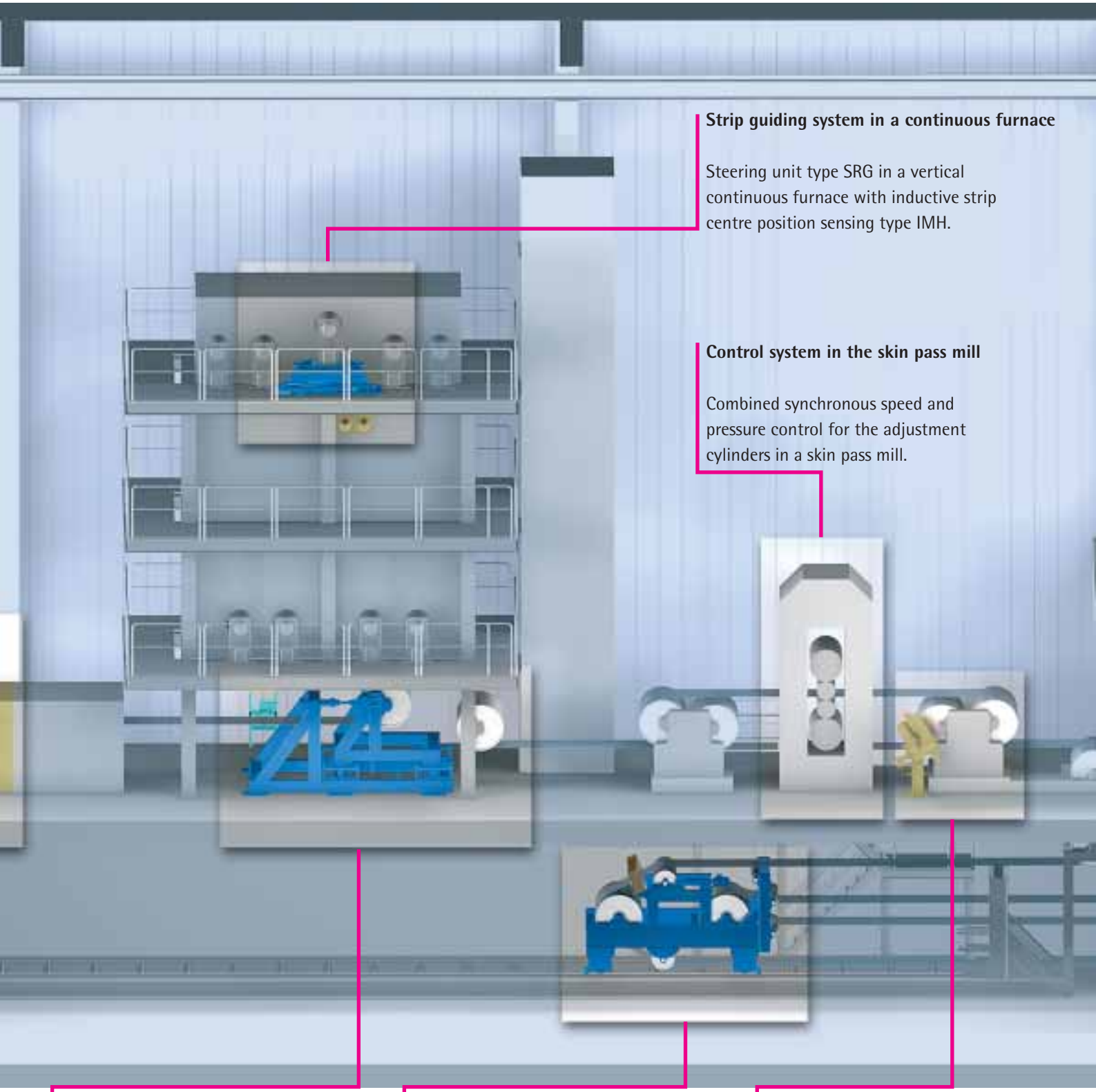
Strip guiding system in the strip accumulator with SRW steering unit

Use of an SRW steering unit inside a vertical strip accumulator where space is limited.

Strip guiding system downstream of the strip accumulator with SRD steering unit

SRD steering unit, used on two deflector rolls for changing strip pass line levels between accumulator and strip process section.

EMG Control Systems



Strip guiding system in a continuous furnace

Steering unit type SRG in a vertical continuous furnace with inductive strip centre position sensing type IMH.

Control system in the skin pass mill

Combined synchronous speed and pressure control for the adjustment cylinders in a skin pass mill.

Dancer roll

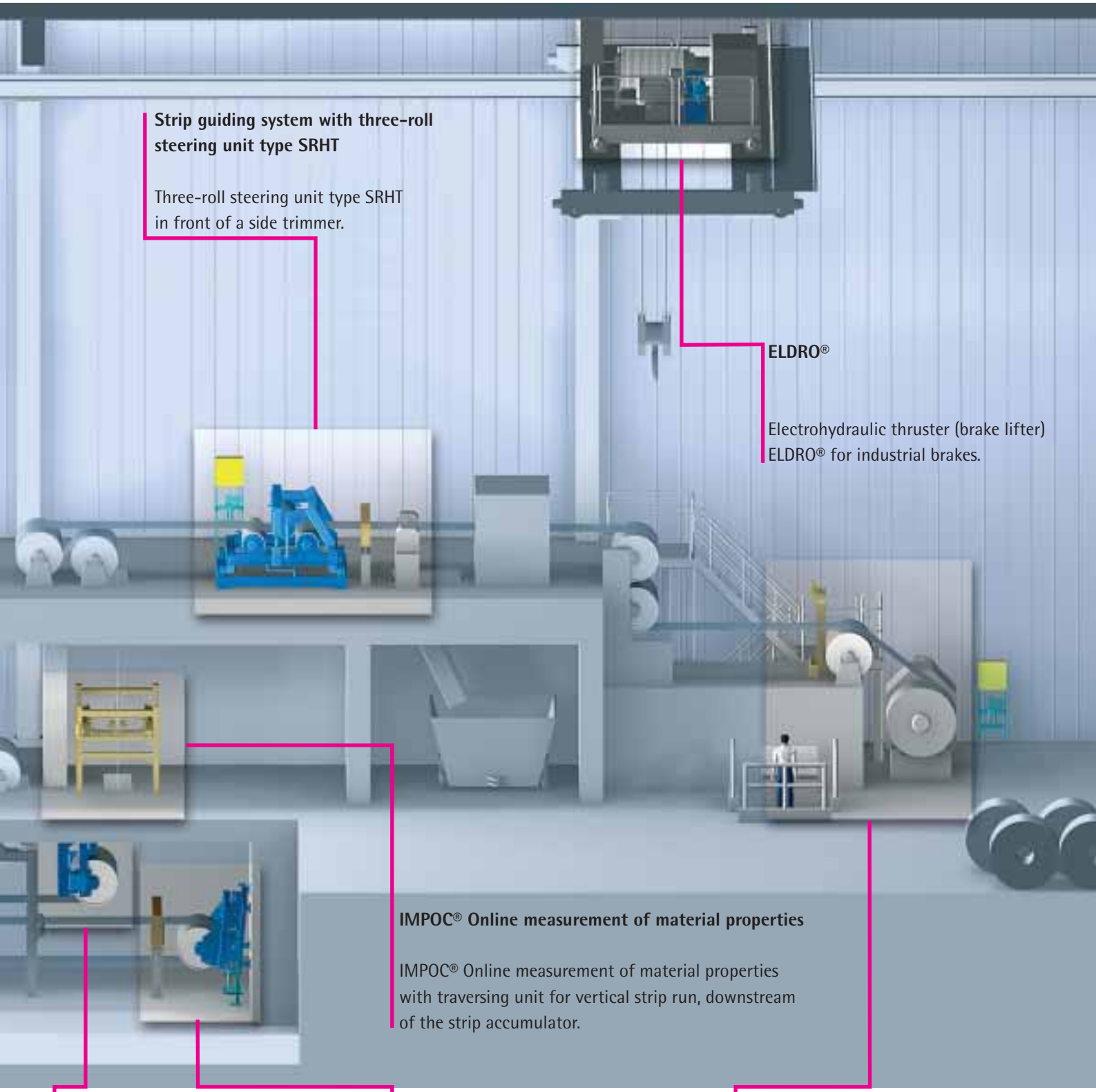
Dancer roll assembly in front of a continuous furnace for exact control of the strip tension and compensating for variations in strip length.

Strip guiding on the looper car with SRE steering unit

Use of an SRE steering unit with end bearing on the looper car of a horizontal strip accumulator.

SORM 3plus Online Roughness Measurement

Roughness measurement SORM 3plus immediately downstream of the skin pass mill.



Strip guiding system with three-roll steering unit type SRHT

Three-roll steering unit type SRHT in front of a side trimmer.

ELDRO®

Electrohydraulic thruster (brake lifter) ELDRO® for industrial brakes.

IMPOC® Online measurement of material properties

IMPOC® Online measurement of material properties with traversing unit for vertical strip run, downstream of the strip accumulator.

Strip guiding downstream of the strip accumulator with SRH18 steering unit

Compact steering unit type SRH18 in the exit of the strip accumulator.

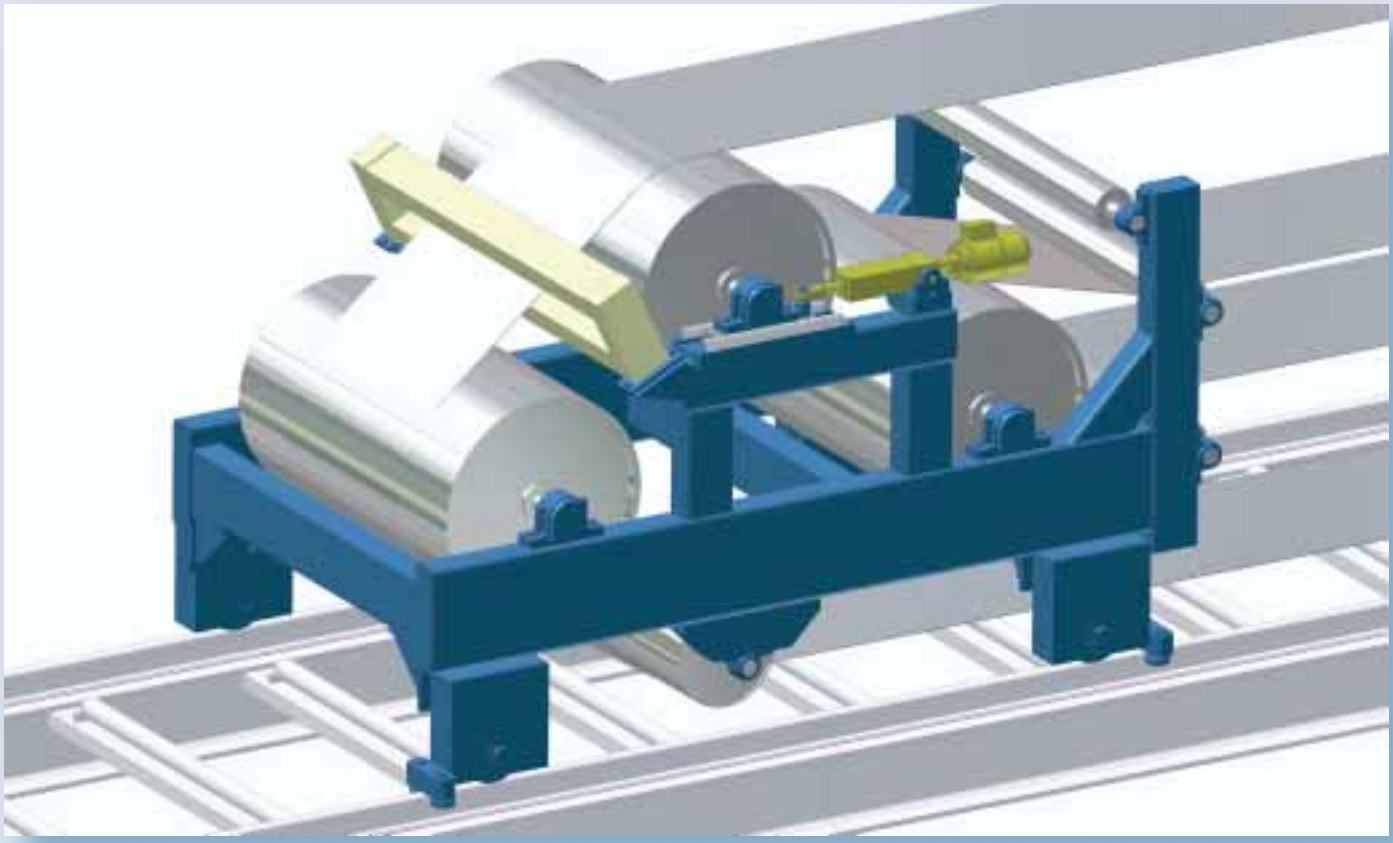
Strip guiding in the strip accumulator with SR steering unit

SR steering unit with stationary deflector roll in the horizontal strip accumulator, inclined for increased correction capacity.

Strip guiding on the recoiler

Strip edge guiding on the recoiler, design without a mechanical link between the sensing system and the recoiler.

Strip Control by Guide Frames - Steering Guide



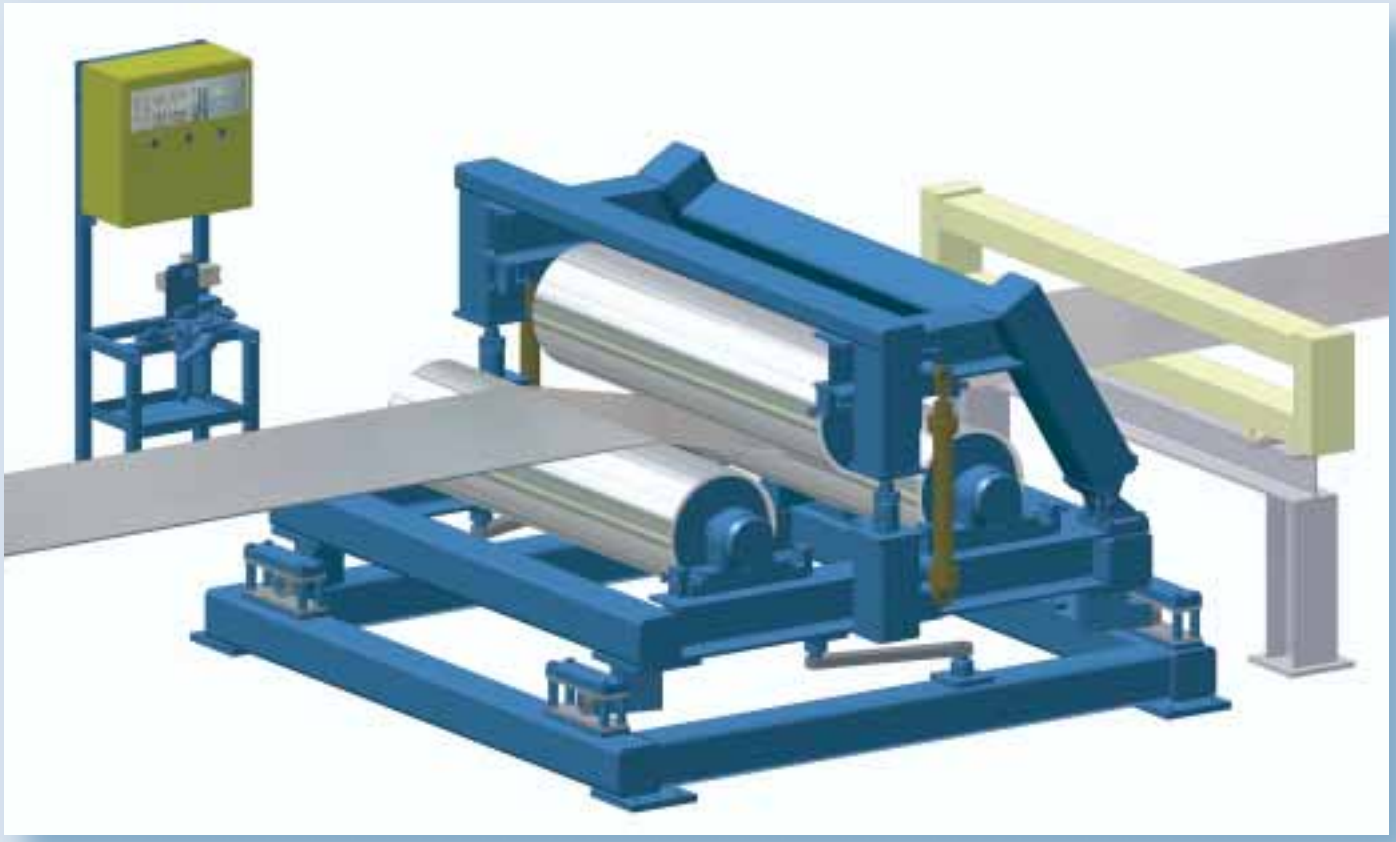
The steering guide is used to re-align strip where a long free span on the entry side of the guide demands the benefits of back steering. The method of steering utilizes the fact that strip tends to align itself at right angles to the axis of a roll.

With a pure steering guide for example end pivot or centre pivot overshoot of the roll occurs.

With the EMG electronic feedback system stable operation without overshoot is guaranteed.

Strip guiding system

in front of a side trimmer with three-roll steering unit type SRHT

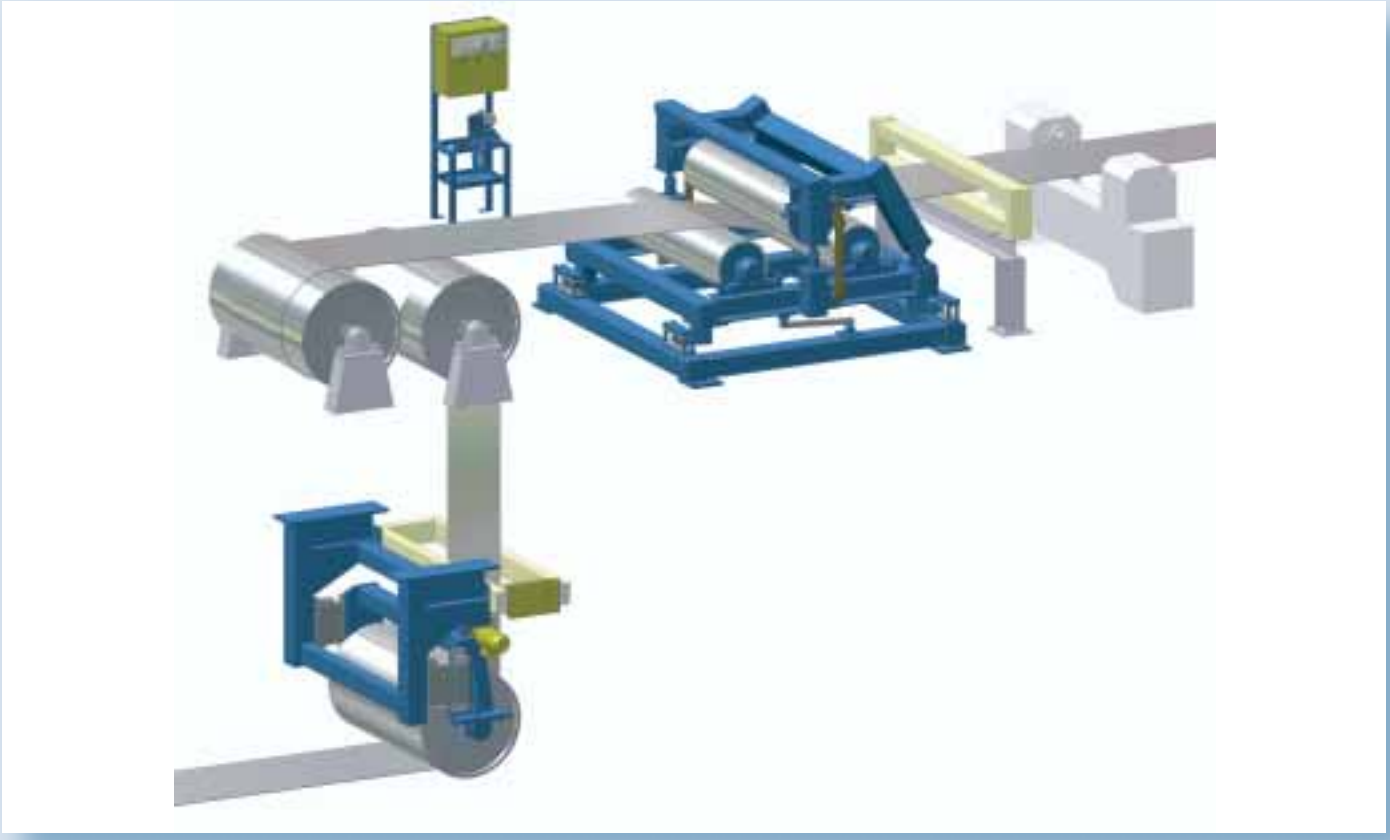


In the case of high strip tensions and/or thick strip it is recommended that a strip guiding system with a three-roll steering unit type SRHT is used for correcting strip travel without deflection of the strip. Achieving a good steering effect necessitates sufficient friction between strip and rolls. The degree of friction is determined by the roll diameter and the dive in position of the mid-roll.

The swivelling frame with the three rolls is guided by two steering levers so that a suitable relationship between the angle formed between the strip and the roll axis (I portion) and lateral displacement of the strip (P portion) is achieved. In addition to obtaining the exact position of the strip at the exit, a centring effect is also achieved at the entry span. The application shown here with a very short entry distance can only be realised in combination with an upstream strip guiding system, see: HQT-System (page 16).

The most stringent requirements concerning exact guiding of the strip are imposed in the area of side trimmers. On the one hand, the width of the edge to be cut off must be kept as small as possible, and on the other hand, there must be a defined minimum width to prevent the cut edge from tearing off. For exact sensing of the strip position, the high-precision inductive strip centre sensing system type BMIH as shown here or the HF alternating light measuring system, impervious to ambient light, is recommended.

High Quality Twin (HQT) Guiding System



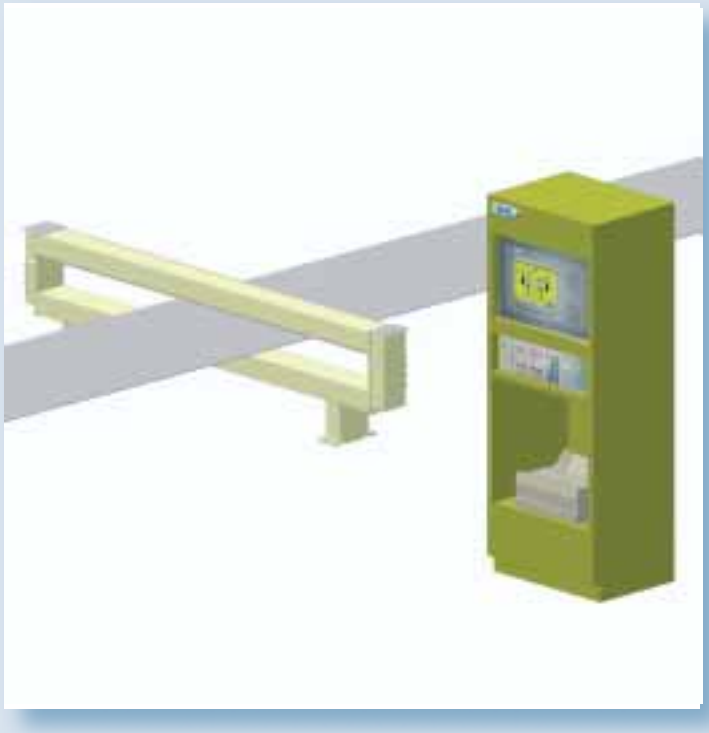
The HQT system is used where high-precision guiding of the strip is required, e. g. upstream of side trimmers or slitters. It is composed of two independent strip guiding systems, i. e. either guiding on the uncoiler together with the next steering unit or two strip guiding systems in a processing line.

The first strip guiding system (rough guiding) corrects the incoming strip as far as possible. The second strip guiding system (fine guiding), which corrects subsequent slight deviations, is installed immediately upstream of the critical area.

Any strip deviation causes the fine steering unit to counteract and correct the strip. This movement is continuously monitored. By taking into account the strip speed and distance between the two guiding systems a variable offset is generated and automatically fed back to the rough steering unit to offset the strip guiding position. This ensures a strip entering the fine steering unit very close to centre and nearly under 90° at the trimmer knives.

The fact that the second guiding system carries out only slight corrections makes the system suitable for use on installations where the strip entry distances are relatively short.

Strip Centre Guiding and Strip Width Control



High-precision inductive strip centre guiding and strip width control type EMI

A high-precision strip centre guiding system with an accuracy requested of better than ± 1 mm and/or the measurement of the strip width, or the sensing of the strip edge positions is achieved by means of the inductive centre guide/strip width sensing frame type EMI.

The compact measuring frame made from anodised extruded aluminium section is provided on one or on both strip edges with inductive sensors moved by an electric motor. In the lateral part, the two sensors arranged below and above the strip are mechanically coupled by means of a synchronising shaft, and they follow the strip edge in a rigid position control loop. Their position values are continuously signalled by an integral path encoder. Based on these position values and the sensor covering, the positions of both strip edges are calculated. The evaluation and drive electronics including the digital strip controller are installed in a separate housing.

High-precision strip centre guiding and strip width control - Optical

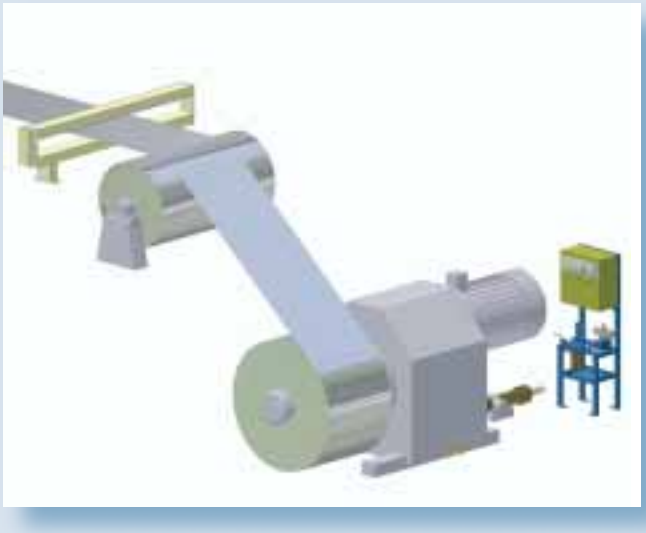
Should the measurement of the strip width be of highest precision, the optical strip width measurement is recommended.

The strip edges are detected on either side of the strip by motor-driven receiver adjusting devices which are equipped with HF alternating light measuring devices. Lamp units with a high-frequency supply are installed, so that the measuring signal is impervious to ambient light. If the position of the strip edges changes as result of a variation in the strip width or in the lateral strip position, each measuring equipment follows the strip edge to which it is assigned, following a defined position control loop. The movements of the adjusting slides are measured without contact by a digital absolute encoder and transmitted to the computer. The difference between the positions of the two adjusting slides corresponds to the strip width.

Temporary position changes of the measuring receivers in the phase of strip movement are also read into the computer and taken into account, so that the strip width is determined in an unbiased manner in any operating mode.

Strip guiding on the recoiler

without a mechanical link



Strip guiding on the recoiler ensures coils with straight lateral surfaces, which prevents damage to strip edges during further transport and handling. To achieve this aim, strip edge guiding systems are generally used. Strip centre guiding systems are recommended when the strip is coiled with natural edges and when the strip will be centrally fed to further processing stages.

Since the strip does not always leave the processing area at the same point, the recoiler follows lateral strip deviation in order to ensure straight-edge recoiling. Strip edge sensing systems for recoilers must always be installed in the immediate vicinity of the deflector roll and be connected to the movable part of the recoiler. This connection may be mechanical or, as shown in this example, electronic synchronising of sensor and recoiler movement may be used.

In addition, it is of utmost importance that the strip does not slip or incline on the deflector roll. An adequate wrapping angle on the deflector roll and sufficient and stable strip tension must ensure that the strip closely follows the roll contour. Large roll diameters are recommended.

For the recoiling of strip with slightly thickened edges, which is likely to occur when applying a surface coating, the strip position controller is extended to generate a stagger winding pattern in the coil build up. A constant pattern of the coil edge is achieved when taking account of the recoiler revolutions and the strip thickness.

Virtual Line Layout on CD-ROM

Your contact: