The future of belting in digital printing

Habasit Smart Printing Blanket powered by Moovimenta

Introduction

Habasit has developed, specifically for digital printing applications, a breakthrough belt with integrated position measurement system that achieves a precision of ± 10 µm.
The solution uses a novel application of magnetic linear encoding technology, advanced digital signal processing and a unique custom made machine learning algorithm.
The system accounts for factors such as ambient temperature, belt ageing effects, belt fabrication tolerances, and is independent from mechanical tolerances of the conveyor and drive system.
For printing machine manufacturers, this means up to fifteen-fold improvement in precision over current technologies.
For printers this means a dramatic printing precision increase combined with the potential for a significant productivity increase by reducing the number of passes needed for a given design.

Even if digital printing machines, compared to screen printing machines, require a belt placement that is more precise by a factor of 10, most conveyor transport systems typically use a rotary encoder based positioning system, which is placed on the conveyor driving roller delivering an indirect measurement of belt position which is negatively affected by manufacturing inaccuracies and tolerances in the motor, gearbox, driving roller and belt that negatively combine to magnify the error and limiting the maximum overall precision.

The Smart Printing Blanket sets a new industry standard in printing blanket position measuring as the usual indirect measuring on the driving cylinder roller using a rotary encoder appears now outdated compared to the new direct measuring of a magnetic signal embedded in the belt.

Habasit combined knowhow and energies with Moovimenta in order to harness magnetic linear encoding technology for direct belt measurement.
The breakthrough came by embedding magnetically readable material inside the belt. Three magnetic linear encoder sensors were placed under the belt surface and connected to an FPGA board for processing the digital signal.

To further increase system precision our engineers have developed a bespoke machine learning algorithm, which continuously acquires measurements of the belt position at different locations. The AI uses this data to create a digital twin of the belt, model belt deformations and calculate the correct and accurate reading of belt position.

The result is a continuously self-calibrating belt position measuring system that achieves a precision of ± 10 µm with a 95% confidence interval (2 sigma).

Customer Benefits

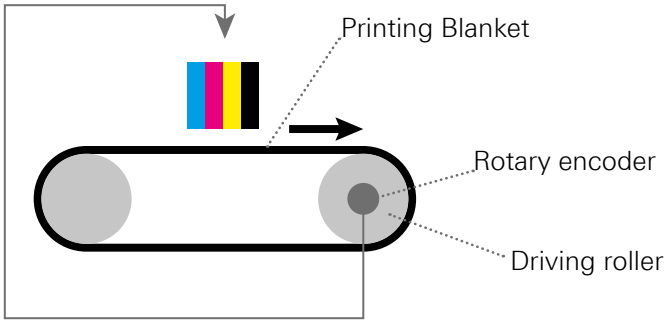
- Increases printing precision by minimizing the effects of mechanical inaccuracies
- Enables printing precision without extensive workarounds
- Increases productivity in scan type machines by reducing the number of required passes
- Keeps performance consistent over time thanks to continuous calibration
- Can easily be applied to existing machine designs

Working Principle

Industry standard approach

Indirect measurement of the belt position via rotary encoder on the drive cylinder propagates inaccuracies due to

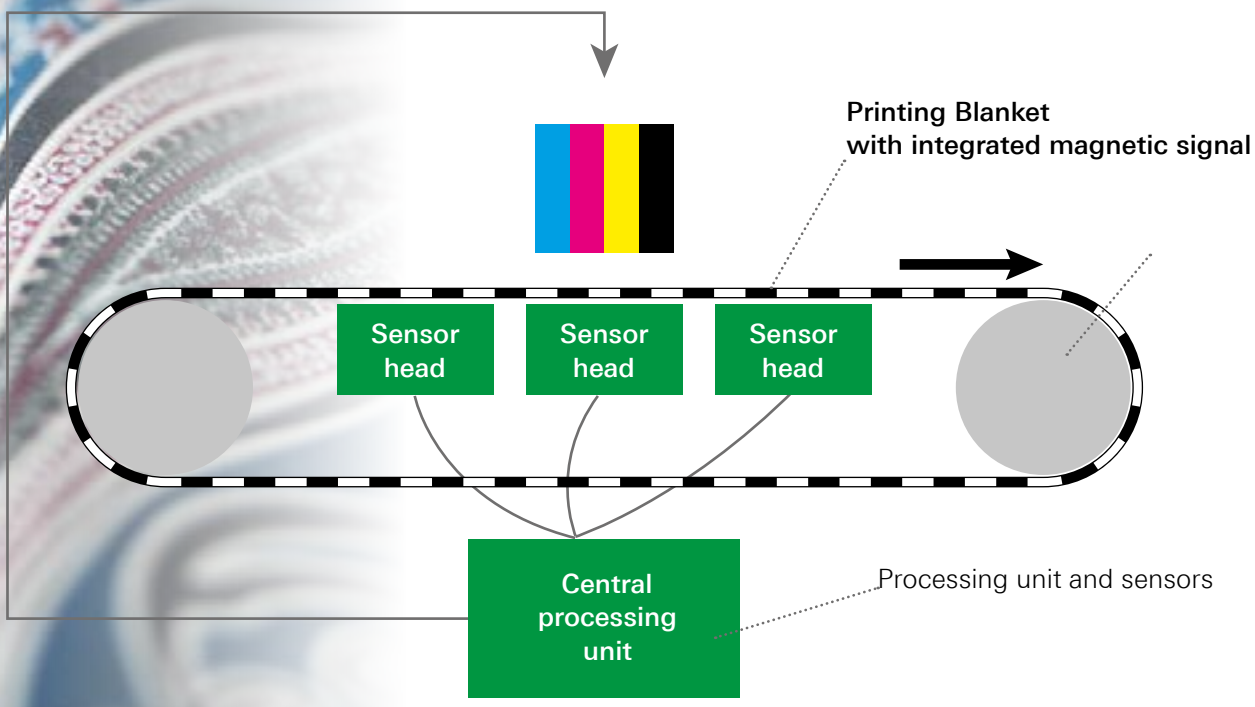
- mechanical tolerances (roller inaccuracies, gearbox play, motor play, …)
- belt effects (neutral line, joint effects, dynamic effects, …)



Smart Printing Blanket

Direct measurement of the belt position via linear encoder integrated into the belt

- **enables radical accuracy improvement**
- **no moving parts**
- **unique solution, completely developed in-house**



Product features

Imagine the future of belting in digital printing, with

Habasit Smart Printing Blanket powered by Moovimenta.

A unique patent protected solution that brings significant benefits

This new generation of smart belts allows to upgrade current machine designs in order to reach improved precision and increased machine productivity .
At the same time it opens the possibility for new machine designs that are : simpler to design, more cost-effective to manufacture, easier to transport, install and service.

Superior precision performance

- ±10µm (2σ, 95%) both in multi-pass and in single-pass applications
- Direct belt position measurement
- Sub-pixel accuracy
- Comparable to printhead jetting accuracy
- One pass scan printing ready

Automatic and continuous calibration

- Consistent precision performance over time
- Automatically adapts to changing conditions without interrupting production

Reliable & durable

- Based on the best-in-class Habasit printing blanket
- Sensors design with no moving parts

Easy to integrate

- Same output signal as commercial encoders
- Does not need machine re-design
- Sensors can be mounted above or under the belt
- The belt can be joined on the machine (same as standard belts)

Belt technical data

Belt type : ENU-50AXBD

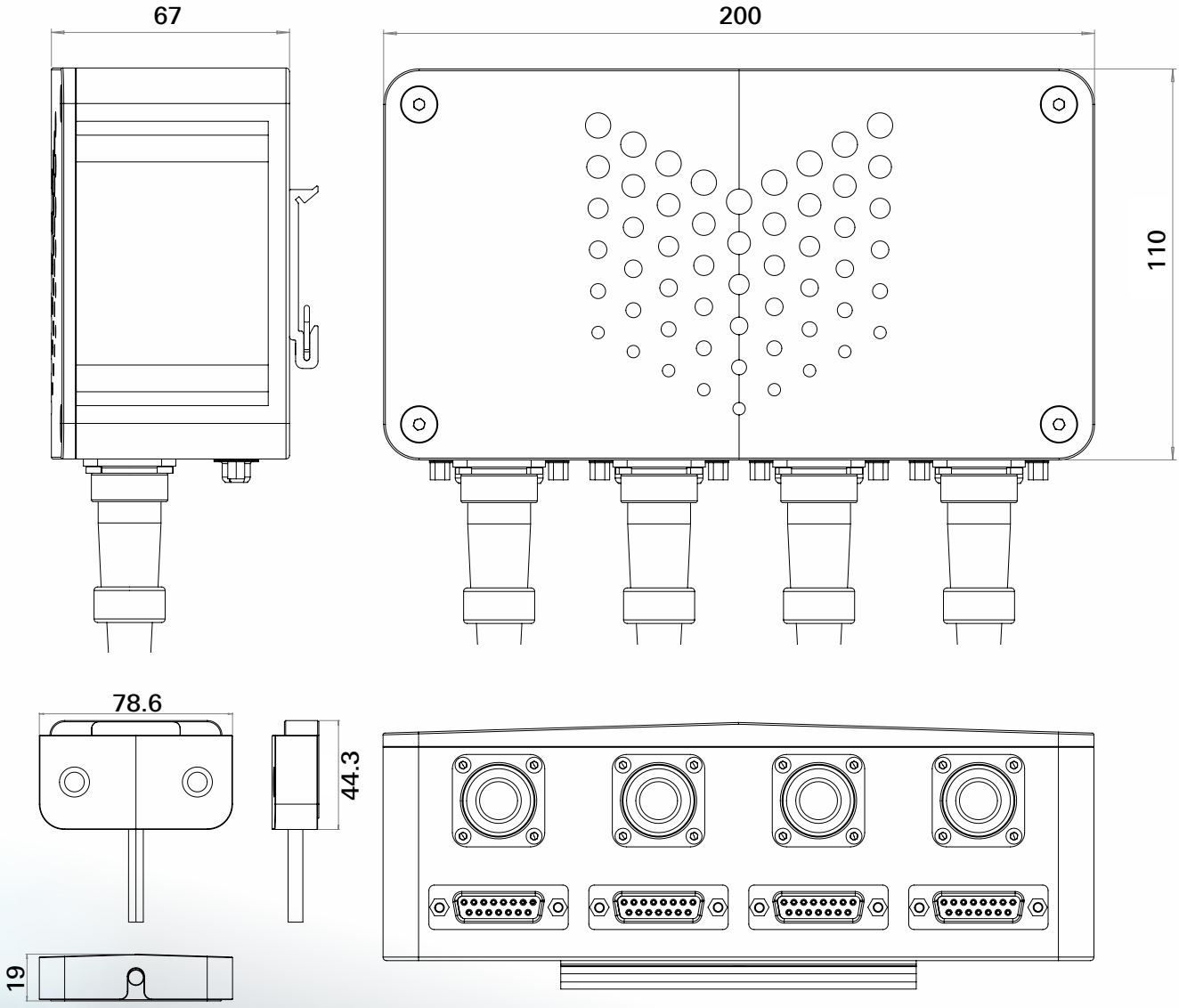
01 Conveying side: Thermoplastic polyurethane (TPU), smooth, non-adhesive, black

02 Traction layer: Aramid fabric

03 Pulley side: Polyester (PET), impregnated fabric, non-adhesiv, gray

Belt	
Thickness of belt	2,3 mm
Tensile force for 1% elongation after relaxation (k1% relaxed) per unit of width	26 N/mm
Maximum operating temperature admissible (continuous)	70 °C
Maximum initial elongation	0.7%
Recommended initial elongation	0.3 - 0.5%
Maximum width	4000 mm
System	
Measuring accuracy (multi-pass & single-pass)	±10 µm (2 sigma, 95.5%)
Resolution	Adjustable, [1 - 100] µm
Maximum speed	> 2 m/s
Number of measurement point	2 per box
Output signals per measurement point	3 square-wave signals A, B, R and their inverted signals A–, B–, R per output. R indicates an absolute zero reference on the belt.
Mechnical	
Processing unit dimensions and mounting	200x110x67 mm; 35 mm DIN rails
Dimensions sensor head dimensions and mounting	74.5x42.5x19 mm; 2 x M6, 50 mm
Electrical	
Power supply:	12V-24V / < 0.5 A

Electronics installation drawings



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Habasit has subsidiaries, affiliated companies, representatives and service partners all around the world, dedicated to supporting you whenever and wherever you need us.