Converting

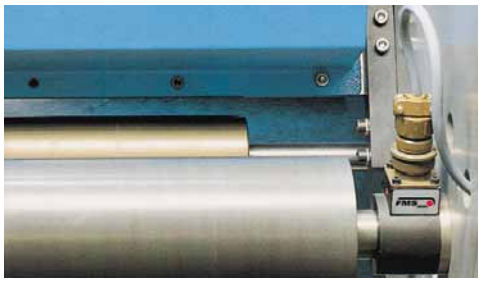
Tension Control and Web Guiding

SWISSMADE

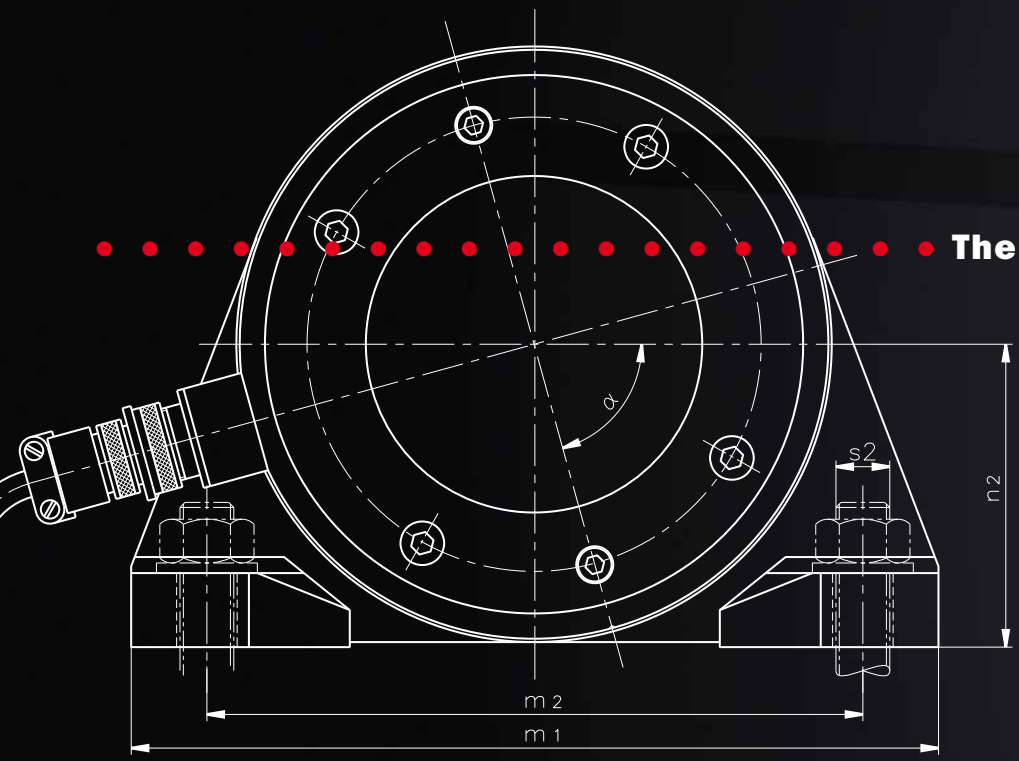
FMS: Origins

FMS was founded in 1993, following a buyout from the FAG Kugelfischer company. Since that time, a dedicated team has been establishing its own company history in the web tension and web guiding industry through market-leading developments and sucessful international expansion.

Today, FMS is the company of choice for manufacturers and users of web processing equipment around the globe. Success has been achieved in a wide cross-section of industries, processes, and materials.



The Point is Technology



FMS: Capabilities

Wherever running web products are manufactured, processed or finished, two factors are critical for quality production of the finished product: constant tension and the consistent lateral position of the web in the process.

FMS closed loop control systems for web tension and web guiding continually maintain all the relevant parameters to ensure precise compliance with the reference values. At the same time, these values are made available for comprehensive recording for quality assurance purposes.

FMS • Converting performance spectrum

System competencies
Web tension measurement
Closed loop tension control
Web guiding

Product competencies
Force sensors (load cells, transducers)
Measuring amplifiers
Closed loop controllers
Bus system interfaces
Web guides
Web guide sensors

FMS: Innovations

The FMS name stands for quality, reliability, expertise and innovations in web tension control and web guiding worldwide. With its range of products, FMS covers many different applications in all production processes.

Our range of products is continually optimized and supplemented in order to take advantage of all the possibilities of new technologies. However, the fundamental characteristics of FMS technology remains its operating simplicity and reliability even under challenging operating conditions.

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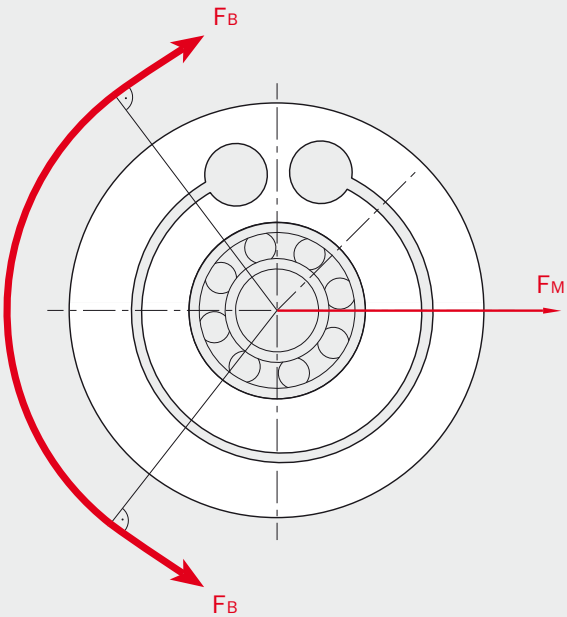

FMS web tension measurement
The web tension in the material (FB) causes a resulting force in the direction of the bisecting line (FM) on a wrapped roller. The measurement of this force is a direct measure of the web tension. The feedback value can be sent to an FMS closed loop tension controller, which regulates a drive, brake, or clutch, ensuring constant material tension throughout the process.

FMS web Guiding
The actual position of the web is detected by a sensor. The web guide controller compares the measured position value with the pre-set reference value and controls the drive of a steering frame. The steering frame ensures a stable web position by pivoting the steering frame rollers to guide the material.

FMS applications ● Web tension control / web guiding

Advantages

- Increased production speed
- Reduced downtimes
- Minimized waste
- Improved amortization periods
- Enhanced documentable quality

Materials

- Paper
- Film
- Foil (synthetic / aluminium)
- Tape and labels
- Plastics and rubber
- Corrugated products

Processes

- Printing
- Coating and laminating
- Tape and label processing
- Slitting
- Unwinding and winding
- Nip force measuring
- Packaging

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1 *Force sensor for tension measurement in a coating plant for special papers.*

2 *Force sensor for tension control of an unwinding reel in an aluminium tape cutting plant.*

3 *Tension value transmission utilizing a Profibus® connection in a flexo printing machine.*

4 *Tension control of an unwinding station using a digital closed loop tension controller.*

5 *Web guiding in a label printing machine prior to material processing.*

6 *Control of two material webs by a chase and follow system with two motorized sensor adjustments and a steering frame in a plastic foil coating plant.*

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FMS: Three phases of process integration

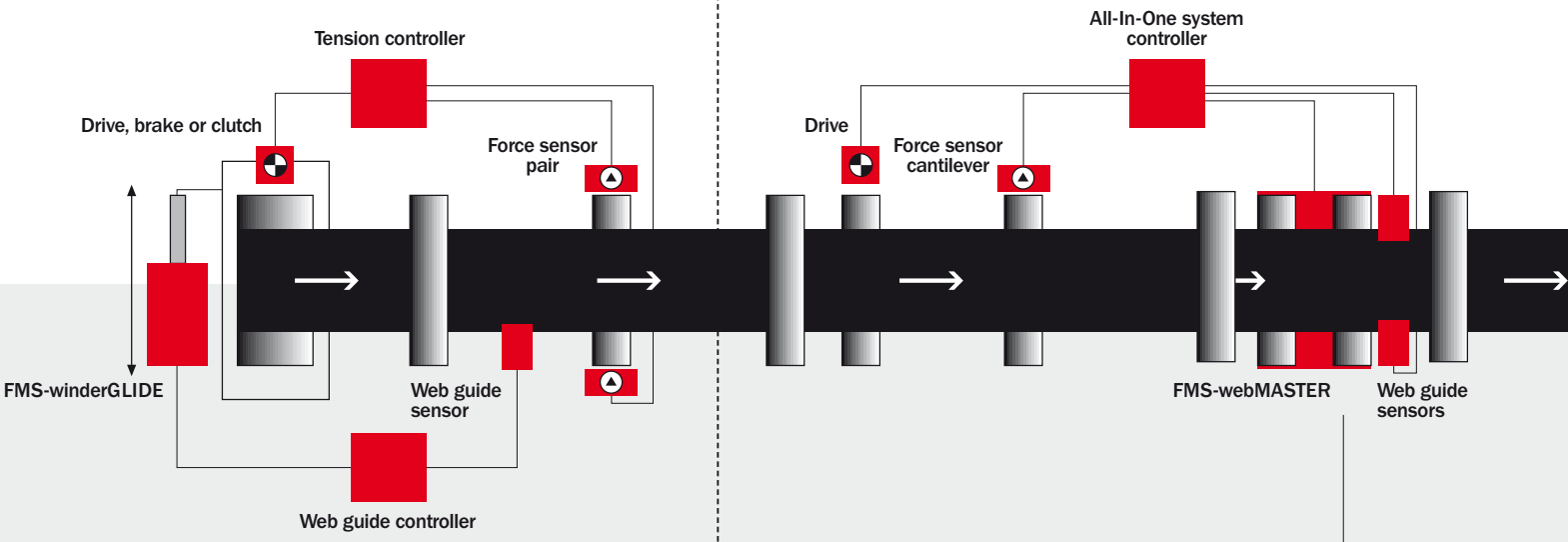
Phase 1: Unwinding

FMS unwind control:
Through the pre-defined braking of the unwinder, tension is created in order to feed the material to the process under a controlled condition. FMS force sensors measure the material tension and transfer a signal to the FMS tension controller as a feedback value. The FMS tension controller compares the feedback value with the pre-set reference value and passes a resulting control output to a clutch, brake, or drive on the unwind.

Phase 2: Intermediate drive processing

FMS intermediate drive control:
The material tension between two drives (printing stations, coating / drying, etc.) can also be controlled during the process. Controlling these tension zones ensures that the material will be fed to the downstream process at a constant web tension. Ideally, all intermediate drives will be individually controlled by FMS tension control systems.

Closed Loop Tension Control



Web guiding

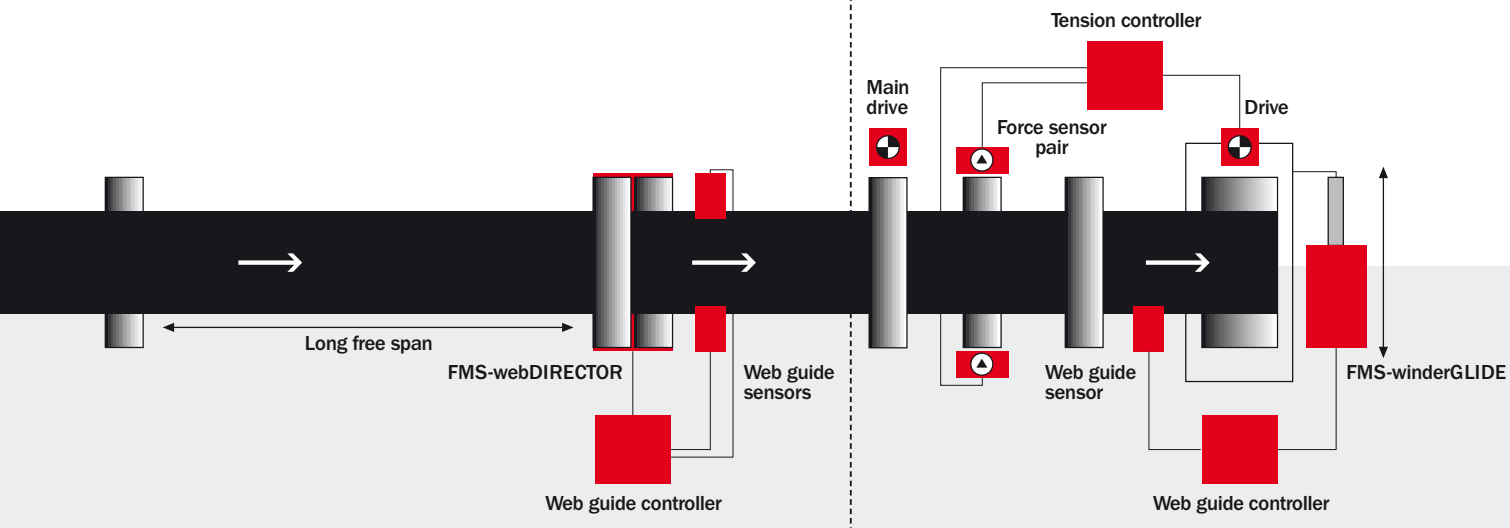
FMS unwind control:
Often, rolls of material with uneven edges have to be processed. In order for this initial condition not to have an effect on the processing quality, the roll must be appropriately positioned and adjusted. This is achieved with an FMS-winderGLIDE by moving the complete unwind stand to ensure accurate positioning of the material to be processed.

FMS pre-process control:
Prior to the process (printing stations, etc.), the exact positioning of the web is critical to the product's processed quality. To ensure position, an FMS-webMASTER is installed prior to the process. Using web guide sensors, the position of the web is detected and then precisely guided to the required reference position.

This diagram represents various configurations of FMS components in the unwind, intermediate drive and winding of typical converting processes. The diagram is divided to depict the components for web tension measurement and control (shown above web) and web guiding (shown below web).

Phase 3: Winding

FMS winding control:
Whether a finished product roll is to be sold, or created in an intermediate application before additional processing is required, a well wound roll is the result of high quality process control. With winders, the quality of the wound roll is a direct result of stable material tension during the winding process. In this example, the material tension is detected utilizing FMS force sensors, and an FMS tension controller calculates the output control value for the drive.



FMS post-process control:
After a long processing free span (drying sections, etc.), the web position must be brought back to its original location. Utilizing an FMS web-DIRECTOR, the material web will not only be brought back to the required location, but the position will be maintained.

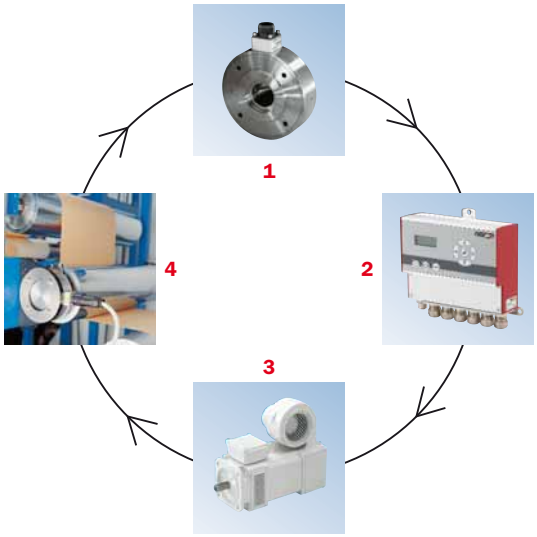
FMS winding control:
Straight edge winding is necessary to avoid waste during further rolled material processing. To achieve aligned rolls, the winding base is appropriately positioned with an FMS-winderGLIDE, thus ensuring accurate winding of the processed material and the highest winding quality.

FMS: Managing the tension

Force sensors (load cells): Operational reliability and accuracy of measurement determines the productivity and quality of the processing. The type of processing, the material, and factors such as temperature, humidity and changing winding diameters lead to continuous variations of the tension in the processed material.

FMS force sensors determine the material tension and send a signal proportional to the material tension to the FMS electronic units.
The defining characteristics of the individually tested FMS force sensors are their capacity to withstand extreme overload conditions while maintaining the highest accuracy in the industry.
This is accomplished through built-in mechanical stops that protect against overload and the utilization of four foil-type strain gauges installed in a full wheatstone bridge configuration in each sensor to ensure the highest performance.

Electronic units: FMS tension measuring amplifiers and closed loop tension controllers process the signals from the force sensors and have been specifically developed for use in tension control applications.
The measuring amplifiers provide a feedback signal, while the tension controllers generate a feedback as well as an output value for a drive, brake, or clutch. These values can be outputted as standard analogue signals or be transmitted via BUS connection.
Continuous new product development is one of the main reasons FMS is the leading technology partner for tension measurement and control technology.



Closed loop tension control

1 *Force sensors measure the effective material tension*

2 *The tension controller amplifies the measured signal from the force sensor and calculates an output value from the difference between the reference and feedback values.*

3 *The drive, brake, or clutch converts the output value from the tension controller into a corresponding torque or speed.*

4 *The tension in the process material is maintained.*

Advantages:
- *Defined, adjustable material tension*
- *Reproducible values in physical units (Newtons, Pounds, etc.)*
- *Known manufacturing conditions for finished products (quality recording capability)*

FMS – Simply the best force sensors:
- *Built-in mechanical overload protection*
- *Accurate operation down to 2 % of nominal load*
- *Highest accuracy and reliability*
- *Each sensor individually tested for performance*

FMS tension control ● Force sensors (load cells)

LMGZ	CZ 205	CA203	RMGZ	UMGZ	LMGZ.D	DMGZ
						

FMS force sensors are designed to meet widest variety of application requirements in the converting industry. Different sensors are available for measuring material tensions from ***< 1N to over 100kN*** *in live and dead shaft, internal roller, pillow block, cantilever, nip pressure, and many other versions.*

FMS force sensors offer ***many different mounting arrangements*** *including single bolt, adjustable bracket, side frame, flange mount, and more. These different options are designed specifically for application flexibility.*

FMS force sensors feature outstanding accuracy and the industry's ***highest overload protection.*** *Built-in mechanical stops ensure that* ***frequent calibration is not required*** *and makes the sensors virtually indestructible.*

FMS tension control ● Tension measuring amplifiers and controllers

EMGZ 306A	ExMGZ 100 / 200 Atex	EMGZ 309	470 / 480 Series	600 Series
				

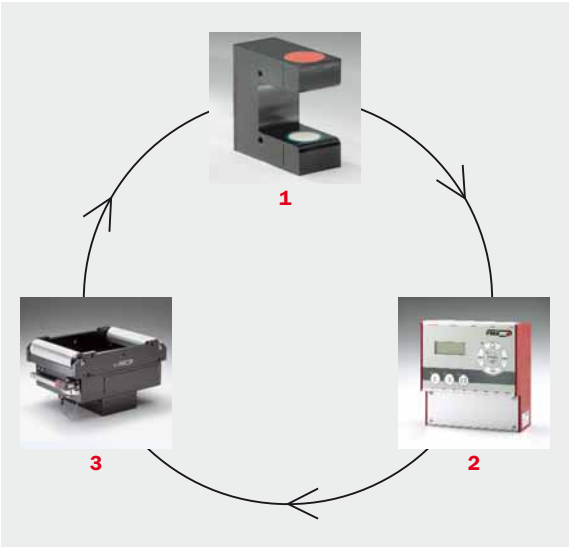
FMS's electronic units offer several different varieties of tension measuring amplifiers or closed loop tension controllers. There are both digital and analogue versions which are available in ***DIN rail, rack, panel, and housed display*** *mounting arrangements. FMS also offers versions which are water proof and vibration resistant. In addition, all FMS electronic units are designed for* ***ease of installation and operation.***

FMS's electronic units utilize state of the art hybrid technology, SMD circuit boards, and high end microprocessors for tension measurement and control. Each version is capable of providing ***both 0...10V / ±10V and 0...20mA / 4...20mA output signals*** *and offers* ***built-in signal filtering.***

FMS's electronic units also offer ***several different integrated interfaces*** *including RS232, PROFIBUS®, DeviceNet™, CanOpen, etc. for both tension measuring amplifiers and tension controllers.*

FMS: Following the right path

Web guiding: Many processes require material webs whose positions are precisely guided. FMS web guides detect the position of the material with web guide sensors, calculate the deviation from the reference position, and maintain the material at the required position with a steering frame actuator. FMS's wide range of web tension control and web guiding products offer many possible modular combinations to cover virtually all applications.

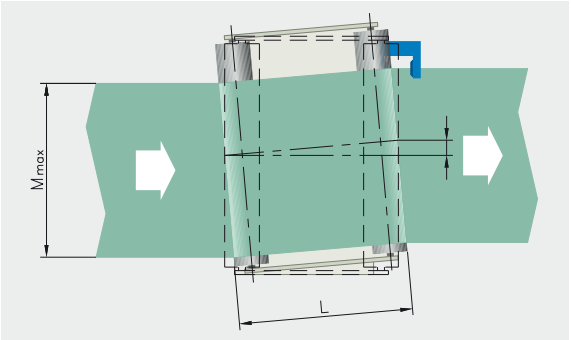


Closed loop control

1 *The web guide sensor detects the position of the material web.*

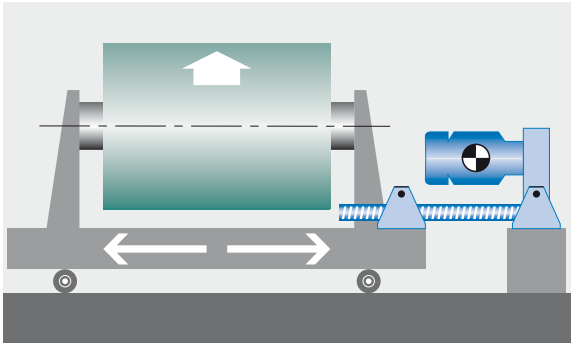
2 *The web guide controller calculates the deviation from the reference position and drives the steering frame actuator accordingly.*

3 *The steering frame actuator maintains the position of the material web at the reference location, thereby laterally controlling the web material.*



FMS-webMASTER

The FMS web guide is mounted as close as possible to the location where the positional accuracy is required. With an FMS-webMASTER, the length of the steering frame (L) should be the same as the maximum material width (Mmax). For optimal control, the web guide sensor is mounted as close as possible to the outfeed of the steering frame. With an FMS-webDIRECTOR the guiding of the material will take place over a virtual turning point in the infeed run of the steering frame.



FMS-winderGLIDE

The actuators of the FMS-winderGLIDE series have been specifically developed for use in unwind and winding stations. Utilizing powerful drives ensures they are suitable for moving large rolls and stands. The web guide sensor is mounted as close as possible to the nearest idler roller.
The electric drives of the FMS actuators offer superior operation when compared to hydraulic drives when processing foodstuff and pharmaceutical packaginges because there is no risk of contamination with e.g. oils or other hydraulic liquids.

FMS web guiding ● Steering frames

FMS-webMASTER

FMS-webMASTER

FMS-webDIRECTOR

FMS-winderGLIDE

*FMS steering frames and actuators are **robustly designed** to perform even in the most demanding web guiding applications. They satisfy any guiding application including material unwind and winding, lateral positioning of unwind and winding stands, and pre or post process guiding.*

*FMS steering frame actuators are equipped with **lifetime lubricated ball screws** and either AC, servo, or stepper motors.*

*FMS steering frames and actuators are perfect for guiding **ultra-narrow to very large material webs.***

FMS web guiding ● Sensors

Ultrasonic edge sensors

Optical edge sensors

Optical line sensors

Manual and motorized sensor adjustment

*FMS web guide sensors are available in different styles **to detect the position of any type of web material.** They are available in several sizes **to accommodate a wide range of correction requirements.***

FMS web guide sensors are offered with a basic manual adjustment or an automatic motorized traversing adjustment driven by the web guide controller.

FMS web guiding ● Web guide controllers

600 Series

309 Series

*FMS web guide controllers are offered in several styles including **single and multi-channel** versions for controlling multiple web guides. They are specifically designed for the industry's increasing control requirements, faster machine speeds, and demand for **ease of installation and operation.***

*FMS web guide controllers utilize high end microprocessors and provide **high flexibility** to control AC, or stepper motors as well as hydraulic valves.*

*FMS web guide controllers of the 600 series are offered with **several different integrated interfaces** including RS 232, PROFIBUS®, CanOpen, etc.*

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