

Wire and Cable

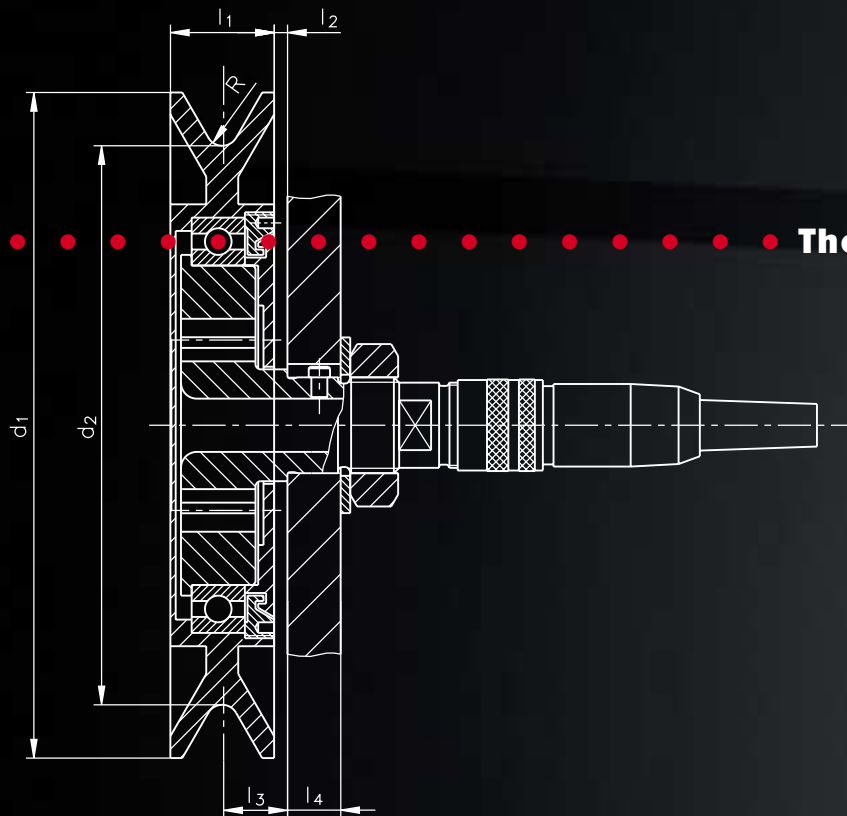
Tension Measurement and Tension Control



FMS: Origins

FMS was founded in 1993, following a buyout from the FAG Kugelfischer company. Since that time, a dedicated team has been writing its own company history in the Web Tension and Web Guiding industry through market-leading developments while achieving international success.

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



The Point is Technology

FMS: The means to an end

Now more than ever before, it is the overall manufacturing quality of the product that determines its success. In continuous production processes, the quality of the finished product is directly dependent on the accurate measurement and control of the material tension. FMS Tension Measurement and Control products are designed specifically to enhance

in-process production control, thereby improving finished product quality, reducing waste, increasing processing speeds, and minimizing machine downtime. Typical applications which can benefit greatly from FMS Tension Measurement and Control include: Drawing, Stranding, Bunching, Extruding, Unwinding, and Winding.

FMS Applications • Benefitting from tension measurement / tension control

Benefits

Improved finished product quality

Reduced waste

Increased production speeds

Minimized process downtimes

Materials

Wire and Cable

Fiber optics

Cord and Rope

Narrow tapes and Flat wire

Processes

Drawing

Stranding and Bunching

Extruding

Unwinding and Winding

QUALITY



FMS: Anything is possible

One of the main advantages of FMS components is that they are specifically designed for application flexibility under a variety of conditions with many different materials, production processes and

customer-specific requirements. Some of the wide range of applications covered by FMS's technology are shown in the following examples.



1



2

Application 1

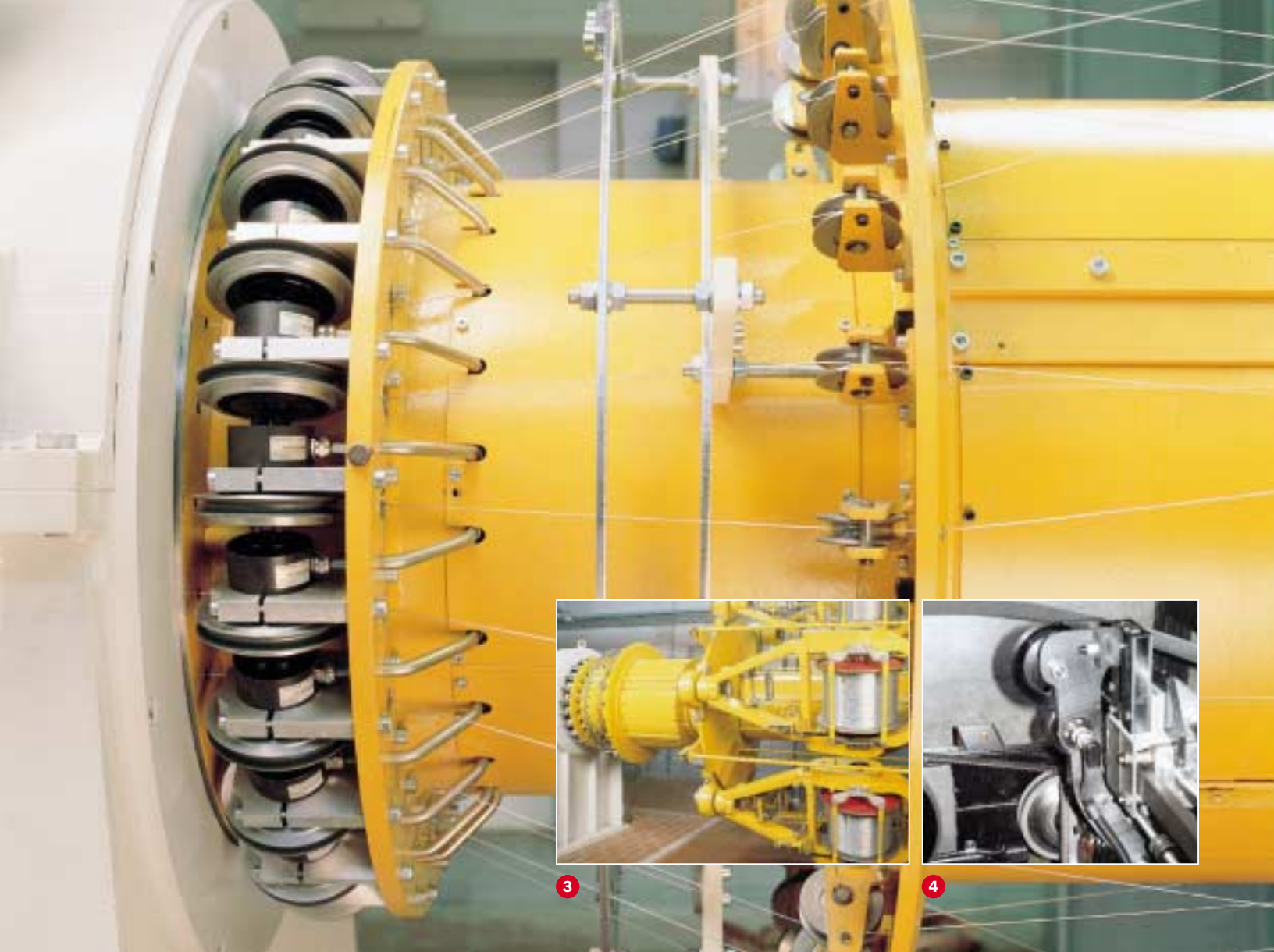
Tension control in a winding machine

With magnetic coils, the highest level of winding quality is a requirement. An FMS Sensor measures the material tension and sends the feedback value via an FMS Measuring Amplifier to a PLC. The PLC calculates the appropriate speed reference value for the servo drive from the feedback value and line speed to accurately control and maintain the proper tension.

Application 2

Tension control in an extruder

With fiber optic cables, the consistent thickness of the insulation material is critical in determining overall product quality. In order to achieve this during the manufacture of the cable, the FMS Tension Control System measures the tension after the extrusion of the thermoplastic insulation material. The pay-off drive regulates the pay-off speed, which determines the depth of the insulation layer. The advantage in this FMS application is that the constant, defined tension guarantees the highest product quality with minimum waste.



Application 3

Tension measurement in a cage strander

A cage strander is one of the most complicated applications for measuring and controlling material tension forces. In this application, all the FMS measuring equipment is mounted on the rotating stranding cage. When designing this measurement system, it is not only the material tension that is important, but compensating for the centrifugal and Coriolis forces.

In the cage strander shown above, the tension is controlled in every strand. The measured signals are sent to a master controller via an FMS Measuring Amplifier with a built-in PROFIBUS[®] connection.

With FMS products, even the most delicate stranding material achieves the highest level of quality while productivity is increased, and downtime reduced.

Application 4

Tension control and tension monitoring in a dual twist stranding machine

In this dual twist stranding machine used in the production of data cables, the material tension is measured with an FMS Force Sensor and the winder is controlled with an FMS Tension Controller. In this application, the material tension value can be read from a display so that production can also be monitored visually.

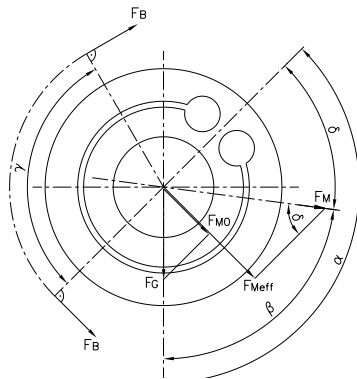
In addition to the continuous visual monitoring of the process values, the FMS Tension Control in this application ensures that the highest level of winding quality is achieved.

FMS: Managing tension

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

FMS Force Sensors determine the tension and send a signal proportional to the 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 to protect against overload and the utilization of foil-type strain gauges installed in a full Wheatstone Bridge configuration in each sensor to ensure the highest measuring accuracy.



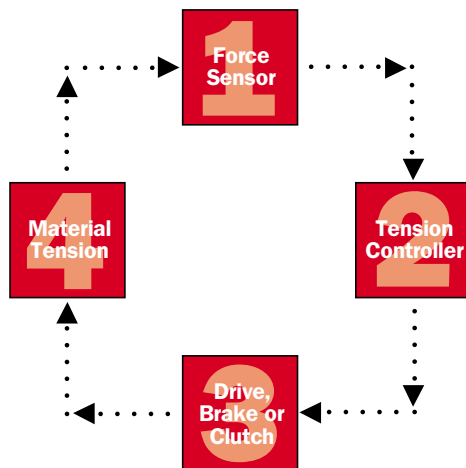
Electronic Units: Specifically developed for use in tension control, FMS Tension Measuring Amplifiers and Closed Loop Tension Controllers process the signals from the Force Sensors. The measuring amplifiers provide a feedback value signal, while the tension controllers generate a feedback value as well as an output value for a drive, brake, or clutch. These values can be output as standard analog signals or be transmitted via BUS connection.

The **FMS-cyberCONTROL**[®] self-optimizing tension controller was one result of the ongoing development of our electronic systems. Continuous new product development is one of the main reasons FMS is the leading technology partner for Tension Measurement and Control technology.

FMS tension measurement

The tension in the material (F_B) causes a resulting force in the direction of the median line (F_M) on a wrapped roller. The measurement of this force is a direct measure of the material tension.

The feedback value can be sent to an FMS Closed Loop Tension Controller, which regulates a drive, brake, or clutch, ensuring constant tension through the process.

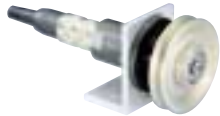


Closed loop tension control

- 1 A Force Sensor measures 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 Tension measurement and control ● Force sensors

RMGZ100 Series



RMGZ400/500/600 Series



RMGZ800 Series



RMGZ 900 mini Series



RMGZ 900 Series



- Designed specifically for wire, cable, and related applications
- **Many different mounting possibilities** including existing sheave replacement or machine frame attachment
- Can also be utilized with or without application specific sheaves of various materials
- Capable of measuring material tensions from **<.25 lbs. to 2,000 lbs.**
- **Highest overload protection** in the industry with outstanding accuracy
- **Frequent calibration is not required**
- Virtually indestructible

FMS Electronic units ● Tension measuring amplifiers and controllers

EMGZ306A



EMGZ308 Series



400 Series



470 Series



600 Series



- Several different varieties of Tension Measuring Amplifiers and Closed Loop Tension Controllers are available
- Digital and analog versions are available in a variety of mounting arrangements including:
 - **Housed with Display**
 - **DIN rail**
 - **Panel**
 - **Rack**
- Waterproof and vibration resistant versions
- State of the art hybrid technology, SMD circuit boards, and high end microprocessors for both tension measurement and control
- **Easy installation and operation**
- **0...10V / ±10V and 0/4...20mA output signals**
- **Built-in signal filtering**
- Both Tension Measuring Amplifiers and Tension Controllers are available with **several different integrated interfaces** including:
 - RS232
 - PROFIBUS®
 - DeviceNet™
 - CanOpen



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