

Cable and Wire

Tension Measurement and Tension Control

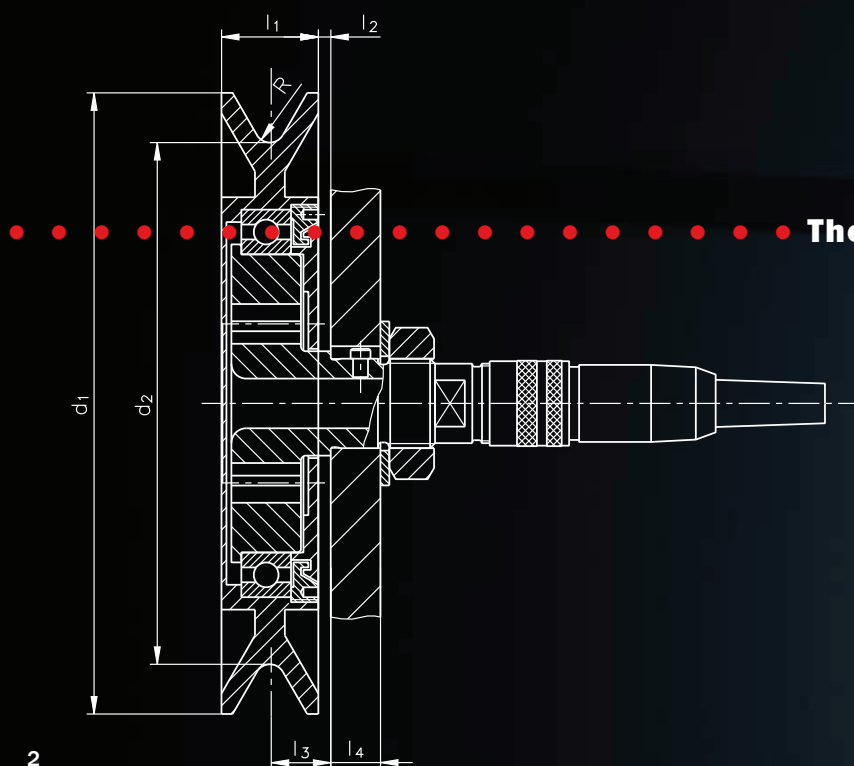


SWISSMADE⁺

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 the 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	Materials	Processes
Improved finished product quality	Wire and Cable	Drawing
Reduced waste	Fiber optics	Stranding and Bunching
Increased production speeds	Cord and Rope	Extruding
Minimized process downtimes	Narrow tapes and Flat wire	Unwinding and Winding

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 characteristics. Some of the wide range of applications covered by FMS's technology are shown in the following examples.



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Application 1

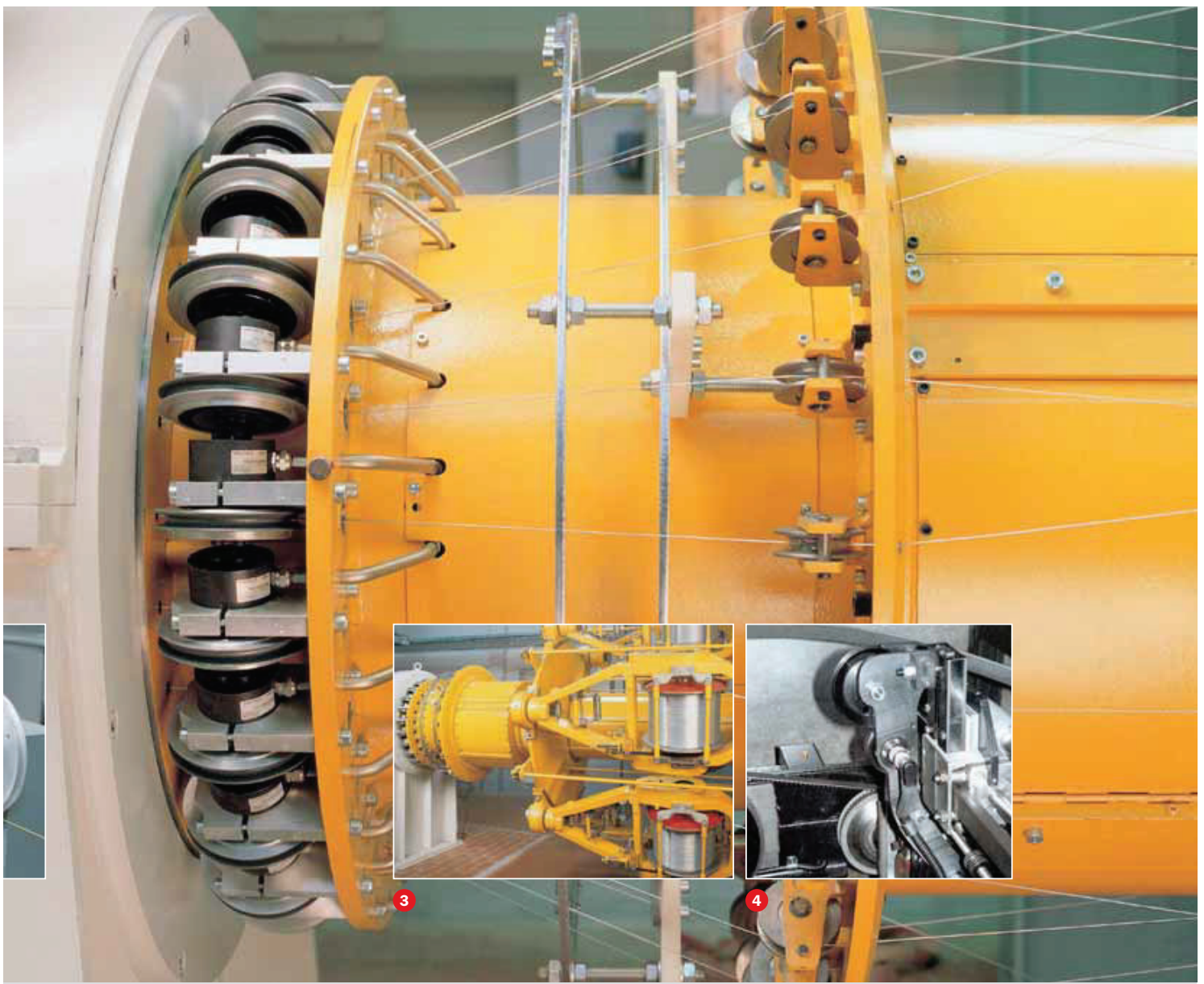
Tension control in a winding machine

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 the highest level of winding quality is achieved.

FMS: Maintaining the tension

Force Sensors (load cells): Operational reliability and accuracy of measurement determine 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.

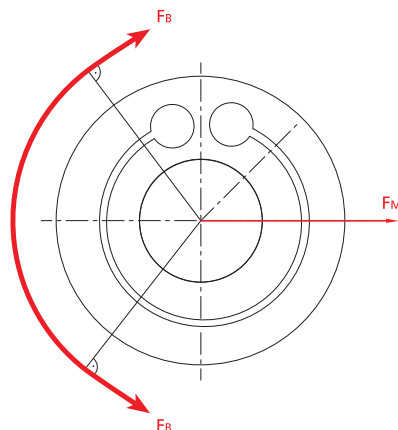
FMS Force Sensors determine the tension and send a signal proportional to the tension to the FMS electronic units.

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: FMS Tension Measuring Amplifiers and Closed Loop Tension Controllers process the signals from the Force Sensors and have each been specifically developed for use in tension control. 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 outputted as standard analogue signals or be transmitted via BUS connection.

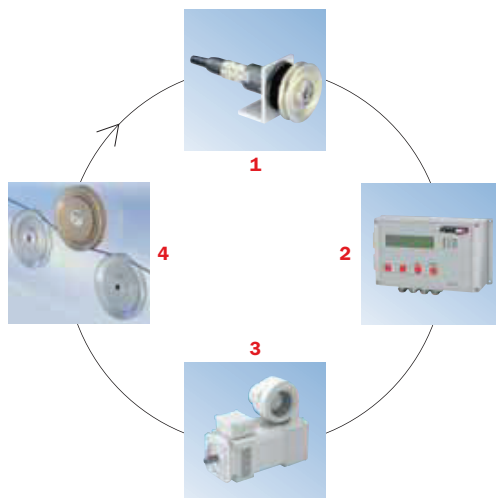
The versatile tension controller series CMGZ600 was one result of the ongoing development of our electronic systems. Continuous new product development is one of the main reasons FMS is the leading technology partner for Tension Measurement and Control technology.



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.



Description of closed tension control loop

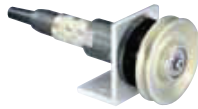
- 1 Force Sensors measure the effective material tension
- 2 The Tension Controller amplifies the measured signal from the force sensor and calculates an output value from the difference between the reference and feedback values.
- 3 The drive, brake, or clutch converts the output value from the tension 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 Tension Measurement and Control ● Force Sensors

RMGZ 100



CR 208 / 210 / 212



RMGZ 400



RMGZ 800



RMGZ series Force Sensors are designed specifically for wire, cable, and related applications. There are versions available capable of measuring material tensions from **< 1N to 8000 N**.

RMGZ series Force Sensors offer **many different mounting possibilities** including existing sheave replacement or machine frame attachment. They can also be provided with sheaves of various materials or without them so an application specific sheave can be mounted on the Force Sensor.

RMGZ series Force Sensors feature the industry's **highest overload protection**. Built-in mechanical stops ensure that with FMS Force Sensors, frequent calibration is not required and makes the Sensors virtually indestructible.

FMS Electronic Units ● Tension Measuring Amplifiers and Controllers

EMGZ 306A



ExMGZ 100 / 200 Atex



EMGZ 474



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®, Device-Net™, CanOpen, etc. for both Tension Measuring Amplifiers and Tension Controllers.

FMS RTM-System ● Transmitted Tension Monitoring System (without slippings)

RTM-System



The FMS **radio transmitted tension monitoring system (RTM)** is designed to monitor tension of individual wires or cables in rotating applications. This system sends all the collected data via radio transmission. The RTM system is a complete tension monitoring package designed to easily retrofit onto older machines. It is ideal for upgrading existing machinery to current tension measuring technology.

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