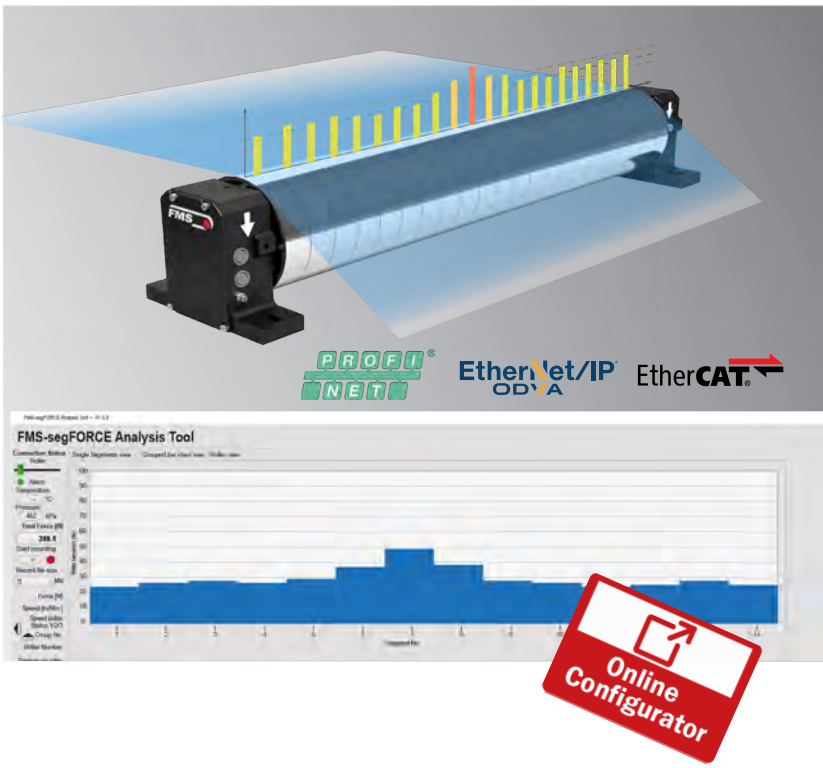
FMS Solutions for Web Tension Measurement

FMS-segFORCE®Compact measuring roller with multiple, independent force sensors

- **Monitoring of smallest tension deviations from segment to segment**
  High sensitivity, wide measuring range
- **Customized configuration**
  Full flexibility in terms of quantity, width and position of the segments, various nominal forces, full range of roll surface options
- **Easy retrofit and installation**
  Flexible installation options, individual overall length, simple exchange of standard idler roll, identical web path
- **Full system integration**
  PROFINET, EtherNet/IP or ETHERCAT interface for data processing an display via PLC



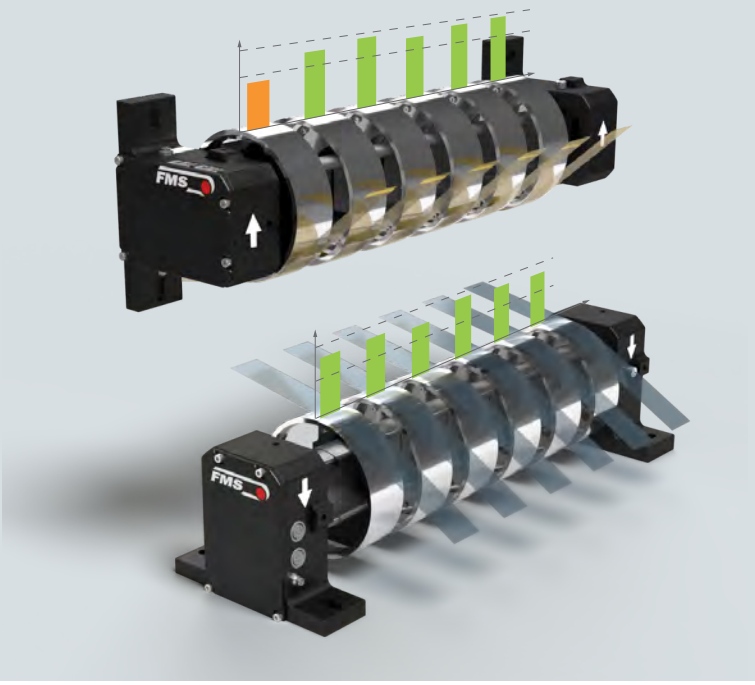
FMS-segFORCE
The centerpiece of the FMS-segFORCE system is the compact measuring roll with multiple independent force sensors. In contrast to conventional tension monitoring systems with a force sensor at each end of the roller, this system provides up to 50 measuring values across the entire web. Especially when it comes to processing of elastic or sensitive materials this extended monitoring offers improvements for various machine and production types.

Slitter / rewinder
- Easy identification of faulty winding shafts or differential shafts
- Clear display of the tension values of each individual web section
- Highest flexibility in terms of the total number of the segments, segment widths and lateral position

Coating lines
- Tension profile for better understanding of the process
- Fast detection and elimination of process or material related faults and malfunctions
- Fast quality assessment of the delivered parent rolls

Functional description
The force measuring roller of the FMS-segFORCE system consists of a rigid axis that holds the individual segments. The segments are slidable along the axis. The total number of segments, their width and their lateral position can be selected according to the individual requirements of the machine or the process. The secure locking of the segments on the axis is realized by means of pneumatics via a connector on one of either pillow block type brackets. Power supply and sensor signals are routed wirelessly over the axis. Automatic contacts allow for easy and quick re-adjustment of the lateral position of each segment for the required application. Universal installation of the measuring roller is provided by the two pillow block type brackets. The central electronics as well as the connectors for power supply and pressure air is also located in one of these two brackets. RJ45 sockets are available for the data transfer. Measuring signals can be directly transferred to the PLC or display on any computer with a dedicated software.

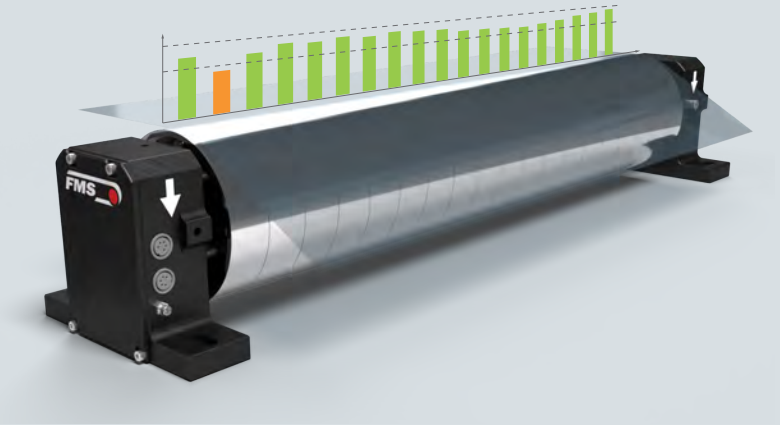
FMS-segFORCE : Slitter / rewinder



- Tension monitoring of each individual web section
- Highest flexibility in terms of number of segments, widths, position

Schematic of two measuring rollers in the slitter / rewinder. The offset of the individual segments from the lower to the upper measuring roller can be seen clearly. Smallest differences in tension between the individual web sections quickly become visible. The sophisticated design allows all types of wrap angles to be covered. Flexible segment widths and freely adjustable distances between the segments make it possible to configure the measuring rollers for a wide variety of slitting widths.

FMS-segFORCE : Coating line



- Up to 50 measuring points along one roller
- Highest sensitivity

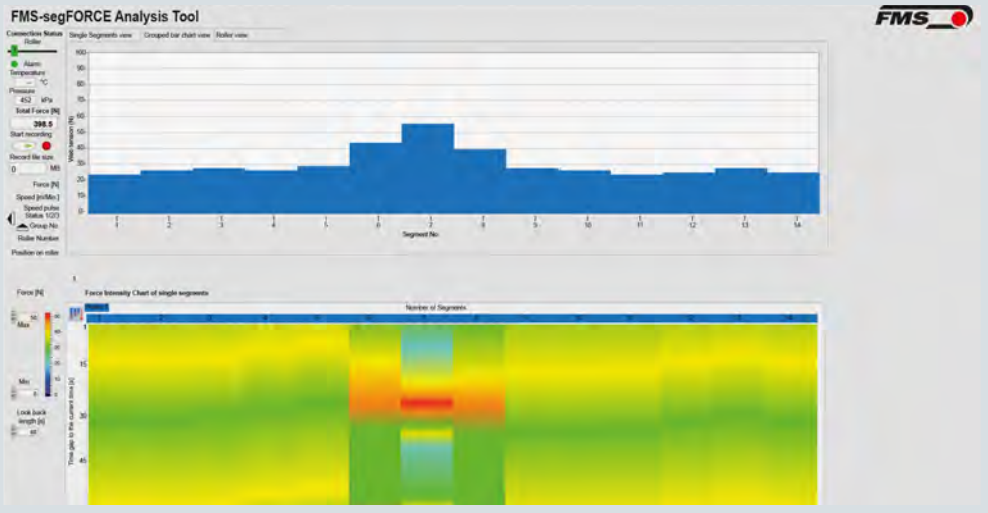
Fully equipped segmented measuring roller with brackets (type P pillow block) for universal mounting on the machine frame. Only a 24 (18 to 38) VDC power supply and a compressed air connection are required. Data connection is realized with an RJ-45 socket.

FMS-segFORCE Analysis Software : Data display and processing – slitter / rewinder

- Quick detection of faulty winding or differential friction shafts
- Clear display of different tension values of the individual webs
- Tension monitoring of up to 50 individual sections

Measuring values of the individual segments.
The different color of the bar graphs shows the affiliation to the respective measuring roller.

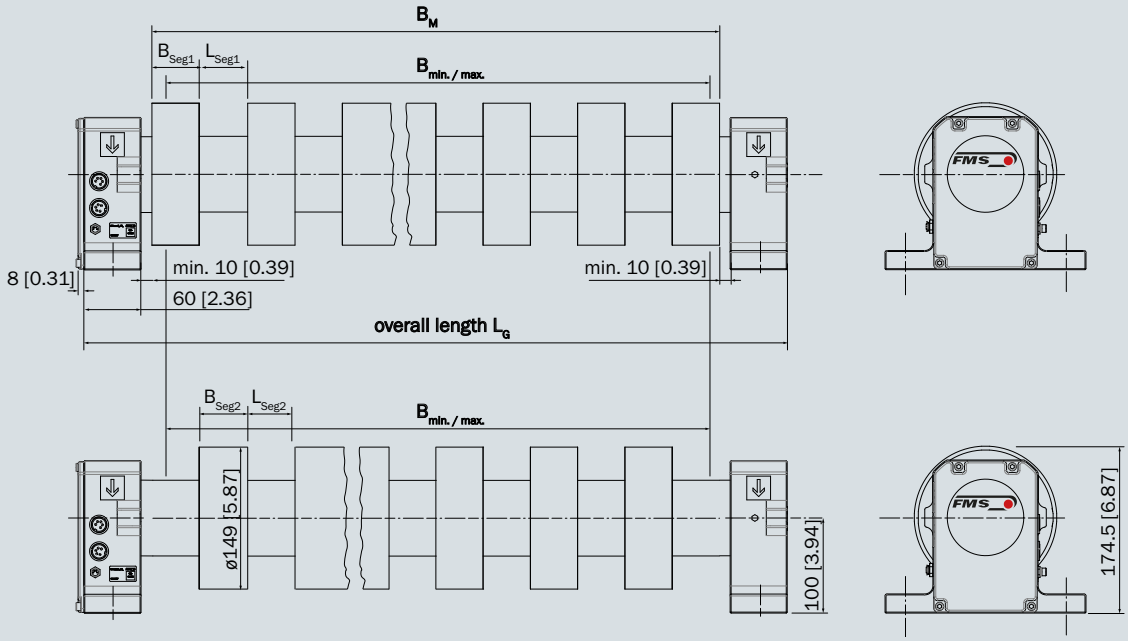
FMS-segFORCE Analysis Software : Data display and processing – Coating line



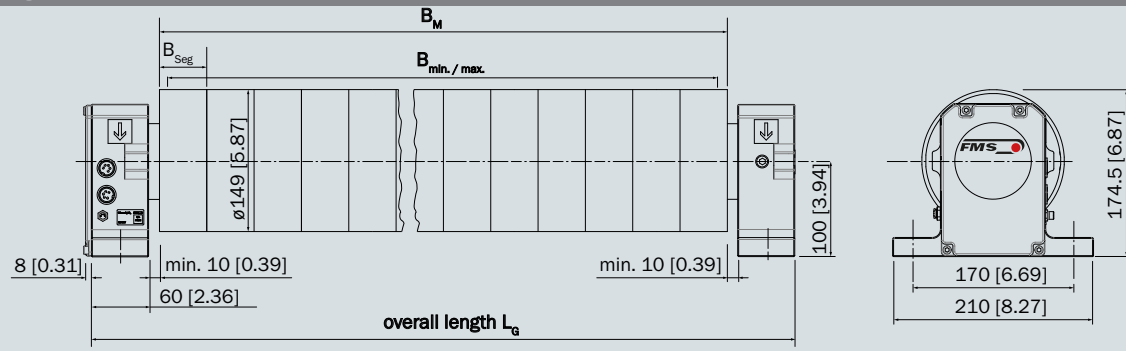
- Tension profile for best understanding of the process
- Fast detection and elimination of process or material related faults and malfunctions
- Fast quality assessment of the delivered parent rolls

Top: Measuring values from each individual segment.
Bottom: Waterfall diagram of a baggy web. This defect pattern can only be detected with a segmented tension roller.

FMS-segFORCE : Dimensions slitter / rewinder

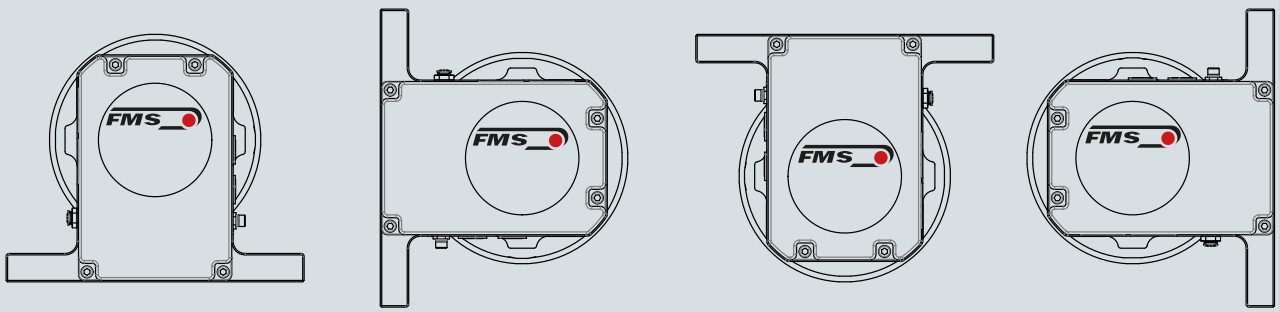


FMS-segFORCE : Dimensions for tension profile



FMS-segFORCE : Dimensions in mm [in.]	
Maximum width of measuring roller B_M	2000 [78.74]
Segment widths B_{Seg}	36, 50, 75, 100, 150, 200 [1.42, 1.97, 2.95, 3.94, 9.84, 7.84] customized dimensions upon request
Maximum number of segments per measuring roller	50

FMS-segFORCE : Bracket orientation type P “pillow block”



S South W West N North O East

FMS-segFORCE : Order code measuring roller

SFA	-1850	.A	.PN	.L3	. PNET	.Hxxx
						Other options
					PNET	Ethernet interface (.PNET PROFINET; .EIP EtherNet/IP; ECAT ETHERCAT)
				L3		Connector side L left, R right (in direction of rotating segment) Axis alignment (time-encoded)
			PN			Bracket type P pillow block Bracket orientation N North, S South, O East, W West
		A				Design revision
	1850					Size, installation dimension, overall length in mm
SFA						Series FMS-segFORCE (axis and side brackets)

FMS-segFORCE : Order code segment(s)

SFS	-50-150	.A	.50	.E
				E
			50	Roller material and surface finish E Aluminum anodized blank, EB Al. anodized black, A other coatings or finish
		A		Nominal force in N
	50-150			Design revision
SFS				Size Segment width and nominal diameter in mm
				Series FMS-segFORCE Segment

FMS-segFORCE : Technical data	
Configuration	via integrated web browser or optional LabVIEW Software
Pressure air	3 to 6 bar, dryed

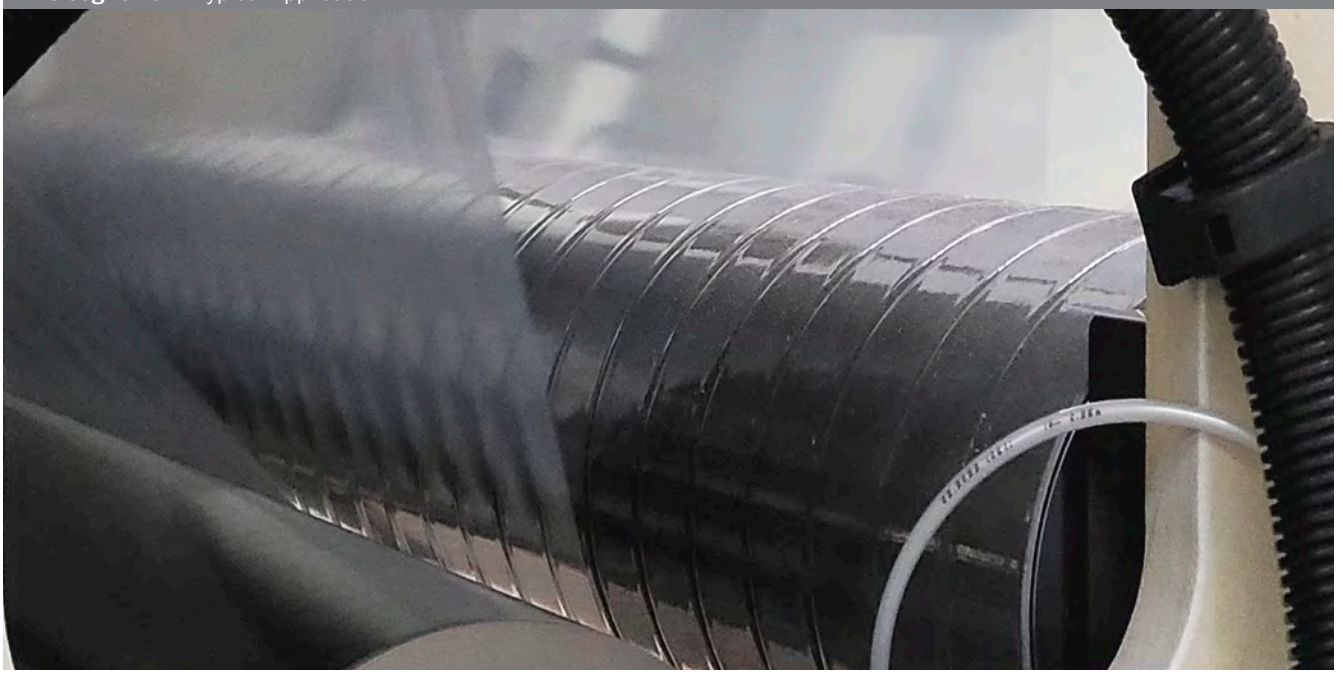
FMS-segFORCE : Technical data force sensor	
Accuracy class	± 0.3 % (F_{Nenn})
Measuring range	50:1
Temperature coefficient	± 0.1 % / 10 K
Temperature range	–10 to +50 °C (14 F to 122 F)
Protection class	IP40
Overload protection	10-times nominal force
Ball bearing	61822
Material	high-strength aluminum

FMS-segFORCE : Technical data pre-amplifier on the force sensor	
Resolution A/D converter	± 32768 Digit (16 Bit)
Measuring error	< 0.05 % FS
Protection class	IP40 (installed)
Power supply	24 VDC (18 to 36 VDC) / 5 W
Temperature range	–10 to +50 °C (14 to 122 °F)

FMS-segFORCE : PROFINET RT Features	
Cycle time	2.5 ms for RT_CLASS_1
Baud Rate	100 Mbit/s
Topology recognition	LLDP, SNMP V1, Physical Device Record Objects
Cyclic process data	number of segments, number of segment groups, status pressure air, overall tension of all segments, temperature electronics, pressure in pressure system, actual readings single segments, actual readings segment groups, web speed single segments, web speed segment groups, number of segment groups, ID of segment group
Media redundancy	Media Redundancy Protocol (MRP) – Client
Supported protocols	RTC Real Time Cyclic Protocol, RT_CLASS_1 (unsynchronized), RTA Real Time Acyclic Protocol, DCP Discovery and Configuration Protocol, DCE/RPC Distributed Computing Environment/Remote Procedure Calls: Connectionless RPC, LLDP Link Layer Discovery Protocol, PTCP Precision Transparent Clock Protocol,SNMP Simple Network Management Protocol
Identification & Maintenance	Reading and Writing of I & M1-3
PROFINET RT specification	V 2.3, legacy startup of specification V 2.2 is supported

FMS-segFORCE : EtherNET/IP Features	
Cycle time	2,5 ms
Baud Rate	10 or 100 Mbit/s
IO Connection Types (implicit)	Exclusive Owner, Listen Only, Input only
Number of Message Connections	Explicit message connections (10); Implizit message connections (5)
Certification	According CT16

FMS-segFORCE : Typical Application



FMS-segFORCE : Scope of supply

- measuring roller with configured segments
- integrated central electronics
- two brackts type P “pillow block” with connectors
- connecting cable, 10 m, with M8 socket for power supply

FMS-segFORCE : Accessories

- FMS-segFORCE Analysis oftware for data display and recording

Other products : Force Sensor, Measuring Amplifier, Tension Controller

RMGZ9-Series	**C203-Series**	**Measuring Amplifier**	**Tension Controller**

About us

FMS Force Measuring Systems AG is the market leader in the field of web tension measurement, control and specialist for web guiding solutions. For the wire industry we are the only manufacturer offering a complete range of technologies for force measurement, data processing and radio transmission of signals.
Our in house developed products are used in the manufacturing industry, converting, metals, paper, textiles, as well as in cable and wire rope production. Utilising the latest technology, high quality components and a firm understanding of customer applications, FMS supports customers worldwide in the effort to maximize the productivity of their machines. Since 1993, our highly qualified employees have been creating high-end solutions for machine builders and plant operators. As an owner-managed company, we pride ourselves on being personal and approachable with the ability to make decisive moves fast.

World Headquarters: FMS Force Measuring Systems AG
Aspstrasse 6 • 8154 Oberglatt (Switzerland) • Phone + 41 44 852 80 80 • Fax + 41 44 850 60 06
info@fms-technology.com • **www.fms-technology.com**

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