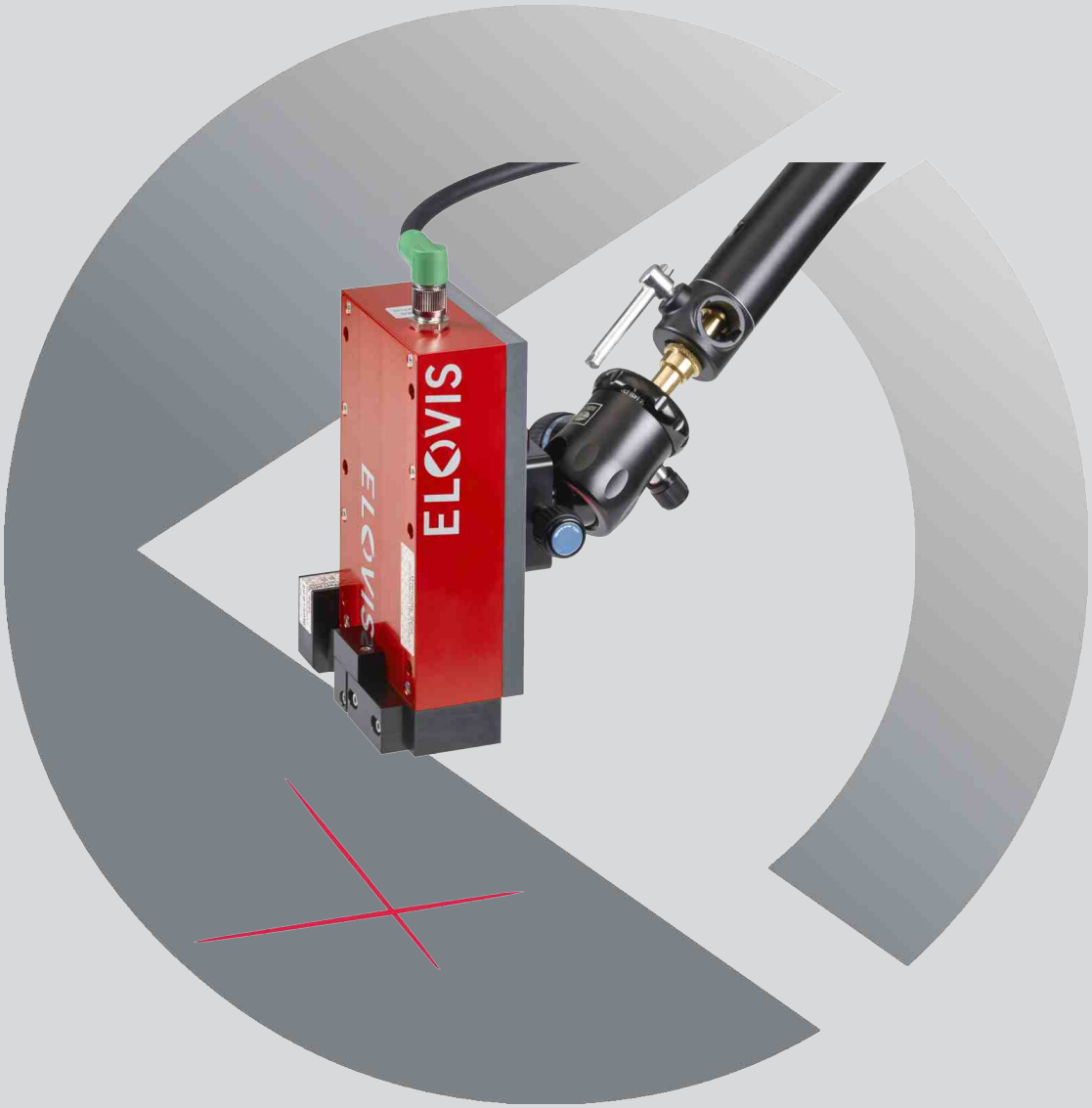


µSPEED - Product Overview

Non-Contact Length & Speed Measurement
Laser-Encoder µSPEED

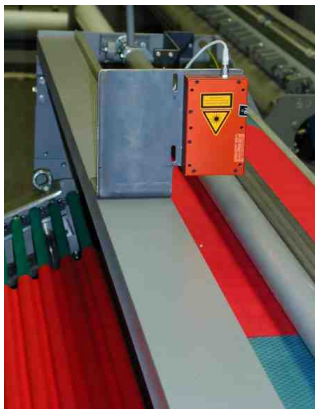
Product Overview
Q1/2020 - Version 1.0

ELOVIS

Product Information

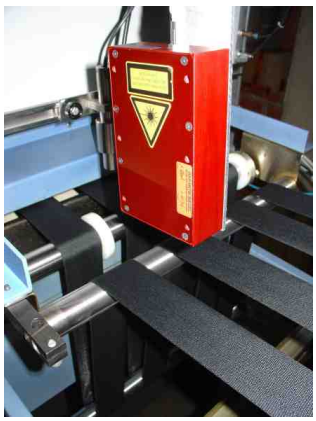
µSPEED gauges are capable of measuring speed and length without contact to the moving material surface. The µSPEED Laser-Encoder systems replace tactile measurement solutions as e.g. contact wheels, which tend to measurement errors caused by slippage, chatter, dirt build-up and day to day wear problems. The maintenance free and long term calibrated µSPEED gauges measure nearly all surfaces without parameter setting.

Most important system features:
- material independent
- long term calbrated
- 0 m/s up to 100 m/s
- bidirectional measurement
- typ. accuracy better ±0,5 m at 1 km
- accredited calibratable acc. MID 2014/32/EU

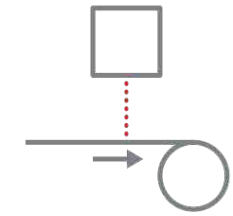


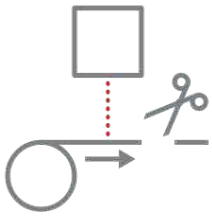
Benefits

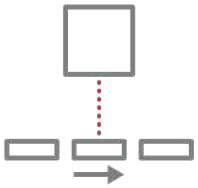
compared to tactile measurement systems :
- self-monitoring
- non-contact, no slippage
- maintenance free and permanently calibrated
- measurement independent from material, surface structur, thickness, elasticity
- can not damage material surface
- high accuracy, high repeatability

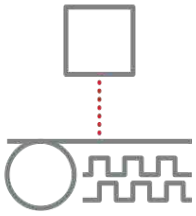


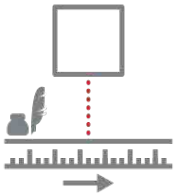
compared to other non-contact devices:
- the most compact gauge in class
- the most easy to handle gauge (plug & play)
- non-contact direction detection
- non-contact zero speed measurement
- no parameter setting necessary
- permanently calibrated
- long laser lifetime
- optimum price performance ratio
- accredited calibratable acc. MID 2014/32/EU
- Made in Germany

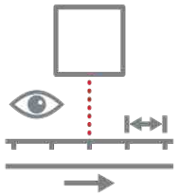

Roll / Spool Lenght

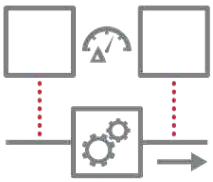

Cut-to-length Control

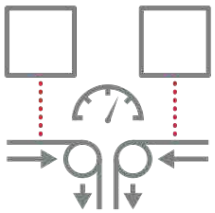

Discrete Part Length

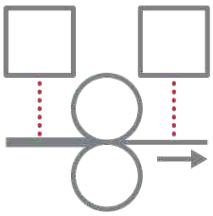

Counter Calibration

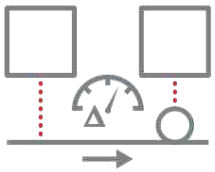

Print Mark Control

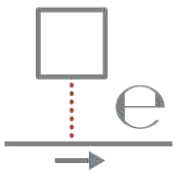

Pattern Repeat Length

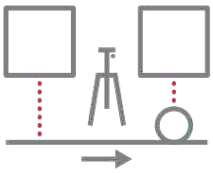

Difference Measurement


Speed Balancing


Elongation Ratio


Slippage Detection


Calibrated Length


Portable Measurement

Application Overview

There are many different applications for the use of non-contact laser encoders:

Roll / Spool Length / Cut-to-Length Control:
- Web, rolled and spooled materials, coils
- Textile, fabrics, carpet, nonwoven, felt
- Foil, film, tape, membranes, artificial leather, Roof foil, bitumen web, geo textile
- Printed and coated material
- Paper, corrugated paper, abrasive paper, packaging material
- Rubber, laminate, extrusion material
- Tube, hose, profile, bar
- Wire, cable, rope

Discrete Part Length Measurement:
- Plate, panel, tube, bar, profile, rail
- Gypsum board, chip board, MDF panel
- Insulating panel, insulating board
- Wooden beam, panel, KVH structural timber
- Metal- and plastic tube
- Metal sheet and metal panel, slab

Counter / Encoder Calibration:
- Calibration of machine counters
- Calibration of tachometers
- Portable calibration of several production lines

Print Control:
- Printing of length scales
- Printing proportional to length

Pattern Repeat Mark Measurement:
- Packaging film, wall paper, carpet
- Measurement of print pattern distances
- Setting of printing machines

Difference Length / Speed Measurement:
- Speed balancing e.g. for lamination or coating
- Elongation speed ratio measurement
- Slippage detection (Cause study for surface errors, material and web breaks, detection of errors caused by wear and tear)

Application Examples

µSPEED gauges are designed for all kinds of conveying processes, for frequent material starts and stops as well as for changes of material feeding direction.

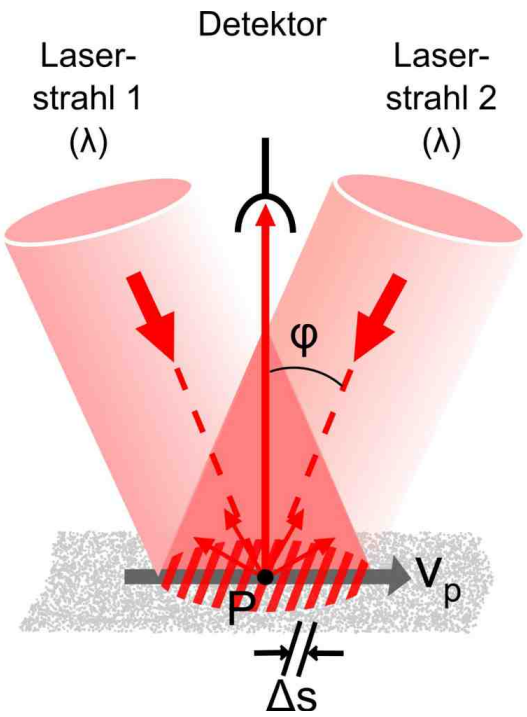
µSPEED gauges
- work on almost any moving objects, such as
  Web and coiled material, tube, pipe, rod, sheet, plate, cylinder, roller, profile, wire, cable, yarn, rope

- are suitable for a wide range of applications e.g
  Continuous length measurement,
  Cut-to-length control, Portable tachometer
  Calibration and differential speed measurement, Discrete part length measurement, Control of scale print marks

- can be found in various industrial sectors:
  Textile: fabrics, non-woven, felt and leather
  Plastics: film, foil and self adhesive tape, rubber, profile
  Metal: sheet, web, foil, profile, tube
  Reel goods: wire, cable, rope, fibre, yarn
  Paper: print and packaging paper, corrugated products and cardboard
  Hygenie and food as well as wood, glass and
  Ceramics and construction industry
  Machine building: converting industry

Measurement Principle

Fig.:
Laser-Encoder - Measurement Principle



µSPEED gauges operate according to the differential doppler method.Therefore two laser beams intersect at an angle φ to the optical axis on the surface of the measurement object. For a point P which moves with the velocity v through the point of intersection of the two laser beams, the frequencies of the two laser beams are doppler shifted.

The two laser beams are superimposed in the measurement volume, producing an interference pattern of light and dark stripes. The stripe spacing Δs is a constant which depends on the laser wavelength λ and the angle between the measurement beams 2φ:

$$\Delta s = \lambda/(2 \sin \varphi)$$

If a particle moves through the stripe pattern, the back-scattered light from the particle is modulated in its intensity. A photodetector in the sensor produces a signal whose frequency fD is directly proportional to the speed component of the surface in the measuring direction vp and:

$$fD = vp/\Delta s = (2v/\lambda) \sin \varphi$$

fD = Doppler frequency
vp = Velocity vector in measuring direction
Δs = Stipe spacing in the measurement volume

The value of λ/sinφ is the measuring scale for speed and length measurement.

Figures on page 4:
Example applications of non-contact length and speed measurement: Foil, timber, textile, cable, wire, steel rope, artificial leather, measurement of cylinder speeds

Product Overview

µSPEED-SMART

- High accuracy smartsensor (typ. better ± 0,05 %)
- Mid price category
- For standard rolling/ cutting processes
- Easy electrical and mechanical integration
- Calibratable length gauge acc. MID 2014/32/EU

Fig. 1: µSPEED-SMART/-ECO/-PRO

µSPEED-ECO

Identical to µSPEED-SMART(see above) apart from:
- Mid accuracy (better ± 0,3 %)
- Low price category

Fig. 2: MID-COUNTER & µSPEED-CONTROLLER

µSPEED-PRO

Identical to µSPEED-SMART (see above) apart from:
- Non-contact bi-directional measurement
- Zero speed measurement
- For each kind of process including stop and go and direction changes
- Calibratable length gauge acc. MID 2014/32/EU

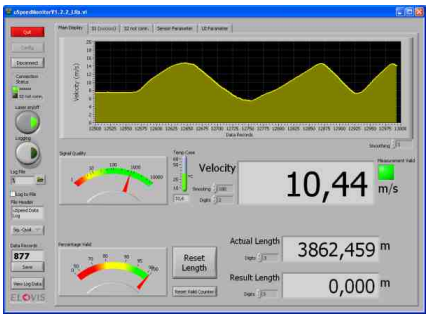


Fig. 3: PC-Software

MID-COUNTER & CONTROLLER

- Display and operator unit and controller
- Control functions for cut-to-length; good/waste length counting; internal memory; direct print-out control; measurement data logging
- For fix integration into machine or portable use
- For each kind of process including stop and go and direction changes
- MID-COUNTER for calibrated length measurement acc. to MID/2014/32/EU

Fig. 4: Big Display

Accessories

- Equipment for portable use: tripod, fast installation devices, case
- PC software for configuration and monitoring
- Eifferential speed measurement software
- Display-units, counters and operator interfaces
- Accessories for accredited version acc. MID 2014/32/EU e.g. printer
- Protective housings, air and water conditioning

Fig. 5: Tripod, Transportation Case

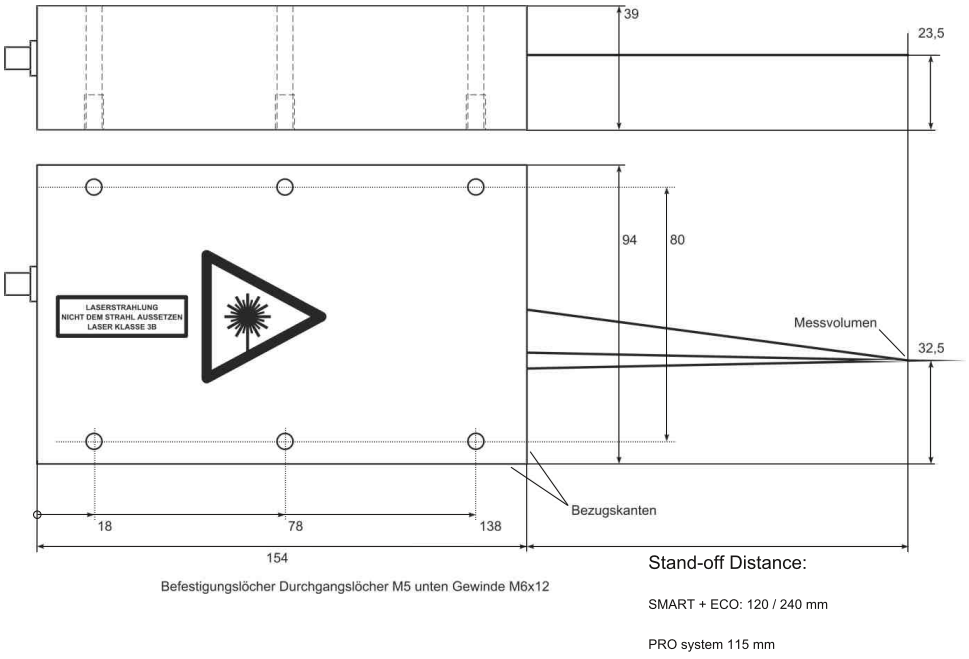
Specifications

Parameter	Unit	µSPEED-PRO	µSPEED-SMART & SMART-ECO	µSPEED-CONTROLLER & MID-COUNTER
Direction Detection		YES non-contact	via external direction signal	acc. to type of gauge
Zero Speed Measurement		YES non-contact	NO	acc. to type of gauge
Material Presence		YES non-contact	optional non-contact	acc. to type of gauge
Accuracy (typical) **(2σ;L>10m/3σ;L>20m)**	%	± 0,05	SMART ± 0,05 SMART-ECO ± 0,3	acc. to type of gauge
Repeatability	%	± 0,02 (except SMART-ECO)		
Gauge / Device Type		Smart Sensor	Smart Sensor	Controller + Display
Speed-Range	m/min m/s	0 to ± 1.200 0-20	1 to ± 6.000 0,02-100	acc. to type of gauge
Stand-off Distances (Tolerances)	mm	115±5 (±20)	120±5 (±20) 240±10 (±40)	
Interfaces		1 x RS-485 or RS-232 alternativ to I/Os: RS-422, RS-485		RS-232 Sensor, USB Ethernet, ...
I/Os	pls/m	Quadrature Output 1 to 100.000 (depending on max. speed) Input: Start, Gate, Direction, Laser Interlock Output: Status		Quadr.Out/Imp.Out RS-485 / RS-232 L-Reset, Direction, Gate Status
I/O Type		RS-422 level Laser Interlock (single, 24V)		4 x digital high speed I/O 5V or 24V level
Data available		Speed, Length, Signal Quality, Status, Laser Interlock, Valid, Measurements, Material Presence		
Fieldbus		Profibus, Ethernet-IP, Profinet (fieldbus optional)		MID-CNT: Available Protocols: SOAP, XML, JSON, UPD
IP Code		Sensor head: IP67		CONTR. & MID-CNT.: Front: IP51; Back: IP20
Dimensions (LxWxH)	mm	Sensor head: 154x94x39		CONTR:236x166x126 mm MID-CNT: 96x96x160 mm
Voltage		24VDC (18 V to 30 V)		CONTR: 110-230VAC MID-CNT: 24VDC
Weight	kg	Sensor head: 1 kg		Controller: 2,5 kg MID-CNT: 1 kg
Laser Data		25mW, 780 nm (Laser class 3B)		
Ambient temperature **Humindity**		5 bis 55°C (41 to 131 °F) non condensing Cooling/heating required outside this range		

Specifications are subject to change without notice.

Dimensions

Fig.:
Sensor head
identical measured for all types of sensors_
(µSPEED-SMART, -ECO, -PRO)



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Version 1 / Q1/2020