



μSPEED®

Non-Contact Speed & Length Gauges
bi-directional, precise, zero speed measurement
Q2/2016

Product Information

μSPEED systems are capable of measuring speed and length without contact to the moving material surface. The 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 systems measure nearly all surfaces without parameter setting.

- material independent
- long term calibrated
- 0 m/s up to 100 m/s
- direction detection/bidirectional measurement
- typ. accuracy $\pm 0,5$ m at 1000 m mat. length
- most compact in market
- available version certified MID 2004/22/EC

Benefits

compared to tactile measurement systems :

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

compared to other non-contact devices:

- the most compact in class
- the most easy to handle in class (plug & play)
- non-contact direction detection
- non-contact zero speed measurement
- no parametration necessary
- permanently calibrated
- long laser lifetime
- optimum price performance ratio
- MID 2004/22/EG standard (proofed by German PTB)
- made in Germany



Applications Overview

Variety of μSPEED Measurement Applications :

Spool Length / Cut-to-Length Control:

- Web, rolled, spooled material, coils
- Textile, fabrics, carpet, nonwoven, artificial leather
- Foil, film, tape, printed and coated
- Paper, corrugated paper, packaging material
- Rubber, laminate, extrusion material
- Roof foil, bitumen web, geo textile
- Tube, hose, profile, strip 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

Encoder Calibration:

- Calibration of machine counters
- Calibration of tachometers
- Portable calibration of several production lines

Print Control:

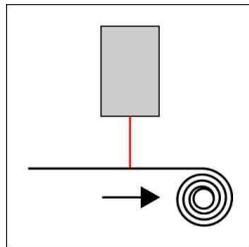
- Printing of length scales
- Printing proportional to length

Repeat Pattern Measurement:

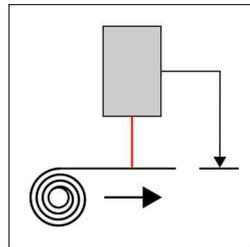
- Packaging film, wall paper, carpet
- Measurement of print pattern distances
- Setting of printing machines

Difference Length / Speed Measurement:

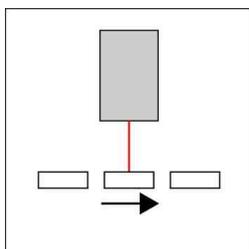
- Speed balancing e.g. for lamination or coating
- Elongation speed ratio measurement e.g. for steel mills
- Slippage detection (Cause study for surface errors, material and web breaks, increased wear and tear)



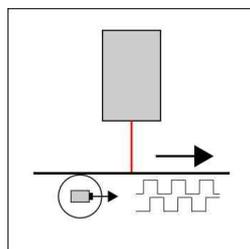
Spool length



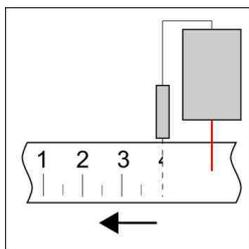
Cut-to-Length Control



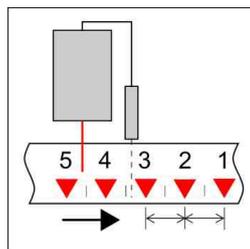
Part Length



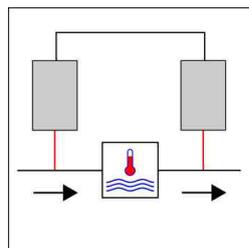
Encoder Calibration



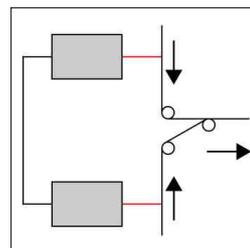
Print Control



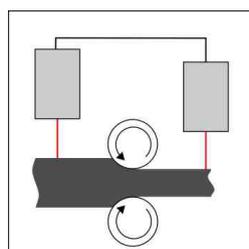
Repeat Pattern



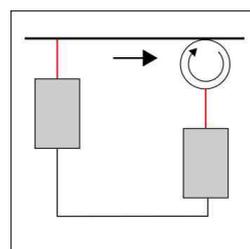
Difference Speed



Speed Balancing



Elongation Ratio



Slippage Detection

Applications

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

μ SPEED sensors

- work on almost any moving objects, such as:

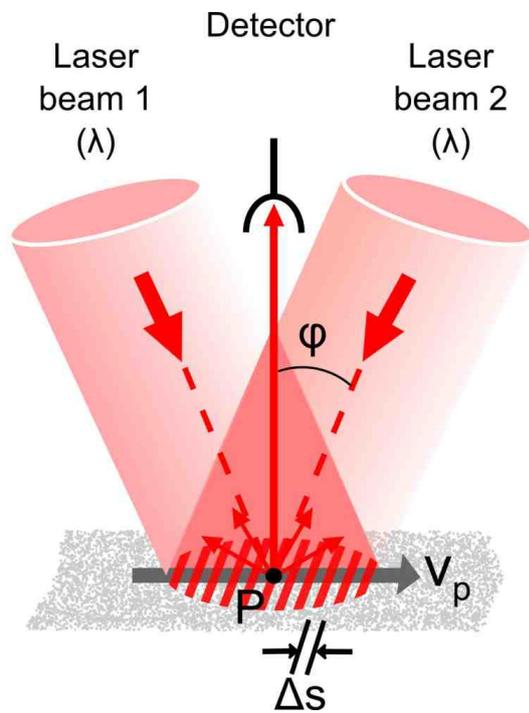
Web and coiled material, tube, pipe, rod, sheet, plate, cylinder, roller, profile, wire, cable, yarn, rope

- 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
 hygienic and food as well as wood, glass and
 ceramics and converting industry



Measurement Principle



μSPEED sensors operate according to the differential doppler method. Here two laser beams, which occur at an angle to the optical axis, superimpose 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 s is a constant which depends on the laser wavelength and the angle between the measurement beams 2 :

$$s = \lambda / (2 \sin \phi)$$

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:

$$fD = v_p / s = (2v / \lambda) \sin \phi$$

fD = Doppler frequency

vp = Velocity vector in measuring direction

s = Stipe spacing in the measurement volume

The value of $\lambda / \sin \phi$ is the measuring scale for speed and length measurement.

Product overview

μSPEED-SMART

- high accuracy smartsensor (typ. better $\pm 0,05$ %)
- mid price category
- for standard rolling/ cutting processes
- easy electrical and mechanical integration

μSPEED-ECO

- Identical to μSPEED-SMART(see above) apart from:
- mid accuracy smartsensor (better $\pm 0,3$ %)
 - low price category

μSPEED-PRO

- Identical to μSPEED-SMART (see above) apart from:
- high end smartsensor for non-contact zero speed, stop and go and bi-directional measurement
 - high accuracy (typical better $\pm 0,05$ %)
 - best price performance ratio in market
 - for each kind of process including stop and go and direction changes
 - MID 2004/22/EG version available

μSPEED-CONTROLLER

- controller for all types of μSPEED sensors
- display and operator unit
- control functions for cut-to-length; good/waste length counting; internal memory; direct print-out control
- for each kind of process including stop and go and direction changes
- for fix integration into machine or portable use
- MID 2004/22/EG accredited version available

Accessories

- equipment for portable use: tripod, USV, case, fast installation devices
- configuration and monitoring software
- differential speed measurement software
- display-units, counters and operator interfaces
- accredited version MID 2004/22/EC standard
- protective housings, air and water conditioning



Pic 1: μSPEED-SMART/-ECO/-PRO



Pic 2: μSPEED-CONTROLLER



Pic 3: PC-Software



Pic 4: Additional Display



Pic 5: Tripod, Centre Ball, Case

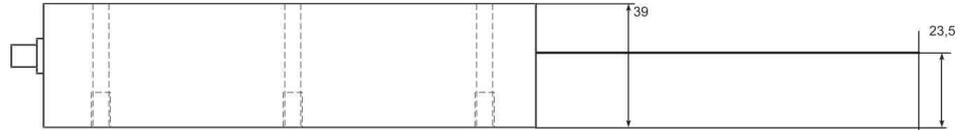
Specifications

| | | μSPEED-PRO | μSPEED-SMART & SMART-ECO | μSPEED-CONTROLLER optional: MID |
|--|--------------|--|-----------------------------------|--|
| Parameter | Unit | | | |
| Direction Detection | | YES non-contact | YES via external direction signal | according sensor type |
| Zero Speed Measurement | | YES non-contact | NO | according sensor type |
| Material Presence Detection | | YES non-contact | YES optional non-contact | according sensor type |
| Accuracy (typical) (2 ;L>10m/3 ;L>20m) | % | ± 0.05 | SMART ± 0.05 SMART-ECO ± 0.3 | according sensor type |
| 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 | according sensor type |
| Stand-Off Distances (Tolerances) | mm | 115±5 (±20) | 120±5 (±20) 240±10 (±40) | |
| Interfaces | | 1 x RS-485 or RS-232 alternatively to I/Os: RS-422, RS-485 | | Multifunction/Config. Sensor, 2 x USB 3.0 2 x Gigabit Ethernet, ... |
| I/Os | pls/m | Quadrature output 1 to 100.000 (dependent on max speed) Input: Start, Gate, Direction, Laser Interlock Output: Status | | Quadr.Out/Imp.Out RS-485/RS-232 L-Reset, Direct., Gate Status |
| I/O Type | | RS-422 levels Laser Interlock (single, 24V) | | 3 x digital high speed 5V or 24V level select. |
| Data Available | | Speed, Length, Signal Quality, Status, Laser Interlock, Valid, Measurements, Material Presence | | |
| Fieldbus | | Profibus, CANopen, DeviceNet, CC-Link, Ethernet-IP, Profinet-IO, Modbus-RTU Bluetooth (Fieldbuses only optional) | | |
| IP Code | | Sensor Head: IP67 Controller unit: | | Front: IP51; Back: IP20 |
| Dimensions (LxWxH) | mm | Sensor Head: 154x94x39 Controller unit: | | 236x166x126 |
| Voltage | | 24VDC (18 V to 30 V) | | 110-230VAC/50-60Hz |
| Gauge Weight | kg | Sensor Head: 1 kg | | Controller: 2,5 kg |
| Laser | | 25mW, 780 nm (Laser Klasse 3B) | | |
| Ambient Temperature Humidity | | 5 to 55°C (41 to 131°F)- non condensing Cooling/heating required outside this range Ask for ELOVIS housing for cooling/heating | | |

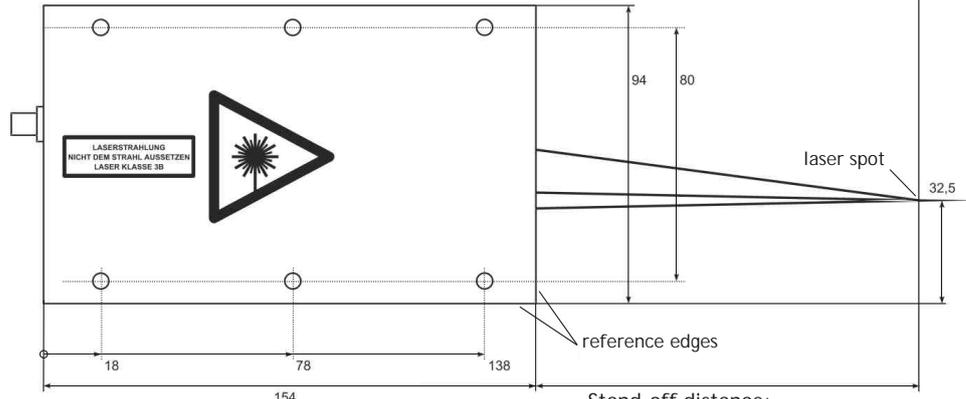
Specifications are subject to change without notice.

Dimensions

Sensor Head:
identical measures
for all sensor types:



μSPEED-SMART/
ECO/PRO



fixing hole clearance hole M5 lower thread M6x12

Stand-off distance:
SMART + ECO: 120/240 mm;
PRO: 115mm



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