

LSV: Laser Surface Velocimeter

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How It Works

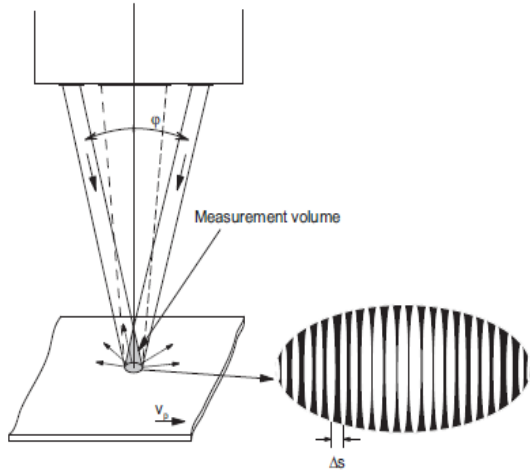


Figure A.1: Measurement principle of the LSV

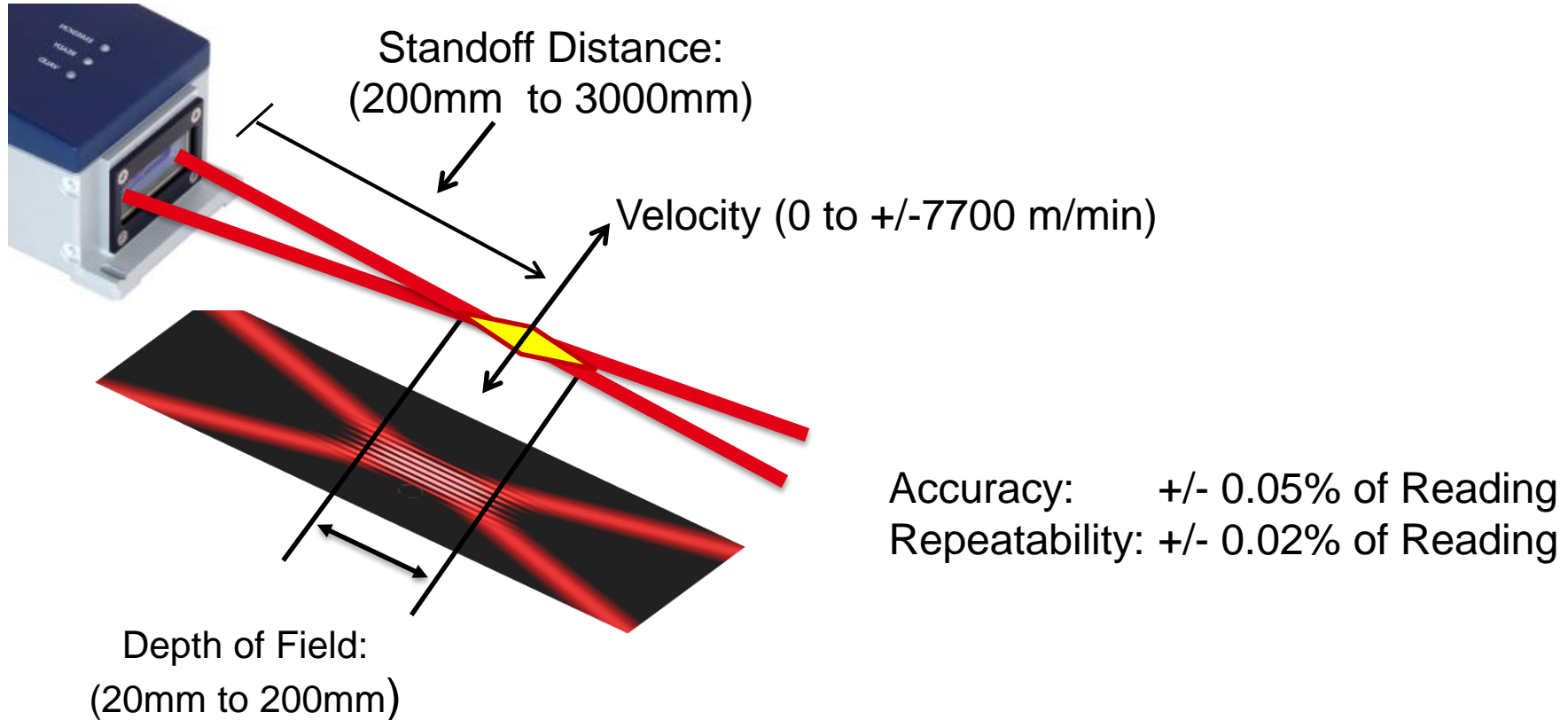
- Two beams focused at one point.
- An interference or fringe pattern results
- Fringe spacing Δs is constant determined by the wave length λ and the angle between the beams.
- Parallelism of the fringes contributes to system accuracy throughout depth of field
- Detector sees oscillation in light intensity (modulation frequency – Doppler Shift) as material moves through fringe pattern

Fringe spacing $\Delta s = \frac{\lambda}{2 \sin \varphi}$

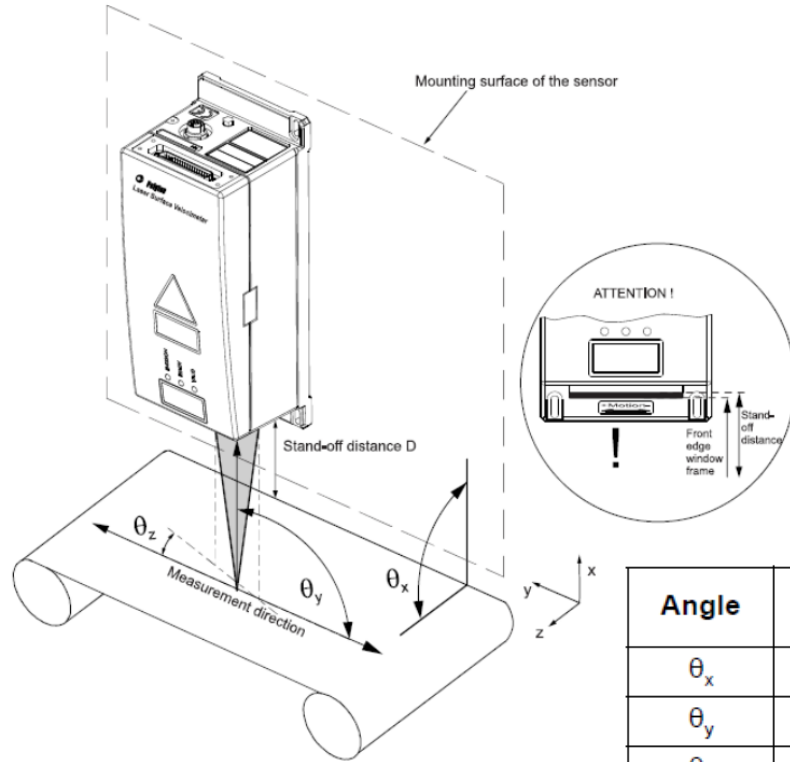
Doppler frequency $f_D = \frac{v_p}{\Delta s}$

Modulation Frequency \longrightarrow Speed

Sensor Parameters - Depends on Sensor Head



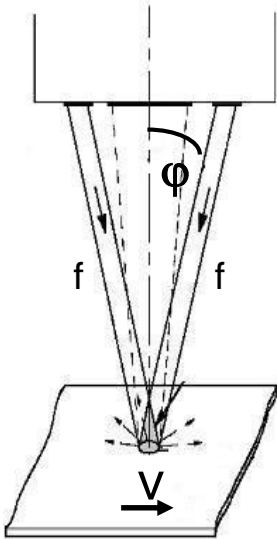
Sensor Alignment:



Angle	Target value	Error in %	Error at $\pm 1.3^\circ$	Error at $\pm 2^\circ$
θ_x	$90^\circ \pm 5^\circ$	0	0	0
θ_y	90°	$(1 - \sin\theta_y) \cdot 100$	0,026%	0,061%
θ_z	0°	$(1 - \cos\theta_z) \cdot 100$	0,026%	0,061%

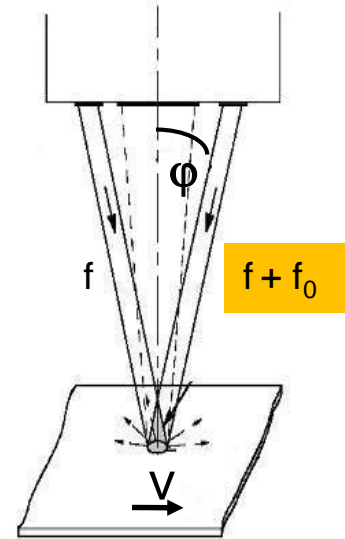
Types of Sensors:

Non-Shifted - Base System LSV1000 SYSTEMS:



- Measures to a specified minimum velocity
- Positive Speed Only

Frequency Shifted System LSV2000 & LSV 2100 SYSTEMS:

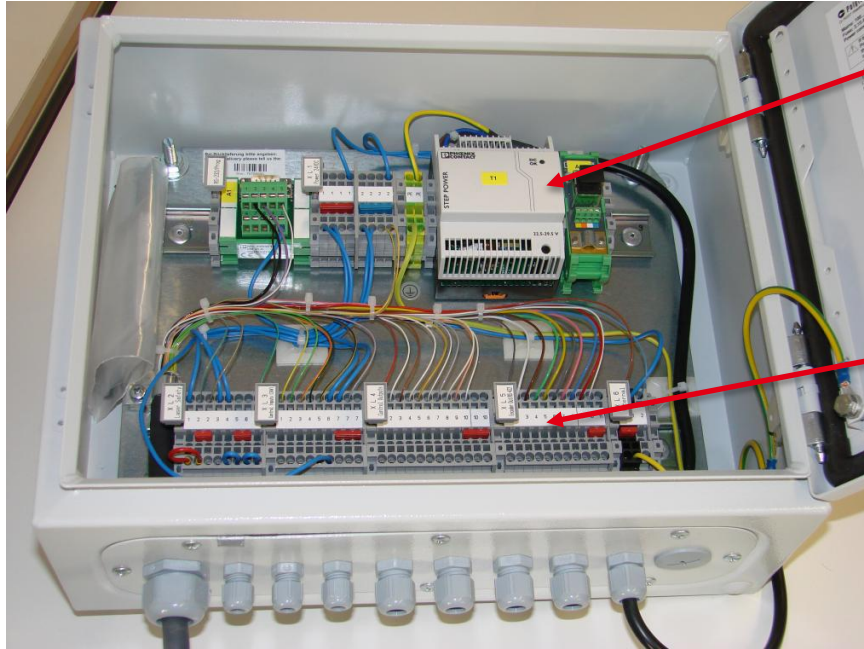


- **Measures to Zero Speed ($v=0$)**
- **Determines Direction**

- Included: Direct from Sensor Head:
 - Quadrature Encoder Pulse
 - RS422 – Requires Programming
 - Ethernet (TCP/IP) – Serial over Ethernet:
Ethernet interface to Laptop to run LSV Software
 - Additional Logic I/O

- Optional Gateway PLC Interface Modules:
 - Allen Bradley Specific Preconfigured Ethernet Protocol
 - Siemens Preconfigured Profinet/Profibus Protocol

LSV-A-110 Connection Box: Pre-wired



24Vdc System Power Supply

Quadrature Encoder Pulse Output
(Power plus A, A/, B, B/)

LSV Sensor Heads

LSV 1000: Specifications:						
Visible Laser Diode: 690nm 25mW max. Class 3B						
Working Distance (mm)	200mm	300mm	500mm	700mm	1000mm	1500mm
Depth of Field (mm)	30	40	60	80	120	140
Min Velocity (m/min)	0.3	0.53	0.8	1.05	1.43	2.11
Max Velocity (m/min)	875	1535	2296	3058	4188	6211

LSV2000 Specifications:									
Visible Laser Diode: 658nm 25mW max. Class 3B									
Working Distance		300mm	500mm	700mm	1000mm	1500mm	2000mm	2500mm	3000mm
Depth of Field (mm)		120	120	140	140	140	200	200	200
Min-Max Velocity (m/min)	0 to +/-7700								

LSV2100 Specifications:

LSV2100 Specifications:									
Visible Laser Diode: 658nm 25mW max. Class 3B									
Working Distance		300mm	500mm	700mm	1000mm	1500mm	2000mm	2500mm	3000mm
Depth of Field (mm)		120	120	140	140	140	200	200	200
Min-Max Velocity (m/min)	0 to +/-7700								

- Multi-User Interface (3 Ethernet + 1 RS422)
- Web Interface
- Built-in Profinet or Ethernet/IP (Q2 2019)

APPLICATION PHOTOS

Applications

Applications:

- Cut-to-Length
- Part Length Verification
- Footage Counting
- Differential Speed (Elongation)

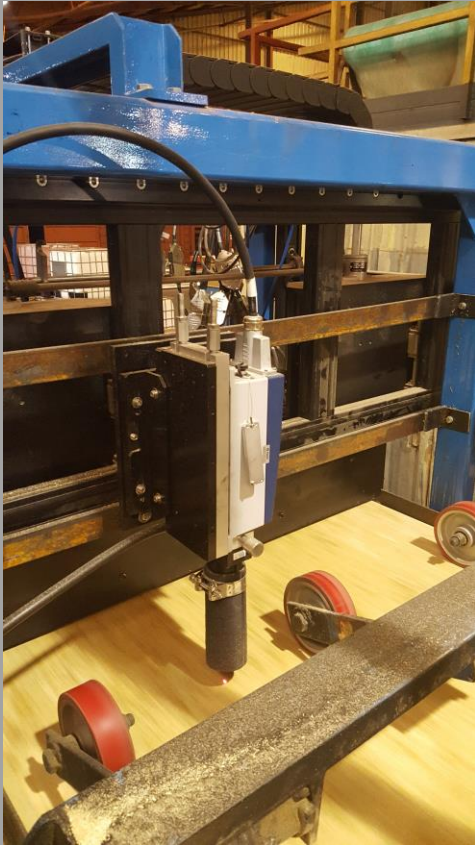
Typical Industries:

- Steel/Aluminum/Metals
- Tube & Pipe (Metal Seamless & Welded)
- Tubing/Hose: (Extruded-Rubber, Plastic)
- Building Materials
- Fabrics/Textiles/Foams/Rubber
- Corrugated Board
- Converting
- Paper

Corrugated Board – Cut to Length



OSB Board: Integrated to Printer for Logo



Flame Retardant Insulation Blanket - Length

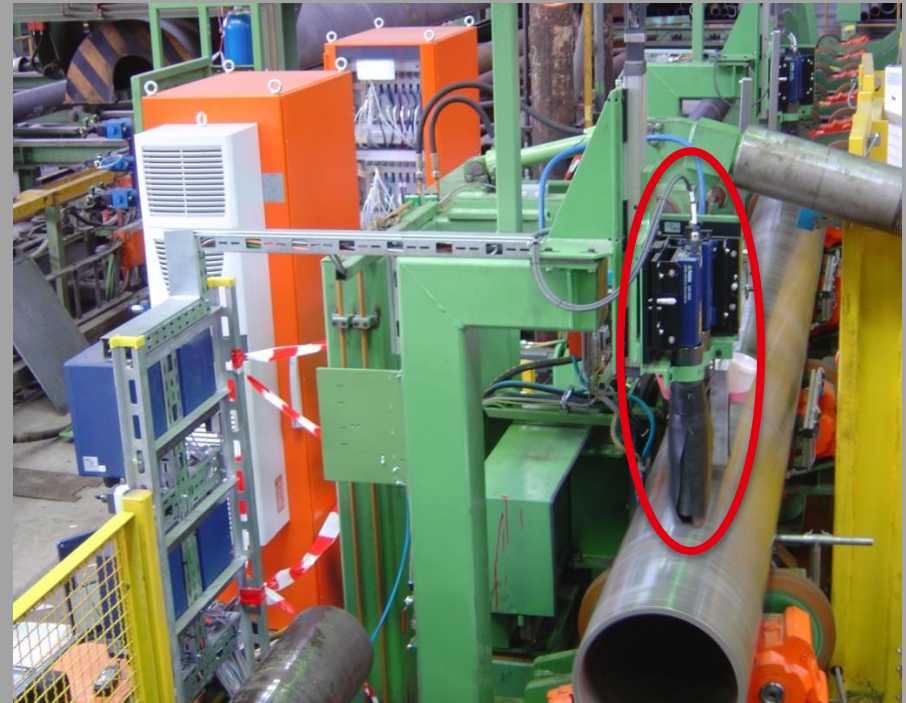


Exit of Oven



Slitter / Rewinder

Tube/Pipe Applications



Sucker Rod (Oil Industry) - Length



Tube & Pipe: Cut To Length



Robotic Plasma Steel Cutting Systems



- Application: Positioning of beams for cut to length and profile cuts

Aluminum Processing Line:



Tilted to avoid specular reflection

Aluminum Roll Mill

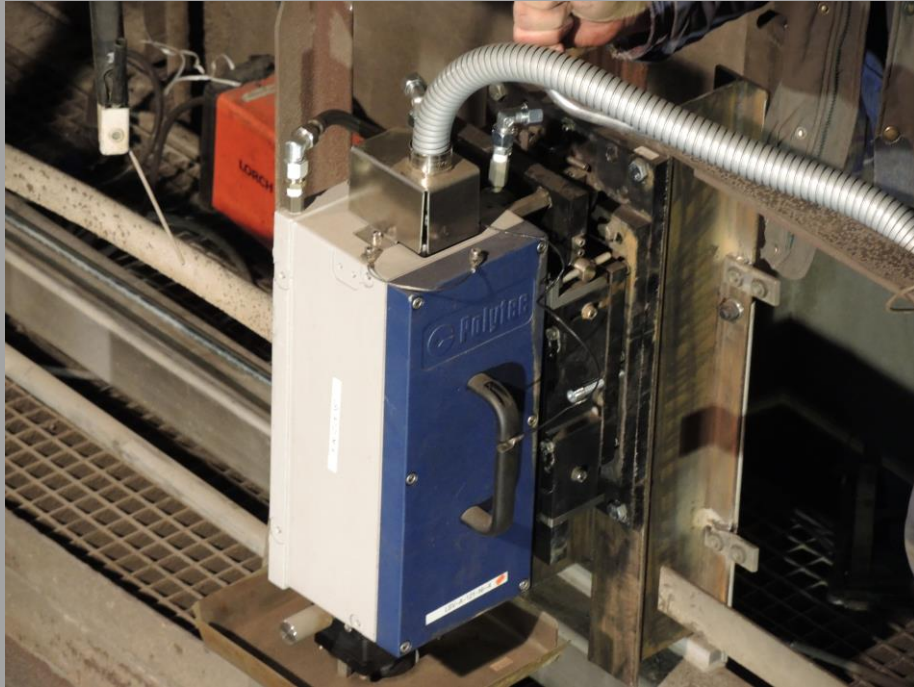
AGC: Mass Flow/Elongation



Plate Length Verification

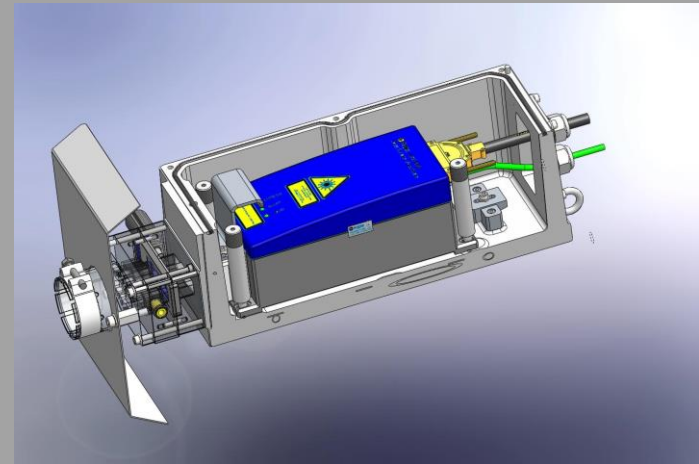


Slab Caster: Cut To Length: Heavy Duty WaterCooled Housing:



Heavy Duty WaterCooled Housing

- Continuous Casters: (Slab & Billet)
- Hot Roll Mill:
- Cold Roll Mill (Tandem/Temper)
- Bar Mills
- Tube/Pipe Mills



5 Strand Billet Caster

