Polytec

Steel Industry

Non-contact Length and Speed Measurements: Precise, Reliable, Repeatable

Competence Field

Polytec LSV:
When The Going Gets Tough

Polytec's line of LSV laser length & speed sensors are specifically designed to deliver precise and reliable measurements for advanced process control, process optimization, improved quality and increased yield. From Casting to Finishing, the LSV offers a comprehensive range of sensor systems and accessories to enable optimal configuration for the specific application requirements.

With over 20 years experience in the industry, customers have come to rely on Polytec to supply advanced, reliable technology in a rugged, mill-duty package, while providing the attention to customer support responsible for building long term business partnerships. Polytec's LSVs provide length & speed solutions to many applications throughout the steel process including Casting, Hot Rolling, Cold Rolling, Coating, Plate Mills, Steel Processing, Tube & Pipe and much more. Whether the sensor is used for Process Speed, Cut-to-length or Length Verification, the LSV is the solution of choice for mills around the world.

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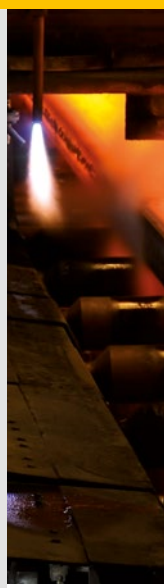
- All-in-one system, easy integration into production processes and control environments
- ASA: Automatic Surface Adaption – Automatically compensates for changing surface conditions resulting in optimal measurements
- FBD: Fast Burst Detection – Allows the LSV to quickly lock on to and follow true velocity even at high accelerations
- Unrivaled depth of field at short working distances of the shifted systems. Proprietary optics – ideal for Tube and Pipe applications
- Easy to operate with no recalibration within its lifetime
- Visible laser for easy alignment and operator safety
- Compact design fits into other measurement frames, like thickness C-frames
- Robust sensor technology for reliable operation even under harsh conditions, protection class IP66 and IP67
- Optional cooling, air purge and heavy duty housing for measurement tasks in challenging environments
- Includes two trigger inputs for additional photocells, hot metal detectors or external switches for high precision edge detection and offset length compensation
- Hardware status signals for remote diagnostic functions available
- User-selectable full quadrature pulse output and interfacing with LAN, RS 422/232, Profi bus and more
- Various working distances available from 300 mm to 2,500 mm
- Parallel fringe spacing: proprietary optics produces outstanding parallel and consistent fringe spacing to guarantee accuracy regardless of position within the specified field



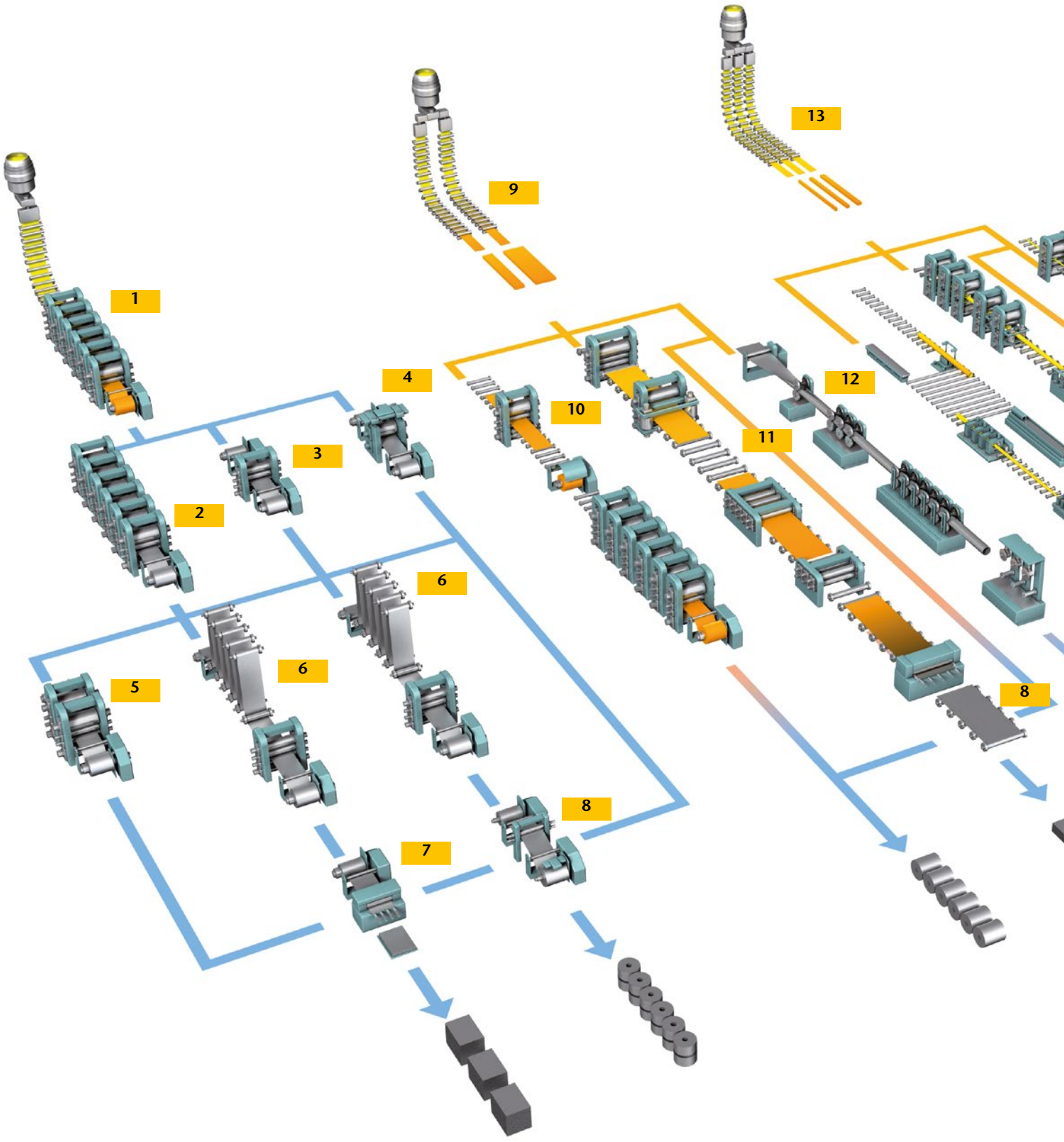
1
LSV with protection housings to measure casting speed and length in a billet caster

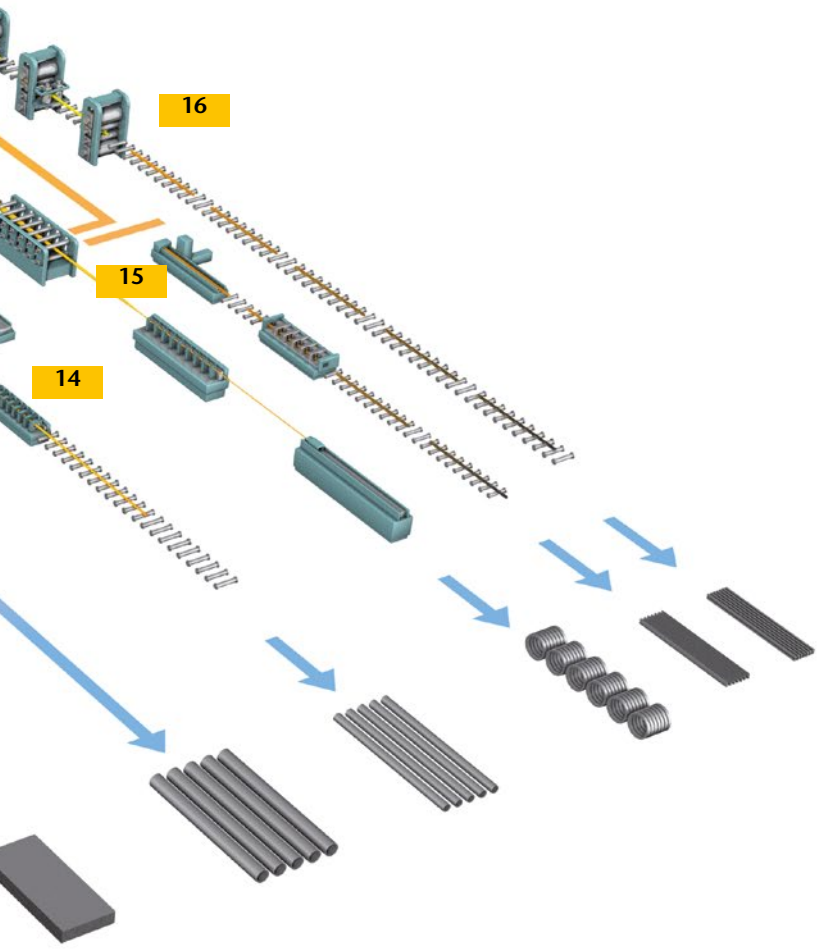
2
LSV with protection housing in a cold rolling mill for mass flow control

3
LSV measures rotation of a tube in a planetary cross rolling mill

4
Stand alone mounted LSV with protection housing in an oily and steamy environment of a cold rolling mill

Multifunctional – Everywhere You Need It





Typical Applications

1 Hot strip speed measurement for coil box speed synchronization at the exit of a Continuous Strip Production, CSP

2 Inter-stand and exit strip speed measurement for mass flow control and automatic gauge control in tandem cold rolling mills

3 Entry and exit speed measurement for mass flow and elongation control in a reversing cold rolling mill

4 Entry and exit speed measurement for mass flow and elongation control in 20 high roll mill stand

5 Entry, Interstand and exit strip speed measurement for mass flow control and automatic gauge control in a tandem reversing cold rolling mill

6 Entry and exit speed measurement for elongation control in a temper / skin pass mill

7 Coil strip length measurement for dividing shear cut to length control

8 Final length measurement of coils

9 Length measurement of the continuous slab caster strands for torch cutter control for slab length optimization

10 Speed measurement for coil box synchronization and crop optimization in a compact hot strip mill

11 Speed measurement for cooling process control in laminary cooling sections

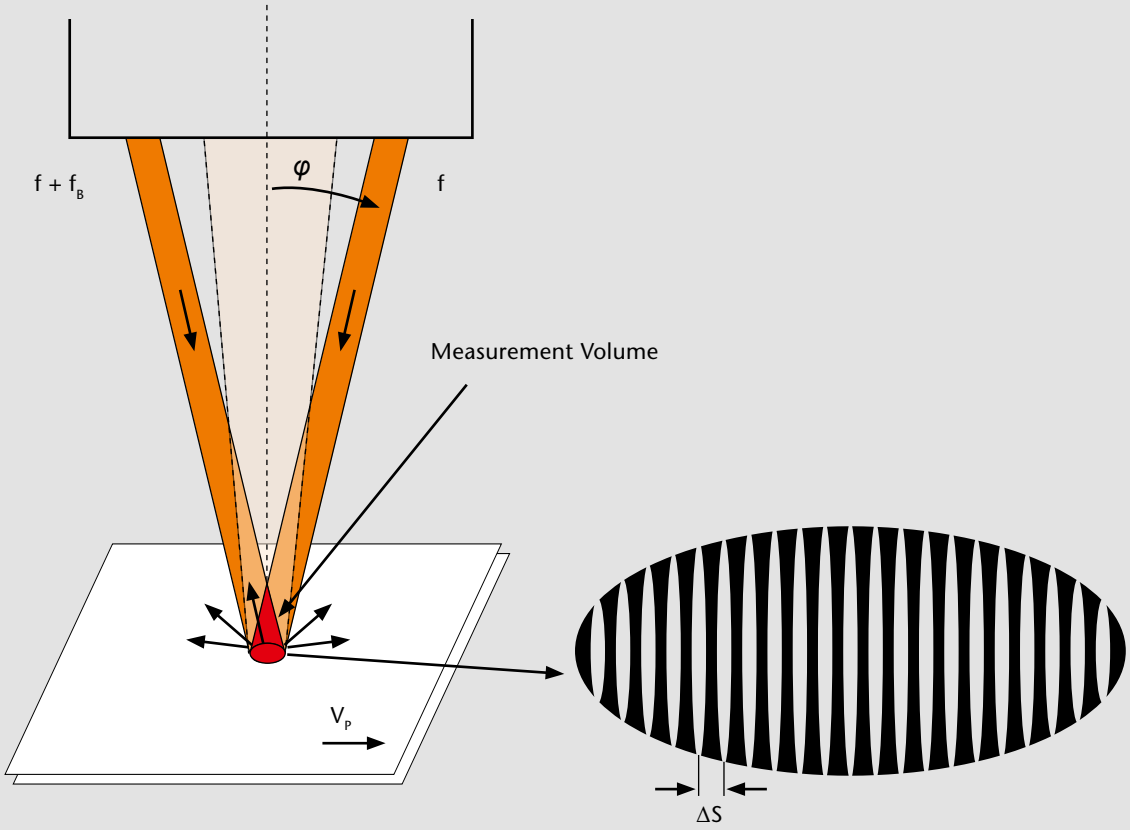
12 Length measurement for U plate positioning in presses in a large diameter pipe plant

13 Length measurement of the continuous long product caster strands for torch cutter control for billet and bloom length optimization

14 Length measurement in stretch reducing mills for seamless tubes, also in combination with wall thickness gauges

15 Speed measurement on rods for flying shear speed synchronization and cut to length control in rod mills

16 Length measurement on long products for cut to length control in section mills



Laser Surface Velocimetry: Built For Precision

Non-shift, Base systems

Polytec LSV Laser Velocimeters use a modified laser Doppler technique to measure the speed of material passing by the sensor. The beam of a single laser diode is split into two beams. These beams are superimposed on to a moving surface at an angle φ, relative to the optical axia. As the two beams overlap, constructive and destructive interference occurs, generating a static pattern of light and dark fringes within a specified measurement volume called the depth of field. The fringe spacing, Δs, a key calibration parameter, is determined by the wavelength λ and the angle φ, as defined by:

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

Light scattered from a material moving through this pattern, experiences a Doppler frequency shift, f_D, proportional to the speed of the material, as defined by:

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

The result is an intensity modulation at the receiving optics, with a frequency proportional to the velocity of the material. Length is then calculated by integrating velocity over time, in real time.

Frequency shifted systems

For those applications requiring material direction (forward/reverse) or measurement at and around standstill (v=0), a Bragg cell is introduced into the optical path to shift one of the beams by a constant frequency of f_B – the offset frequency. The result is a fringe pattern that generates an intensity modulation as defined by:

$$f_M = f_B + f_D$$

Where:
f_M is the measured frequency
f_B is the offset frequency
f_D is the Doppler frequency

This frequency shifting technique enables measurement at standstill (v=0: where f_D=0 and f_M = f_B), as well as, detection of velocity direction (+ / -).

In both cases, system accuracy is dependent solely on wavelength λ and angle φ.

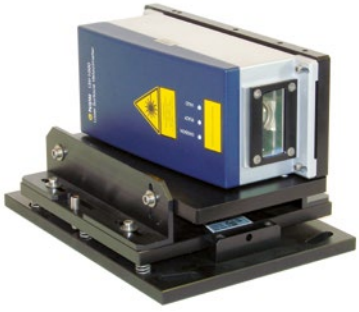
Accessories

LSV-A-110 Connection Box
The connection box is completely wired for instant operation and contains a full terminal block, an universal power supply and LAN connector.

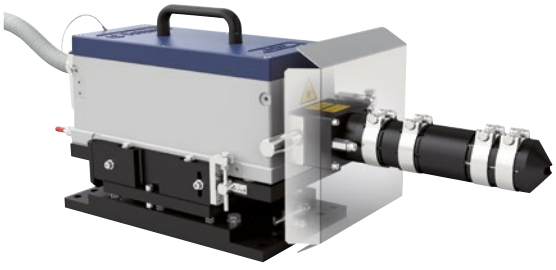
LSV-A-120 Air Wipe With Quick Exchange Window
A front-mounted, aerodynamically optimized air wipe unit keeps the sensor's optical window free of dust and steam. For cleaning or replacement, the quick release window can be easily exchanged.

LSV-A-124 Measurement Installation Kit
The C-Frame accessory kit allows an easy integration into the housing of a c-frame of any thickness gauge. A built-in cooling plate keeps the sensor within its operational temperature range.

LSV-A-122 Cooling Plate
The cooling plate keeps the sensor in its operational temperature range, even under hot ambient conditions.



LSV-A-130 Adjustment-/ Mounting Platform
The 3-axis adjustable mounting platform simplifies the precise alignment of the LSV sensor in relation to the measurement object.



LSV-A-121 Thermoprotective Housing
To enable measurements in extreme environments Polytec has developed a high performance thermoprotective housing.
The LSV can be operated in with this housing and the optional heat protection shield above a slab caster line without additional protection.

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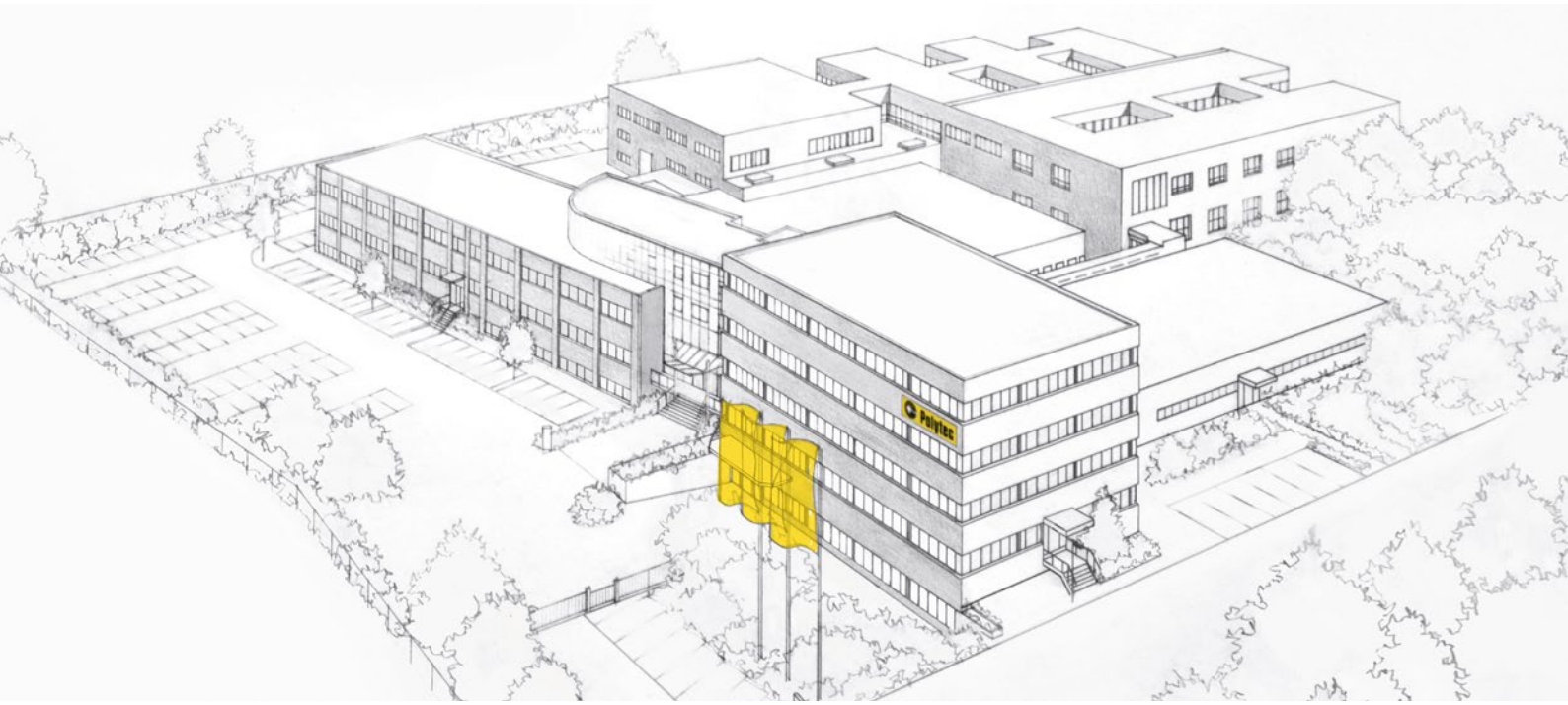

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