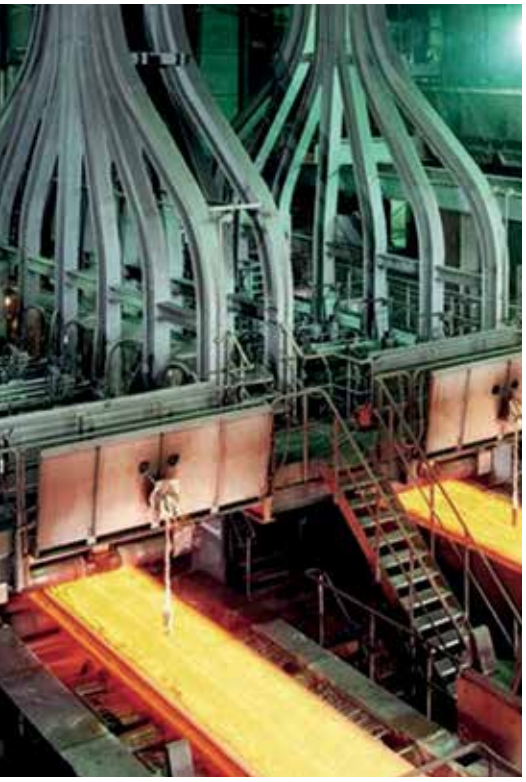
KEMPF

LOKE ENGINEERING

Measuring and Control Systems

for distance & level measurements, positioning and presence detection



- Accuracy even under the most difficult conditions
- Detecting - Positioning - Measuring
- Individual planning for every application

KEMPF – the specialists for non-contact measurement

The company Kempf GmbH & Co. KG offers laser measurement technology at its best, based on decades of experience. Kempf stands for further development of the proven systems and measuring methods of the family-owned company LOKE Engineering, founded in 1988. The company philosophy is clearly defined: Top performance for demanding applications.

Today, KEMPF is market leader for laser measurements for positioning, geometric detection, length, speed and level determination even under the most difficult atmospheric and temperature-related working conditions. KEMPF always offers ideal solutions – among others also for diffusely reflecting solid and liquid hot surfaces such as steel and glass at surface temperatures up to 1700°C.

KEMPF offers a comprehensive range of solutions – also for complex projects – as well as complete services from needs analysis to application support up to the commissioning of the complete system.

KEMPF is the ideal partner for customer-specific tasks and tailor-made solutions – for your quality assurance and production optimisation due to highly developed measuring systems and decades of experience.

Presence, position or distance – always focused on precision

KEMPF realises automation and logistics processes in heavy industry – preferably in steel mills – and in the non-ferrous metal processing industry. The company's special know-how is particularly evident in measuring by means of laser technologies under extreme surface and environmental conditions.

Exemplary are developments of special solutions for millimeter-accurate 1D and 2D measurement on hot surfaces at temperatures up to 1700 °C, or also for the recording/scanning of various semi-finished product geometries during production.

- Laser measuring systems even for the most difficult measuring conditions
- Customised solutions for measuring and inspection systems
- Applicable for a wide range of manufacturing processes
- Measurement on all diffusely reflecting, even extremely hot surfaces
- Millimeter and sub-millimeter accuracy
- Distance measurements from 0.1 m up to 3000 m
- Material length measurements at all process speeds

Everything under control: The processes of the LOKE systems

In order to meet the requirements of the widest possible range of applications, different measuring methods are used in our LOKE laser measurement systems.

The Phase-shift method

Measuring procedure

1. Emission of modulated laser light
2. Comparison of the reflection signal with the reference measurement
3. Distance calculation based on the phase shift between output and input wave

Application examples

- Material presence, width and parallelism determination
- Permanent position detection and positioning
- Material flow tracking and event reporting
- Frame cutting and cutting of semi-finished products
- Edge detection in the casting process
- Coil position and residual length measurement
- Level measurement of gas containers
- Loop control in the silo

The Time-of-Flight method (ToF)

Measuring procedure

1. Emission of laser pulses in millisecond intervals
2. Determination of the time difference between output and input pulse
3. Calculating the distance from the time difference

Application examples

- Position monitoring over long ranges
- Level measurements, tilt heights
- Ship docking
- Positioning of loading equipment

The Pulse backmixing method

This method is a combination of phase-shift and time-of-flight measuring.

Special features

1. Very high time resolution of 10 -12 (ToF laser 10 - 9)
2. Calibration pulse with time stamp before each measurement
3. Very high measurement rate with modulated light as pulse (no continuous light)

Applications

- All high-temperature processes that require high measuring rates

Technical data of laser models

Precise and robust: our opto-electronic distance measuring sensors of the LMC-J series were developed for uncompromising industrial use even under the most difficult conditions.

- Wide range of applications
- Precise measurement on a wide variety of surfaces
- Reflectorless measurement possible
- Low power consumption
- Compact design
- All standard industrial interfaces available
- Dust and splash water protection according to IP 65 /66 /67

Model variants

Model	Measuring method	Laser class	T_{max} (surface)
LMC-J 0040	Phase-shift	2	1050 °C
LMC-J 0050	Phase-shift	2 / 3R	1200 °C / 1450 °C
LMC-J 0062	Pulse backmixing	2	1100 °C [1] 1550 °C [2] 1620 °C [3]
LMC-J 0270	Time-of-Flight	1	300 °C
LMC-J 0310	Time-of-Flight	1	300 °C
LMC-RH	Time-of-Flight	1M	1700 °C [4]
LMC-RP	Time-of-Flight	1M	800 °C

[1] Standard
[2] on steel surfaces
[3] on glass
[4] on steel, other surfaces on request

LMC-J-0040-X / 0050-X

- Phase-shift measuring with amplitude modulation
- Selective measurement by aperture angle 0.6 mrd
- Easy alignment thanks to red laser light

LMC-J-0062-X

- Pulse backmixing measurement
- Millimeter accuracy for distances up to 500 m
- Easy alignment thanks to red laser light

LMC-J-0270-X / 0310-X

- Laser pulse time-of-flight measurement
- For very long measuring distances
- Applicable under harsh industrial conditions
- IR laser with pilot laser for easy alignment
- Special alignment device for long distances

LMC-RP / RH

- Models for special requirements
- For high demanding atmospheric conditions
- Separate measuring head for heat applications (RH)
- Technical details on request

Distance range	Measuring accuracy	Repeatability	Measuring beam visible
≤ 30 m [5] resp. ≤ 150 m [6]	≤ 2 mm	≤ 0-5 mm	yes
≤ 30 m [5] resp. ≤ 150 m [6]	≤ 2 mm / ≤ 3 mm	≤ 0-5 mm	yes
0,1 ... 100 m [5] 500 m [6]	≤ 1 mm	≤ 0-5 mm	yes
≤ 70 m [5] ≤ 270 m [6]	≤ 60 mm @ 40 kHz	≤ 25 mm	no
≤ 400 m [5] > 3000 m [6]	≤ 20 mm @ 100 Hz ≤ 60 mm @ 2000 Hz	≤ 10 mm	no
2 ... 10 m	≤ 10 mm @ 100 Hz ≤ 15 mm @ 1000 Hz	≤ 10 mm	no
8 ... 140 [7]/400 [8]/1500 m [6]	≤ 20 mm @ 2000 Hz	≤ 15 mm	no

[5] reflectorless
[6] on reflector
[7] @ ρ ≥ 10 %
[8] @ ρ ≥ 80 %

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