



Laser Contour Log Profiling System

LKM-400
LKM-700
LKM-900
LKM-1100
LKM-1400



Laser Log Profiling System (Log Measuring System)

The Laser Profiling System LKM is a complete measuring system that has been designed for non-contact measuring of logs in the wood industry. The nominal diameter ranges are 400, 700, 900, 1100 and 1400 mm. The system is intended to work in conjunction with non-split conveyors.

The complete length of the logs can be measured, up to a maximum of 25 m – in two axes in regard to their diameter/cross section (contour), crookedness, volume and length. All of this information is available at the interface.

1. Structure of the Measuring System

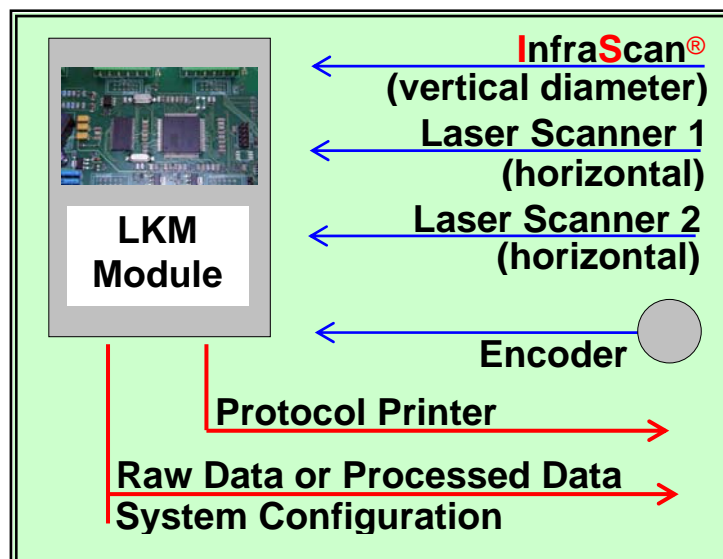
To collect all the measuring data the following sensors are used:

1. An infrared light curtain (scanner) Sitronic® **InfraScan® Series 5000**, nominal measuring areas 400, 700, 900mm, 1100mm and 1400mm respectively,
2. Two Laser Contour Scanners, System H-Sensortechnik – also trimmed to the measuring areas 400, 700, 900mm, 1100mm and 1400mm respectively.
3. An encoder to measure the length of the log (not within the scope of delivery).

Through the application of serial interfaces RS422, these sensors are connected to a **computer module** that is able to evaluate the gathered data. In the first instance **Raw Data** is provided, that is the co-ordinate axes of all laser measuring points in relation to the vertical position of the log. By means of an encoder these measuring data are related to “discs” along the log and the length of the log is determined.

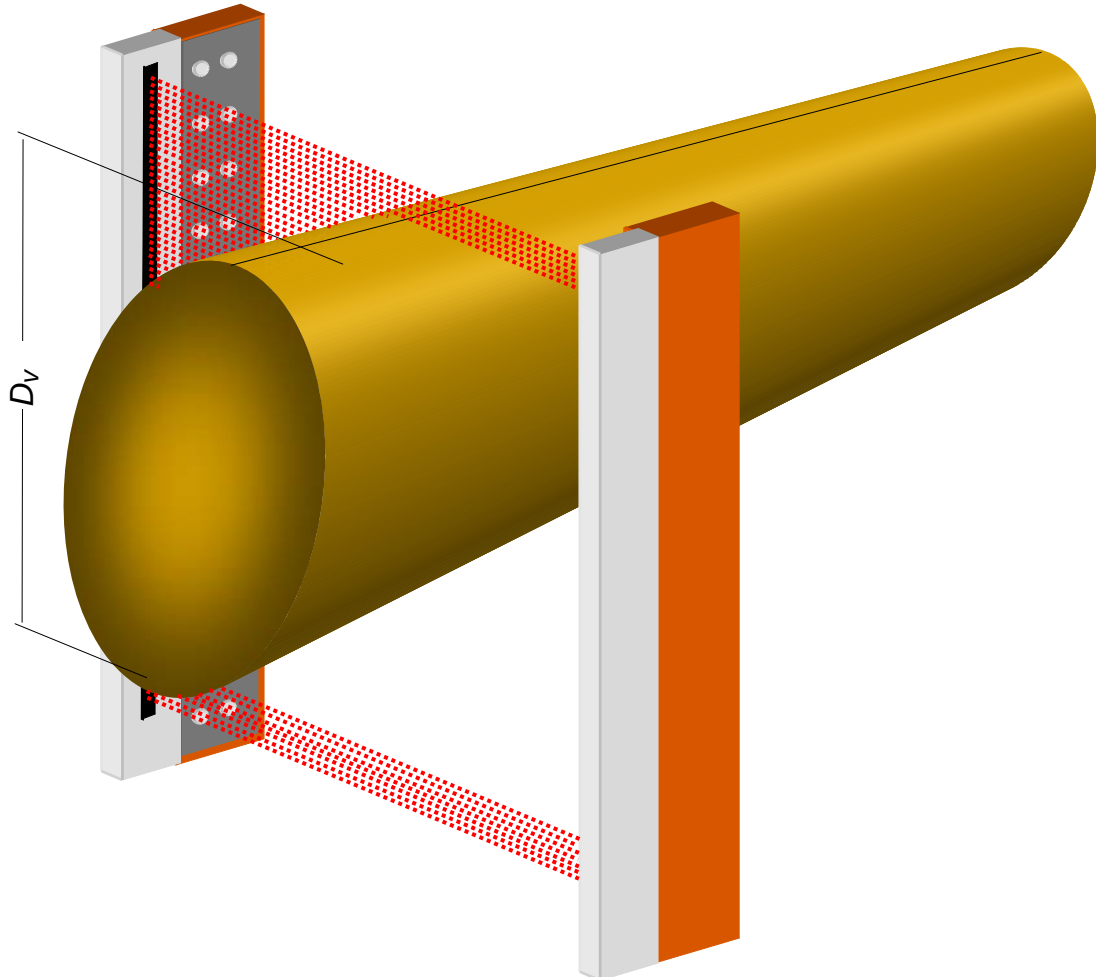
From there, based on a mathematical model, this will calculate the diameters in the x- and y-axes. However, the diameters measured in these two axes are not necessarily required to represent the actual smallest diameter and therefore the ‘smallest pair of diameters’ is calculated using mathematical functions.

The module as such comprises the following input and output interfaces:



2. Data Inputs

2.1 Determining the Vertical Diameter

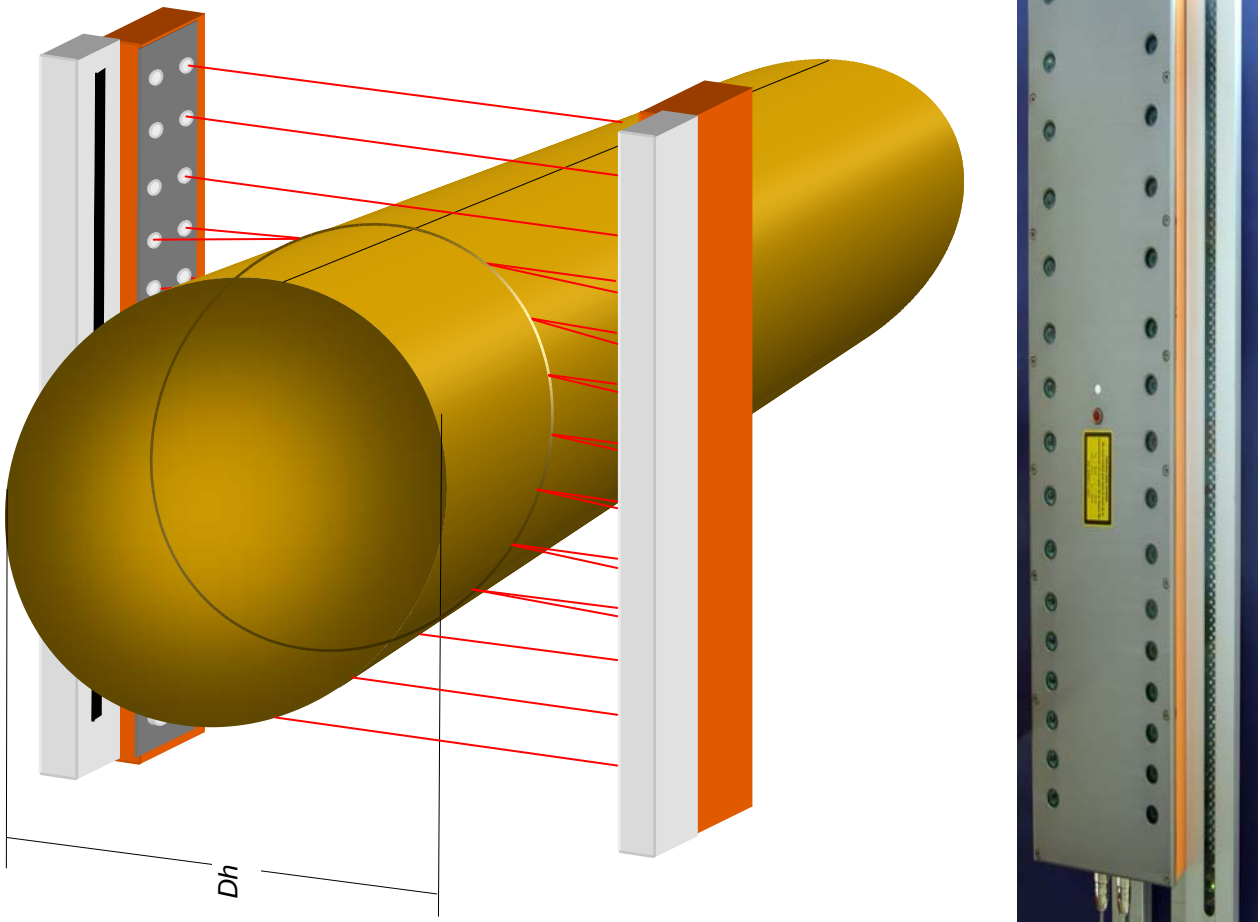


This measuring axis is represented by an infrared light curtain or scanner respectively, which consists of an emitter and receiver unit that not only contains the emitter and receiver diodes but also the electronics for controlling the diodes (light beams) and the evaluation of measuring data.

The special measuring method of scanning the wide-angle infrared beams and evaluating the 'shaded' beams has been designed to ensure a very high measuring speed and that they are not sensitive to ambient light and vibrations. This means that the adjustment of the scanners is made very simple and in turn dramatically reduces the cost of installation.

2.2 Determining the Contour and the Horizontal Diameter

To determine the contour of a log, two laser contour scanners are applied that are facing each other and are equipped with a line of laser sensors. The distance to the log is measured by triangulation. From this data the contour of the log can be determined and the horizontal diameter calculated mathematically.

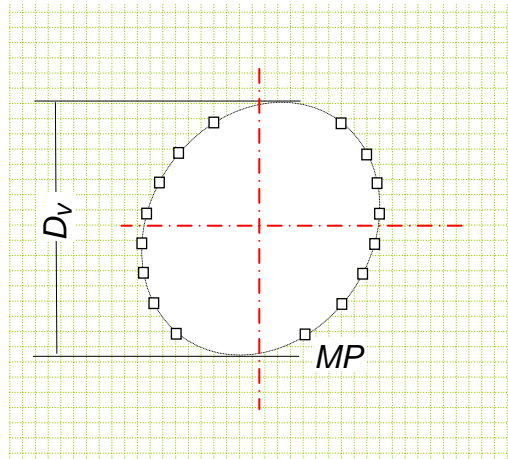


The laser contour scanners are very user friendly both in terms of handling and mounting. We can guarantee that these will not be sensitive to vibrations, sunlight and a wide range of temperatures. Naturally, this is critical for plants that operate either in the open or in adverse conditions.

In order to optimise measuring accuracy for small and large diameter logs, the distance between the laser beams vary. The first 5 beams are 45 mm apart, the next 5 beams 60 mm and the last beams 75 mm. For details see technical data.

2.3 Raw Data for Determining the Actual Contour

In this case the vertical diameter, as well as all co-ordinates of the laser measurements is output. This allows a good approximation of the actual shape of the log - the **Contour** of the log.



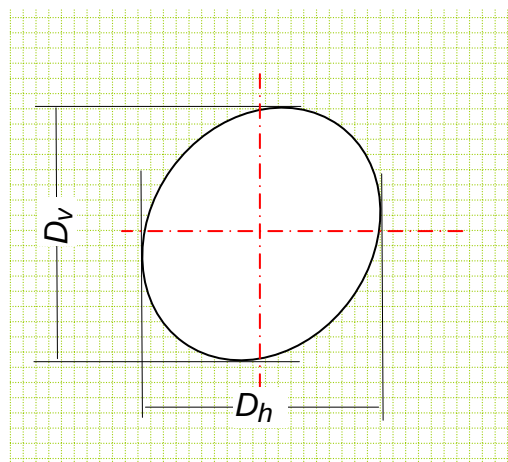
D_v = vertical diameter

MP = measuring point

To assign the individual measurements to a position along the log, it is necessary to use an encoder which at the same time serves for the length measuring.

2.4 Determining the Diameter Data

The diameter is determined through a mathematical model based on the position of the measured vertical diameter and the data derived from the laser contour scanner. The below graph demonstrates a symbolic reproduction of a sample log.

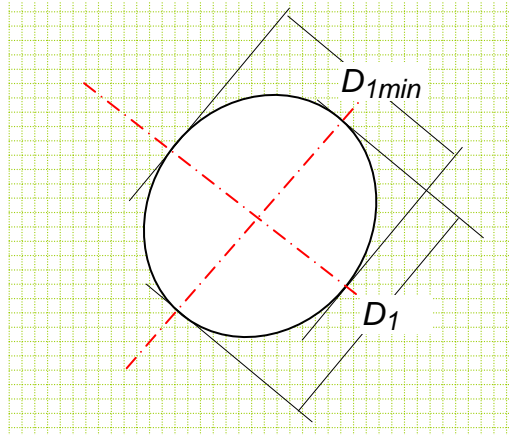


D_v = vertical diameter

D_h = horizontal diameter

2.5 Determining the Minimal Diameter Data

The diameters that are calculated as vertical and horizontal diameters are dependent on the position of the log at the precise moment of measuring. However, on many occasions the 'minimal diameter pair' needs to be established. This can also be achieved through a mathematical model that forms a tangent to the shape of the log.



2.6 Measuring the Log Length

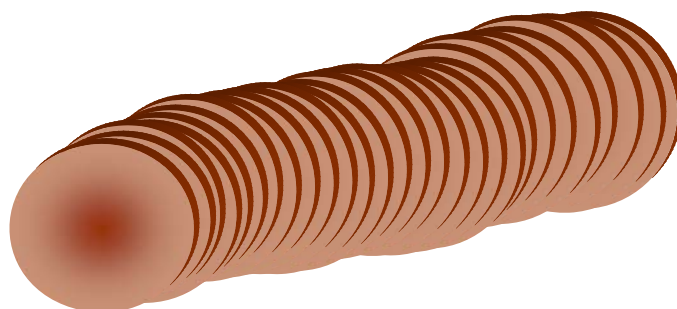
An encoder is used to measure the length of the log. This is mounted on the axle of the conveyor and transforms the rotation into impulses which correspond to positions along the log. This encoder is directly connected to the central LKM module computer which assigns the diameter data to the impulses of the encoder. Consequently, an 'overall picture' is provided of the log. The sum of these impulses between the beginning and end of the log results in it being possible to calculate the length, by using a defined 'length factor' for the pulses.

The measuring is facilitated during a forward movement. If the direction of movement is reversed, this will be detected by the system and the calculation will then be corrected accordingly.

2.7 Determining Possible Crook

The 'pairs of diameter' have an 'optical axis'. And it is through the way in which these axes are related to one other along the log that it is possible to calculate the degree to which a log is crooked.

All of the information on diameters, length and parameters of crook can be found at the interface, which allows to produce a three-dimensional image of the log.



LASER PROFILING SYSTEMS

Technical Data

MECHANICAL DATA

LKM-400

Light curtain , Measuring area:	200 measurements/second 478mm
Beams/resolution:	192 beams, 2.5mm
Measuring principle:	Shadowing
Laser scanner:	
Number of sensors/spacing:	8 sensors, 45-60 mm
Measuring area:	345 mm
Measuring principle:	Triangulation

LKM-700

Light curtain , Measuring area:	200 measurements/second 718mm
Beams/resolution:	288 beams, 2.5mm
Measuring principle:	Shadowing
Laser scanner:	
Number of sensors/spacing:	11 sensors, 45-60 mm
Measuring area:	525 mm
Measuring principle:	Triangulation

LKM-900

Light curtain , Measuring area:	200 measurements/second 958mm
Beams/resolution:	384 beams, 2.5mm
Measuring principle:	Shadowing
Laser scanner:	
Number of sensors/spacing:	16 sensors, 45-60-75 mm
Measuring area:	900 mm
Measuring principle:	Triangulation

LKM-1100

Light curtain , Measuring area:	150 measurements/second 1198mm
Beams/resolution:	480 beams, 2.5mm
Measuring principle:	Shadowing
Laser scanner:	
Number of sensors/spacing:	16 sensors, 45-60-75 mm
Measuring area:	900 mm
Measuring principle:	Triangulation

LKM-1400

Light curtain , Measuring area:	150 measurements/second 1438mm
Beams/resolution:	576 beams, 2.5mm
Measuring principle:	Shadowing
Laser scanner:	
Number of sensors/spacing:	16 sensors, 45-60-75 mm
Measuring area:	900 mm
Measuring principle:	Triangulation

Protection class: IP67

Weight.: ca. 25 kg (total)

ELECTRICAL DATA

Power supply scanners:	24 VDC \pm 10%, ca. 1500 mA Ripple max. 200 mV
Power supply heating system:	24 VDC, ca. 3000 mA
Cycle time:	ca. 5 ms (200 measurement/s max.)
Adjusting aid:	Green LED in receiver (light curtain)

INTERFACE / DATA OUTPUT**Serial interface with UART**

RS422 with RxD and TxD

Baud rate: 39400/115200/230400

Number of data bits: 8

Number of stop bits: 1

Parity: N

Temperature range: - 40°C ... + 55°C

*Specifications are subject to change without notice. These are only valid in the latest confirmed version. Drawings have not been made to scale. All dimensions in mm.
Version 1.61 – 2009-05-26*

SITRONIC GmbH
Weissenwolfstr. 14
4221 Steyregg-Linz
AUSTRIA / EUROPE
Tel +43 732 640591
Fax +43 732 640592

eMail office@sitronic.atwww.sitronic.at