Laser Displacement Sensors A2

Accessory for the KLIPPEL ANALYZER SYSTEM (Document Revision 1.6)

FEATURES

- Static and dynamic measurements of displacement (measures also DC)
- High accuracy
- Different measurement ranges
- Visible red type class 1 & 2 laser
- Calibration by user possible
- direct mechanical parameter identification
- Good cost-performance ratio
- Ideal for loudspeaker measurements

Klippel Analyzer hardware equipped with a Laser displacement sensor allows the measurement of electrical and mechanical states. Transducer measurements are thereby simplified and shortened considerably.

The Laser displacement sensors based on optical triangulation measures not only AC components but also a DC-part of the displacement accurately. A variety of Laser sensor heads are provided to get optimal performance in the particular application.

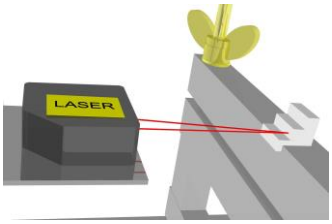
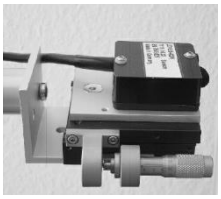
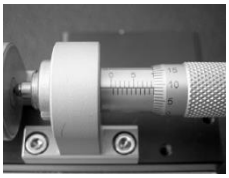
The combination with a Driver Stand allows the easy mounting of the sensor heads and allows also calibrating the sensor by the user. Management for multiple laser sensor heads is provided by dB-Lab and allows choosing a specific laser according to measurement demands. (e.g. small signal, large signal measurements, woofers or tweeters)

CAUTION! Laser Radiation!

Avoid direct or indirect (e.g. reflection) exposure of human eyes to beam.

CONTENT

1 Components

Klippel Analyzer	The Klippel Analyzer hardware provides a special laser sensor input and a built in power supply (for some sensors only). Each laser sensor can be calibrated using the Laser Displacement Meter (Distortion Analyzer) or via dB-Lab (Klippel Analyzer 3). Calibration data for multiple sensor heads can be stored and selected using the frame software dB-Lab.
Laser Sensor Heads	A variety of different laser heads is provided to customize the Displacement Meter for the particular application. The following criteria should be considered for the selection of the sensor head: High resolution (0.5 µm, 44 kHz) required for measurement of tweeter, headphones and micro speakers. Large peak to peak (up to 60mm peak) measurement range for woofer systems. ANR 1282 
Laser Controller	All of the laser sensor heads require a controller. All heads of the ANR-series are operated with the controller ANR5132. This controller is powered by the Klippel Analyzer. An additional extension cable may be used between sensor head and controller. The laser head LK-H052 is operated by the controller LK-G5001P. It can be powered from Klippel Analyzer 3 or an external power supply. The laser head IL-030 is operated by the controller IL-10000. It can be powered by the Klippel Analyzer, For QC LST measurements it needs an external power supply.  ANR 5132
Spacer for calibration (Art. 2201-001)	Laser displacement sensors with +/- 12.5 mm working range and more may be calibrated using a special spacer (10 mm stair part) having diffuse reflecting surfaces of required preciseness. It is part of the laser stand package. May be used for calibrating: • HL-G112, IL-030 • ANR 1282, ANR 1215 • LK-H082 See “Laser Handling” chapter in the hardware manual for details. 
Translation stage for positioning and calibration (Art. 2300-001)	Laser displacement sensors providing high resolution in a working range less than +/- 12.5 mm may be calibrated by accurate positioning with the translation stage. Equipped with a high resolution micrometer (adjustable to 1µm) the calibration process can be performed easily. May be used for calibrating: • LK-H052, LK-H082 • LD 1605-x, LD1607-x Could also be used for (not recommended): • HL-G112, ANR 1282, ANR 1215 See “Laser Handling” chapter in the hardware manual for details.  

1.1 Laser Sensor Heads (high sensitive types)

Sensor type	LK-H022	LK-H052	LK-H082	LK-H152
Reference Distance (mm)	**20**	**50**	**80**	**150**
Measurement Range (mm)	**±3**	**±10**	**±18**	**±40**
	@ >= 20 µs sample rate (up to 2.55 µs with reduced measurement range)			
Linearity Error absolute (µm):	**±1.2**	**±4**	**±7.2**	**±16**
Linearity Error relative:	±0.02% of full scale (measurement range)			
Repeatability* (µm)	**0.02**	**0.025**	**0.1**	**0.25**
Max. Signal Frequency (kHz)	**44** (Default Laser Controller Setup / 20µs sampling for DA2 & KA3)			
	66 (Advanced Laser Controller Setup / 10µs sampling for KA3 only)			
Laser Class	Class 2 / IEC60825-1			
	(closing the eyelids will protect the eyes, avoid the laser beam)			
Light source	visible laser diode (650 nm)			
Max. Output	0.95 mW			
Beam Spot Diameter (µm) @ Reference Distance	25	50	70	120
Max. Ambient Light Level	Max. 10,000 lx			
Indication	LED: inside / outside Measurement, Reference Distance			
Weight (with cable in g)	230	260	280	300
Length of the cable	0.5 m mounted at the Laser Sensor Head Could be extended with 0.7 / 2 / 5 / 10 / 20 / 30 m extension cables 5 m included in the “All Purpose” Sets, 0.7 m included with the SCN			
Supported Calibration Procedures	with Translation Stage			
	with SCN Vibrometer			
			with Calibration Spacer (@ Pro Stand)	

* under special conditions specified by the manufacture (16834 x averaging)

1.2 Laser Sensor Heads (cost effective types)

	IL-030	ANR 1282 (discontinued)	ANR 1215 (discontinued)	HL-G112
Article Number	2102-041	2102-001	2102-003	
Maximal displacement (mm peak for a linearity error < 3 %)	**±12.5**	**±20**	**±50**	**±60**
Minimal displacement (mm peak for a linearity error < 3 %)		**± 0.5**	**± 1.5**	**± 1.0**
Linearity Error absolute (µm):	**±2**	**±80**	**±200**	
Linearity Error relative:	**±0.1% F.S.**	**±0.2 % F.S.**		**±0.1% F.S.**
Resolution (Noise in µm , no averaging *)	**20**	**40**	**200**	**8**
Max. Signal Frequency (in kHz @ 3dB)	**3**	**1**		**2.5**
Center Point Distance (mm)	**32.5**	**80**	**130**	**120**
Light source	visible laser diode (655 nm)	visible laser diode (685 nm)		visible laser diode (655 nm)
Laser Class	Class 1 / IEC60825-1	Class 2 / IEC60825-1		
	(closing the eyelids will protect the eyes, avoid the laser beam)			
Max. Output	0.22 mW	1.6 mW (peak values)		1 mW (peak v.)
Beam Spot Diameter (mm) @ Center Point Distance	0.2 x 0.75	0.7 x 1.2	0.7 x 1.4	1.0 x 1.5
Ambient Light Level	Max. 5,000 lx	Max. 3,000 lx		
Indication	LED: Range, OK, ON/OFF	LED: Range, OK		Display: distance LED:
Weight (with cable in g)	60 g	240 g		110 g
Length of the cable	2.5 m extension cable (between sensor head and controller)	1.2 m extension cable (between sensor head and controller) (5 or 10 m available on request)		0.5 m cable at the senor head + 4 m adapter to analog output and power supply connectors
Calibration Spacer	Recommended (included with SPM or LST bench)	Recommended (included with Standard and Pro Driver Stand)		
Translation Stage	can only be	not included		

	mounted on SPM/MPM laser plate	(available on request with higher travel distance)

* can be improved by averaging with measurement software

1.3 Laser Sensor Heads - discontinued

	LK-G32 (discontinued)	ANR 1282 (discontinued)	ANR 1215 (discontinued)	
Article Number	2102-020	2102-001	2102-003	
Maximal displacement (mm peak for a linearity error < 3 %)	**±5** (@ 50 µs sampling rate)	**±20**	**±50**	
Minimal displacement (mm peak for a linearity error < 3 %)	**± 0.02**	**± 0.5**	**± 1.5**	
Linearity Error absolute (µm):	**±3**	**±80**	**±200**	
Linearity Error relative:	**±0.05% F.S. (F.S. = 20 mm)**	**±0.2 % F.S.**		
Resolution (Noise in µm , no averaging *)	**0.5**	**40**	**200**	
Max. Signal Frequency (in kHz @ 3dB)	**25**	**1**		
Center Point Distance (mm)	30	**80**	**130**	
Light source	visible laser diode (650 nm)	visible laser diode (685 nm)		
Laser Class	Class 2 / IEC60825-1			
	(closing the eyelids will protect the eyes, avoid the laser beam)			
Max. Output	0.95 mW	1.6 mW (peak values)		1 mW (peak v.)
Beam Spot Diameter (mm) @ Center Point Distance	30	0.7 x 1.2	0.7 x 1.4	1.0 x 1.5
Ambient Light Level	Max. 10,000 lx	Max. 3,000 lx		
Indication	LED: Range, OK, ON/OFF	LED: Range, OK		Display: distance LED:
Weight (with cable in g)	60 g	240 g		110 g
Length of the cable	2.5 m extension	1.2 m extension cable		0.5 m cable at the

	cable (between sensor head and controller)	(between sensor head and controller) (5 or 10 m available on request)	senor head + 4 m adapter to analog output and power supply connectors
Calibration Spacer	Cannot be used, sensor working range too small for 10 mm stairs	Recommended (included with Standard and Pro Driver Stand)	
Translation Stage	needed or SCN hardware used for calibration	not included (available on request with higher travel distance)	

	1.4 Laser Controller		
	LK-G5001P for LK-H052 or LK-H082	IL-1000 for IL-030	ANR 5132 for ANR 1282 and ANR 1215
article Number	part of 2102-030	part of 2102-041	2110-001
Analog Output	± 10V/F.S. (Max. 10 mA)	± 5V/F.S. (Max. 10 mA)	± 5V/F.S. (Max. 2 mA)
Output Impedance	approx. 100 Ohm	100 Ohm	50 Ohm
Temperature Drift	0,01 %/^{0}C	0.05% F.S./°C	Max. ± (0.03 % of F.S.)/^{o}C
Zero-Point Adjustment	adjustable	adjustable	± 10% of F.S.
Response Frequency (-3dB)	-		1 kHz / 100 Hz / 10 Hz (switchable)
Response Time (10-90 %)	-		0.4 / 4 / 40ms (switchable)
Sampling Rate (µs)	2.55/5/10/20/50/100/200/500/1000	330/1000/2000/5000	-
Intensity Output	-	-	± 5V
Indication	LED: Operation	Display: voltage + displ.	LED: Operation
Gain Selection	Switchable	-	AUTO, LOW (switchable)
Operating Ambient Temp.	0 to 50 ^{o}C (+32 to +122^{o}F)	-10 to 50 °C (+14 to +122^{o}F)	0 to 50 ^{o}C (+32 to +122^{o}F)
Operating Ambient Humidity	35 % to 85 % RH (no condensation)	35 % to 85 % RH (no condensation)	35 % to 85 % RH
Safety Certificate	Complies with CDRH 1040.10 / IEC 60825 / JIS C6802	Complies with FDA CDRH 1040.10 / IEC 60825-1	Complies with 21 CFR 1040.10 and 1040.11

Length of the cable	2 m extension cable (between sensor head and controller) is part of set Art.-No.: 2102-030 Other length or extension cable between laser controller and measurement device on request		
Power Supply	Input: 24 Vdc ± 10 % max. 500 mA Can be powered by Klippel Analyzer 3	Input: 10 to 30 Vdc / max. 77 mA according class II or LPS Can be powered by Distortion Analyzer or Klippel Analyzer QC: external PSU	Input: 12 to 24 Vdc -15%, + 10% max. 250 mA @ 12V Can be powered by Distortion Analyzer or Klippel Analyzer
External Power Supply	Input: 90 – 264 V~ / 47 –63 Hz / max. 1.6 A @ 90 V Output 24 Vdc / 1.25 A / class II		

1.5 Application Guide

X = best performance
a = applicable
* = not supported by SCN system yet

Laser type		LK-H 022	LK-H 052	LK-H 082	LK-H 152	IL-030	IL-065	HL-G 112	ANR 1282	ANR 1215
Application	SoftwareModules									
Long throw Woofer										
Small signal analysis	LPM	**a**	**X**	**X**	**X**				**X**	**a**
Large signal analysis	LSI Woofer, DIS, TRF		**a**	**X**	**X**			**X**	**X**	**X**
Woofer										
Small signal analysis	LPM	**X**	**X**	**X**	**X**				**X**	
Large signal analysis	LSI Woofer, DIS, TRF		**X**	**X**	**X**			**X**	**X**	**X**
Midrange, Broadband, small Woofer, Exciter										
Small signal analysis	LPM	**X**	**X**	**X**	**a**				**a**	
Large signal analysis	LSI Woofer, DIS, TRF	**X**	**X**	**X**	**X**				**X**	
Horn Compression Driver										
Small signal analysis	LPM	**X**	**X**	**a**						

Large signal analysis	LSI Woofer, DIS, TRF	X	X	X						
Tweeter, Micro-Speakers, Headphone										
Small signal analysis	LPM	X	X							
Large signal analysis	LSI W. or T., DIS, TRF	X	X	a						
SCN – Scanning Vibrometer										
Cone Vibration Measurement	SCN, TRF	*	X	*						
Cone Vibration Measurement	SCN, TRF	*	X	*						
Soft Parts RnD Measurements										
Suspension Part Measurement	SPM Lite	X	X	X	a	X				
	SPM Pro		a	X	X				X	a
Microspeaker Suspension Part Measurement	MSPM Lite	X	X	a						
	MSPM Pro	X	X	a						
Material Parameter Measurement (E- Modulus)	MPM		X	X	a	X	a		X	
Soft Parts QC Measurements										
Linear Suspension Test	LST Lite	X	X	X	a	X	X			
	LST Pro	X	X	X	a	X	X			

Find explanations for symbols at:
http://www.klippel.de/know-how/literature.html
Last updated: May 21, 2021