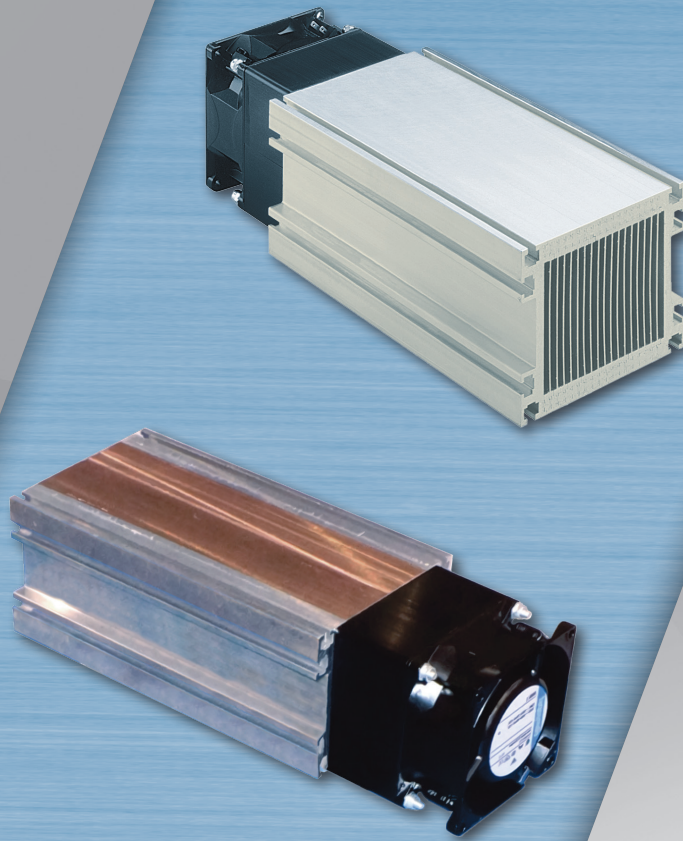




LK20+ ALUMINUM-COPPER HEAT SINK – Technical Report

ALUTRONIC
SOLUTIONS FOR COOL RESULTS

Thermal Analysis by:



BIT GmbH – Berliner Institut für Technologietransfer
Projektleitung Prof. Dr.-Ing. Thomas Heine

Report commissioned by:

ALUTRONIC
SOLUTIONS FOR COOL RESULTS

And:



Test parameters

Measurement equipment and experimental setup:

Measurement equipment:

1) Temperature measurements:

- Thermometer ALMEMO2890-9 v. Fa. „Ahlborn“ + 3xThermopaar Typ „K“ Class 1
- Thermometer 1502A v. Fa. „FLUKE“ SN.: BO8566 + PT100 Typ 5626 Fluke SN.: 2872
- Thermal camera Flir i7 thermal accuracy +/- 2% or 2°C and broad measurement range -20°C to 250°C

2) Power measurements:

- Power Meter WT 110 v. Fa. „Yokogawa SN.:27BY0723

3) Power supply

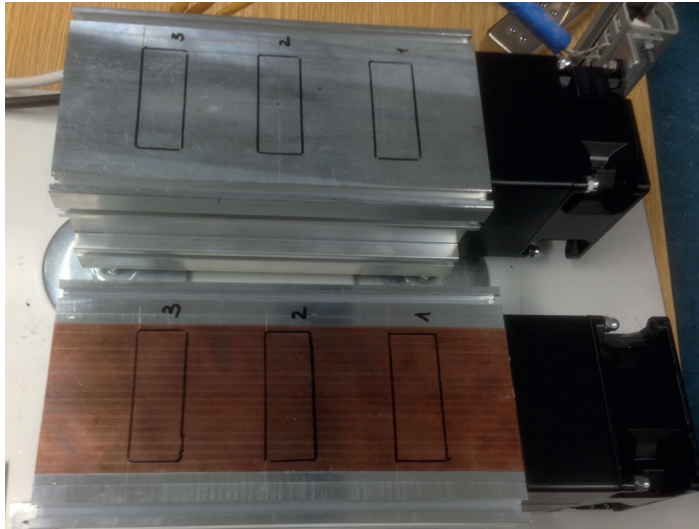
- Three isolating transformer TG 4 1000VA, U= 0-240 V, I=4 A

The picture 1 shows the experimental setup at a glance.

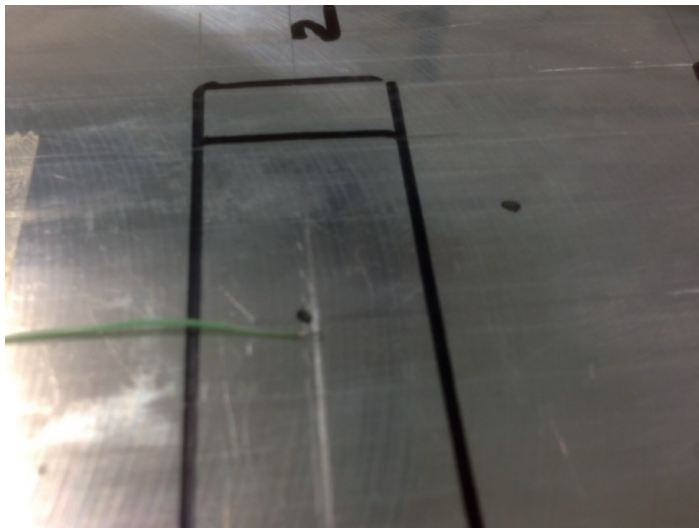
The pictures 2 to 6 show the experimental setup step by step.



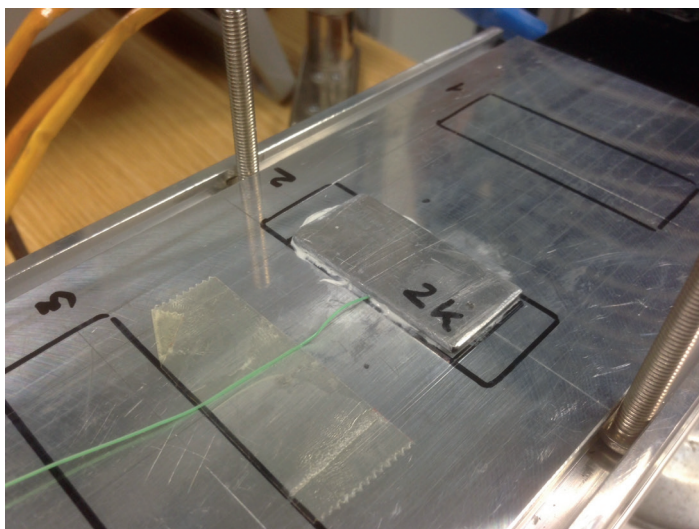
Picture 1: Experimental setup at a glance



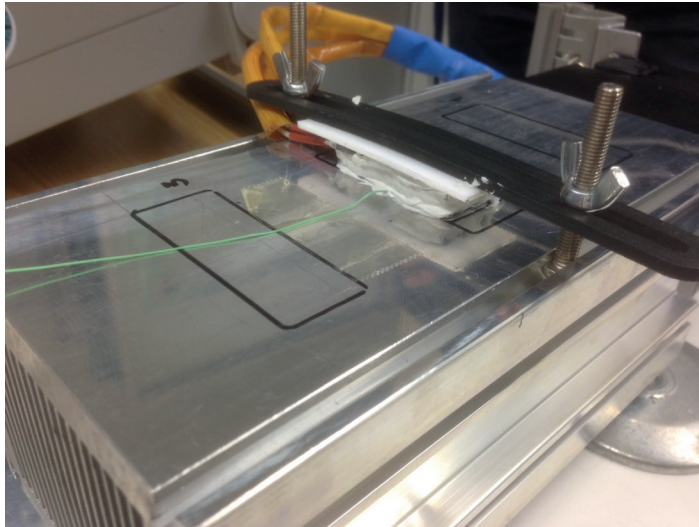
Picture 2: Copper and aluminum lamella unit for high power series LK. Dimension 182mm x 80mm x 278mm each.



Picture 3: Thermo couple (type k class 1 calibrated) used for temperature measurement on lamella surface.



Picture 4: Aluminum plate (40mm x 20 mm x 2 mm) with heat transfer paste Alutronic PA700



Picture 5: Three heaters a 175 W (525W total) mounted on a single aluminum plate (40mm x 20mm x 2mm) with heat transfer paste Alutronic PA700 and 2mm Teflon isolation



Picture 6: Heat isolation single contact situation



Picture 7: Three heaters a 175 W (525W total) mounted on three aluminum plates (55mm x 20mm x 2mm) with heat transfer paste Alutronic PA700 and 2mm Teflon isolation.

Test results

Results: Single contact at the middle position (area of contact: 20mm x 40mm)

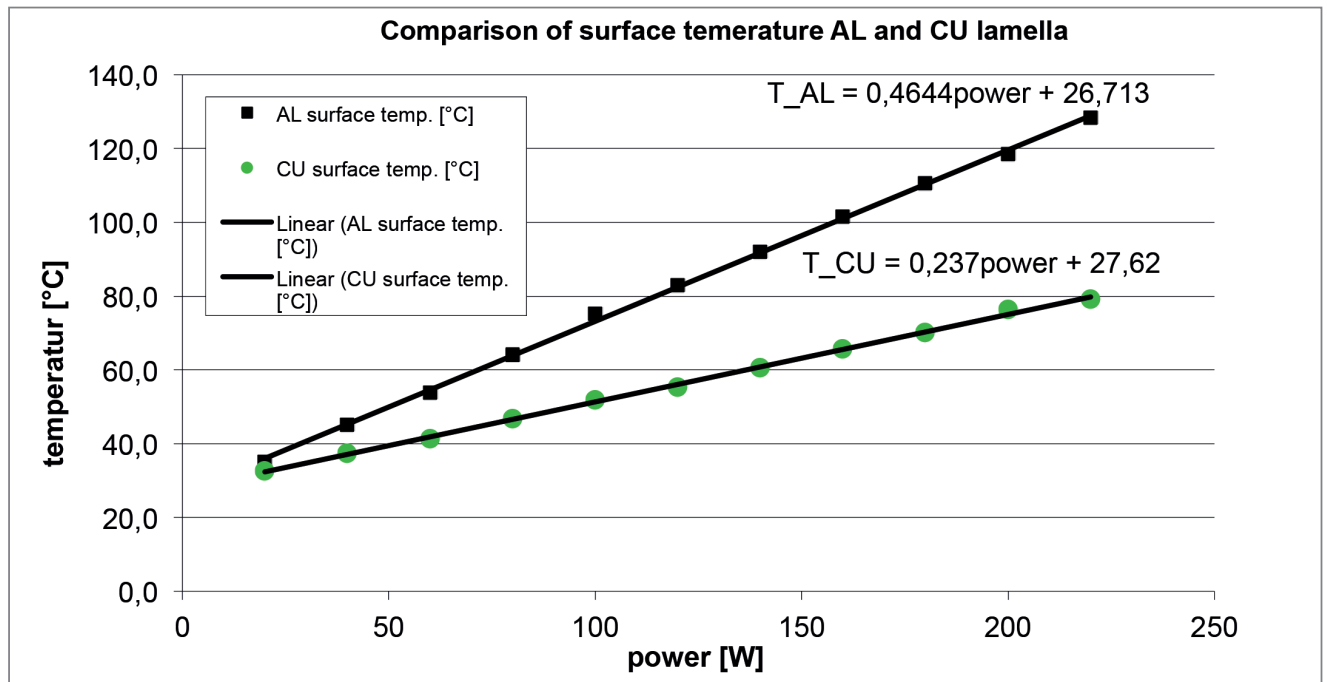


Diagram 1: Comparison of surface temperature, single contact

AL - lamella single contact middle position	power [W]	voltage [V]	current [A]	AL surface temp. [°C]
01.07.13 rH 37% 1013mbar	20	56,4	0,357	35,0
	40	79,9	0,504	45,0
	60	98,12	0,614	53,8
	80	113,41	0,706	64,2
	100	127,40	0,800	75,2
02.07.13 rH 37% 1012mbar	120	138,0	0,860	82,9
	140	149,5	0,935	92,0
	160	160,5	1,001	101,5
	180	170,3	1,058	110,5
	200	179,0	1,103	118,4
	220	189,2	1,160	128,3
	240	198,3	1,212	137,4

Table 1: Temperature measurements, single contact, AL lamella

CU - lamella single contact middle position	power [W]	voltage [V]	current [A]	CU surface temp. [°C]
02.07.13 rH 37% 1013mbar	20	56,69	0,356	32,6
	40	80,30	0,503	37,3
	60	98,10	0,614	41,3
	80	113,40	0,709	46,7
	100	127,30	0,794	51,8
	120	138,80	0,869	55,3
	140	150,30	0,933	60,5
	160	161,00	0,998	65,7
	180	171,20	1,060	70,0
	200	180,80	1,116	76,3
	220	189,90	1,168	79,1

Table 2: Temperature measurements, single contact, CU lamella

Results: Three contact plates (area of contact: 20mm x 55mm)

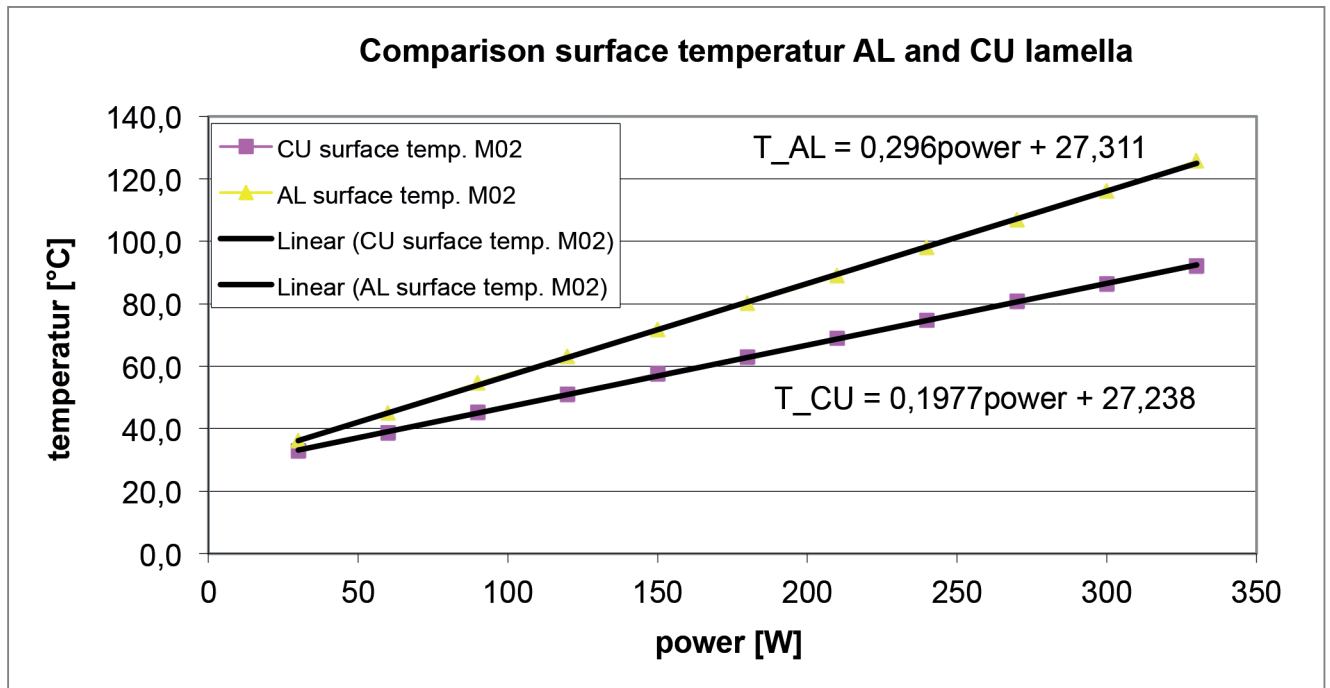


Diagram 2: Comparison surface temperatur AL and CU lamella, three contact plates (20mm x 55mm), surface temperature at the middle position (channel M02)

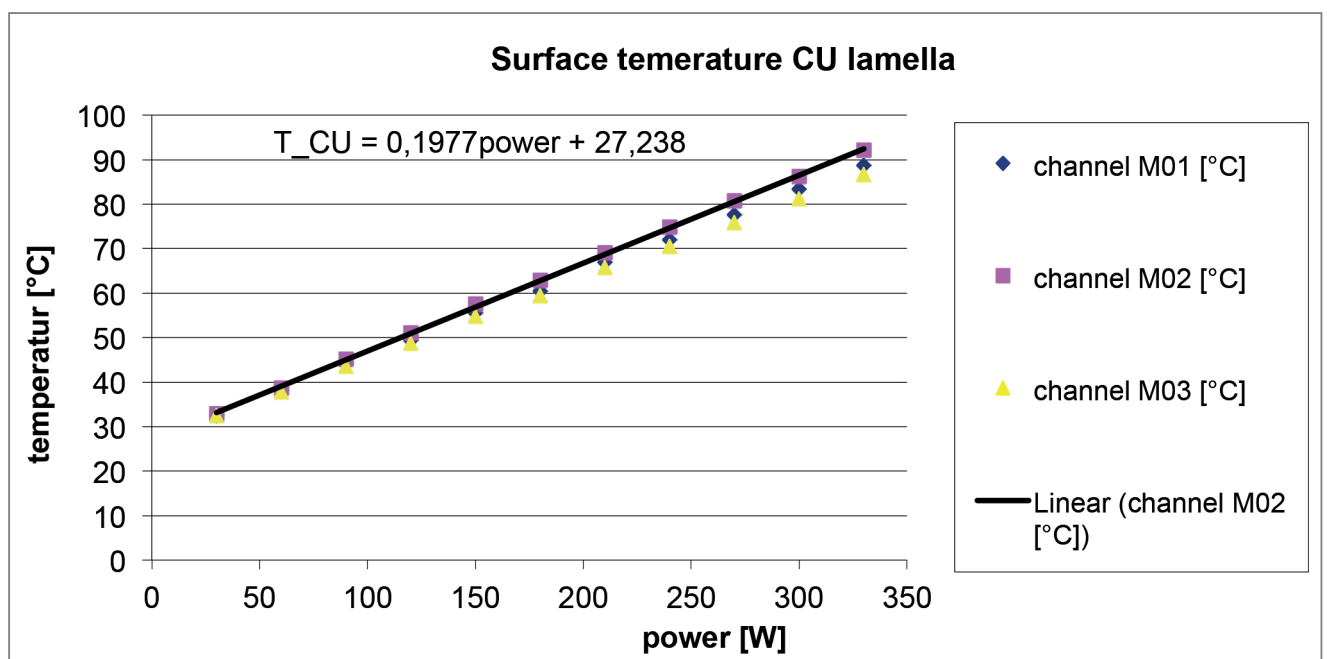


Diagram 3: surface temperatur CU lamella, three contact plates (20mm x 55mm), surface temperature at the middle position (channel M02)

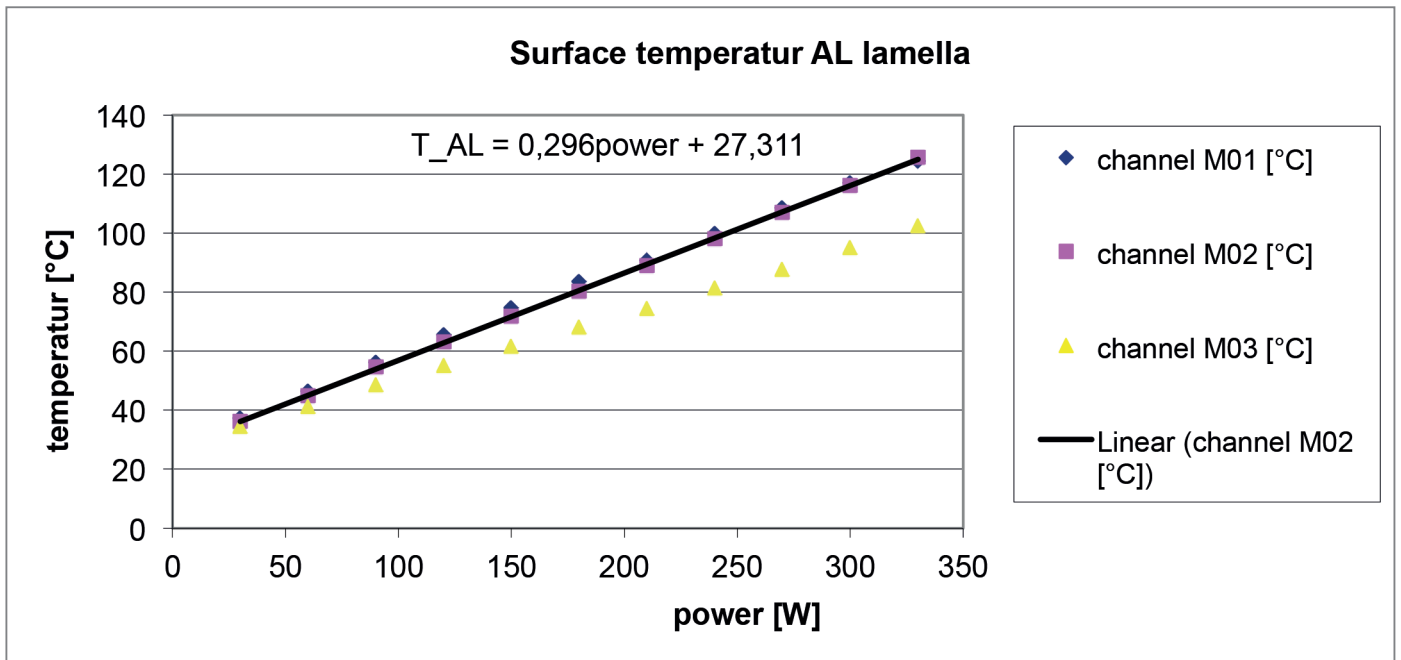


Diagram 4:

AL - lamella 3 measuring positions	power [W]	channel M01 [°C]	channel M02 [°C]	channel M03 [°C]
3 heaters	30	37,2	36,2	34,4
11.07.13	60	46,3	44,9	41,1
rH 35,7%	90	56,2	54,6	48,5
1013mb	120	65,4	63,1	55,0
	150	74,6	71,7	61,5
	180	83,6	80,2	68,0
	210	90,9	88,9	74,5
	240	99,7	98,1	81,3
	270	108,5	106,9	87,7
	300	116,9	116,2	95,0
	330	124,3	125,7	102,5

Table 3: Temperature measurements, three contact plates 20mm x 55mm, AL lamella

CU - lamella 3 measuring positions	power [W]	channel M01 [°C]	channel M02 [°C]	channel M03 [°C]
3 heaters	30	32,5	32,9	32,4
10.07.13	60	38,0	38,7	37,8
rH 43,2%	90	44,0	45,1	43,6
1014mb	120	49,3	51,0	48,8
	150	55,5	57,5	54,8
	180	60,4	62,8	59,4
	210	66,9	69,1	65,7
	240	72,0	74,8	70,5
	270	77,6	80,8	75,8
	300	83,4	86,2	81,1
	330	88,7	92,1	86,6

Table 4: Temperature measurements, three contact plates 20mm x 55mm, CU lamella

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