DANISH TECHNOLOGICAL INSTITUTE

TEST REPORT

Brand & model
Elcold Focus 131 (Ice-cream freezer)

Report no.
300-KLAB-17-139

Date
9th September 2017

Energy & Climate
Refrigeration & Heat Pump Technology

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TEST REPORT

Enclosures: 4

Contract no. I17-09

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Item	Brand:	Elcold
	Model:	Focus 131
	Type of appliance:	Commercial refrigerator (Ice-cream freezer)
	Reception/date:	20/3/17
	Test/date:	02.08.2017 – 16.08.2017

Remarks

Terms

Accredited testing was carried out in compliance with the current guidelines laid down by DANAK (Danish Laboratory Accreditation Scheme), please see www.danak.dk and in compliance with DTI's General Terms and Conditions Regarding Commissioned Work Accepted by the Danish Technological Institute (DTI), marts 2015.
The test results apply to the tested samples only.
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Signature/Test performed by

Hans Walløe
Senior Specialist

René Christiansen
Consultant

0. TABLE OF CONTENTS

1. TEST PROGRAM

This test report comprises results from the following tests accredited by DANAK:

- Determination of net volume.
- Energy consumption test at ambient temperature 30 °C, 55 % RH corresponding to test room climate class A.

2. EQUIPMENT

The information is given by application to the laboratory.

3. METHOD

The tests were carried out according to EN 16901:2016

4. RESULTS

The test results solely apply to the tested appliance(s).

Volume	Test results	Declared by manufacturer	Deviation %	Requirement	Meets requirement
Net volume, refrigerator [litres]	256	254	0,8	≥ -3 %	Yes

Please see chapter 5 for determination of net volume.

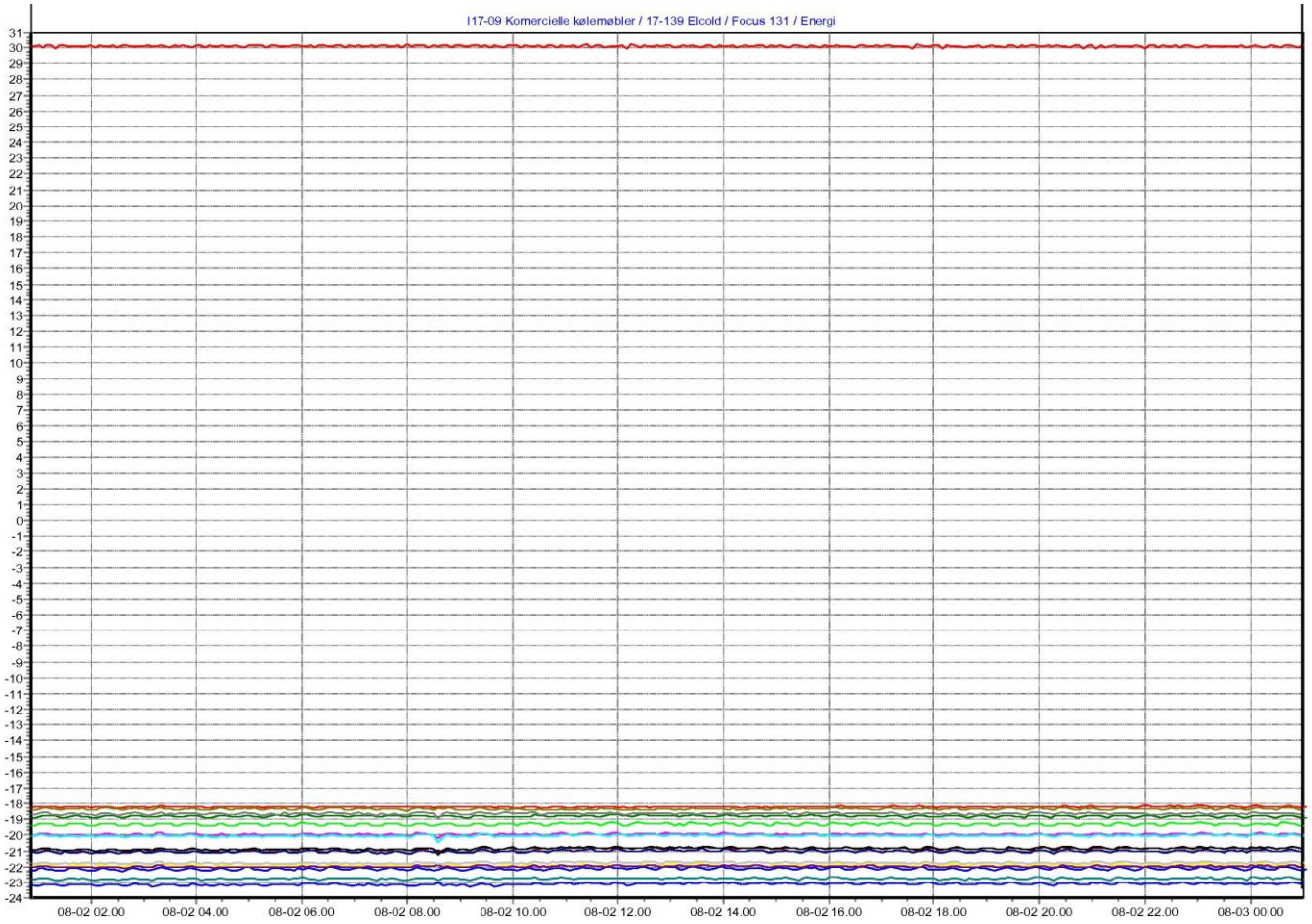
Temperature test Temperature class C1	Test results	Requirement	Meets requirement
Thermostat setting: Min.			
Highest temperature of warmest M-package, Θ_{ah} [°C]	-18,1	≤ -18	Yes
Lowest temperature of warmest M-package, Θ_{al} [°C]	-18,3	-	-
Lowest temperature of coldest M-package, Θ_{b} [°C]	-23,3	-	-
Average mean temperature of all M-packages, Θ_{mc} [°C]	-20,6	-	-

Electrical energy consumption test	Test results	Declared by manufacturer	Deviation %	Requirement	Meets requirement
Thermostat setting: Min.					
Energy consumption, E24h [kWh/24h]	2,252	Not declared	-	< 10%	-
Energy consumption, AEC [kWh/year]	822,0	-	-	-	-
Calculated EEI (ref 2)	68,2	-	-	-	-
Calculated Energy class (ref 2)	B	-	-	-	-

The uncertainty is 1% for the non-rounded values.

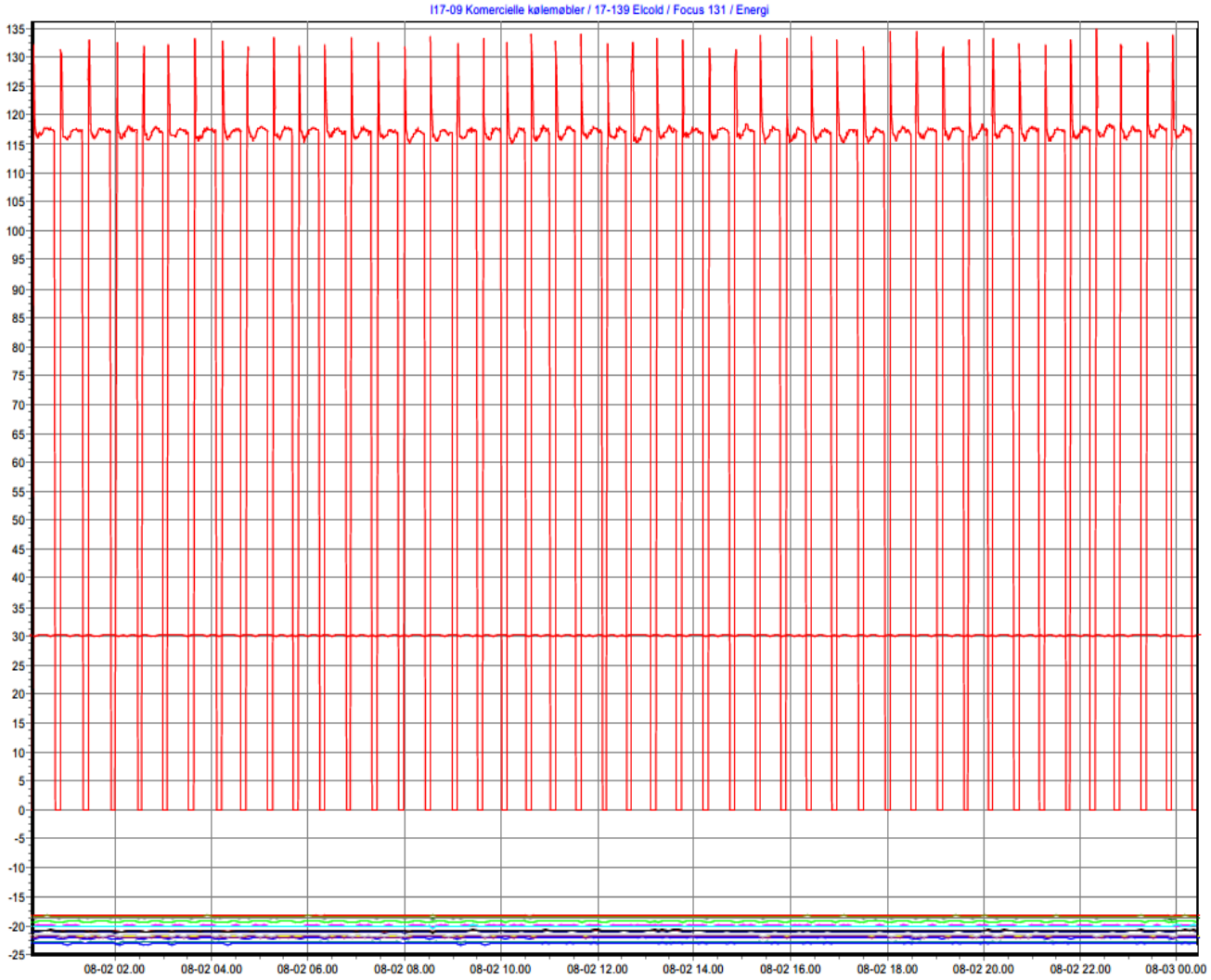
Electrical energy consumption test	Symbol	Value	Unit	Calculations
Thermostat setting: Min.				
Energy consumption	E24h	2,252	kWh/24h	-
Net volume	Y	256	Litre	-
M coefficient for Small ice-cream freezers	M	1,0	-	-
N coefficient for Small ice-cream freezers	N	0,009	-	-
Annual Energy Consumption,	AEC	822,0	kWh/year	AEC = E_{24h} *365
Standard Annual Energy Consumption	SAEC	1206,0	kWh/year	SAEC = (M+N*Y)*365 = (1,0+0,009*256)*365
Calculated EEI (ref 2)		68,2	-	EEI = (AEC/SAEC)*100

Temperatures and energy consumption have been measured in steady state without any lid openings



All temperature measuring points including ambient

——	Warmest M-package	[°C]
——	Coldest M-package	[°C]



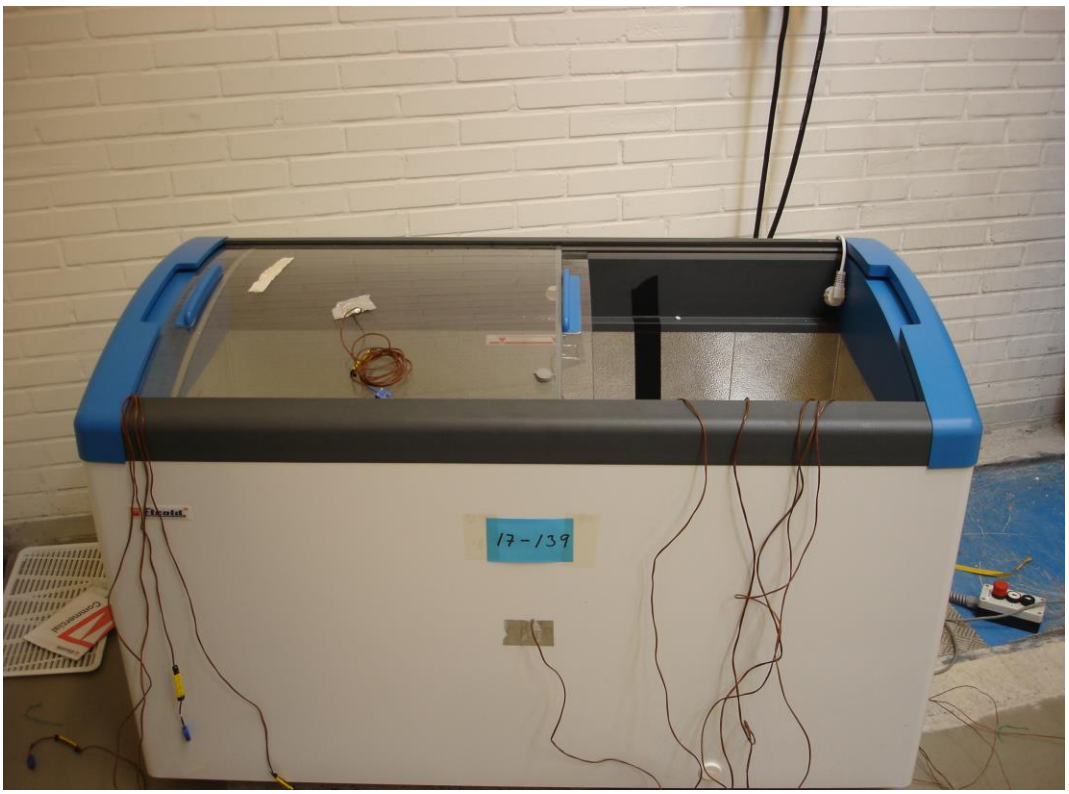
Power and all temperatures

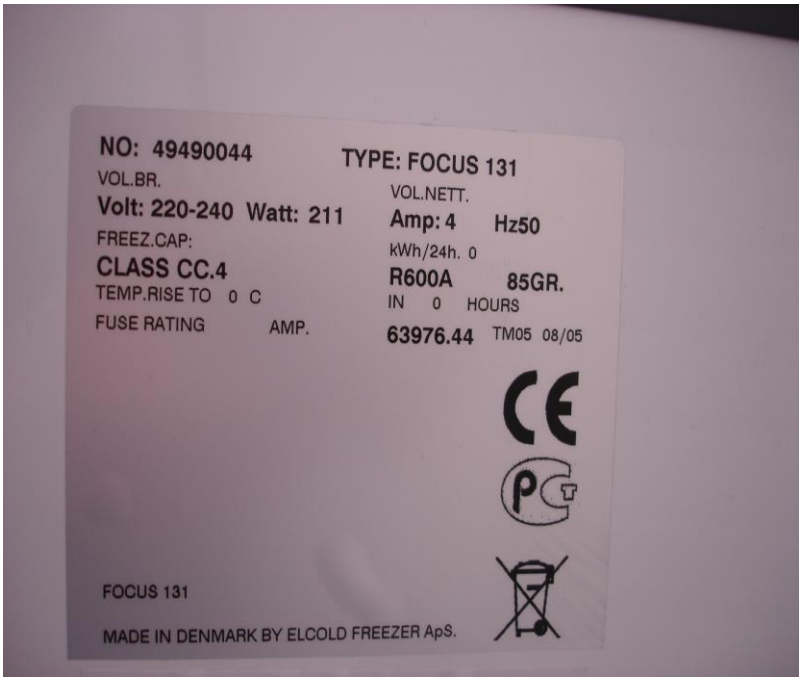
5. COMMENTS

6. REFERENCES

1. EUROPEAN STANDARD EN 16901:2016
   ”Ice-cream freezers – Classification, requirements and test conditions”.
2. Ecodesign draft regulation for refrigerated commercial display cabinets (as prepared for consultation forum meeting on 2 July 2014)

ENCLOSURE 1




NO: 49490044
TYPE: FOCUS 131
VOL.BR.
VOL.NETT.
Volt: 220-240 Watt: 211
Amp: 4 Hz50
FREEZ.CAP:
kWh/24h. 0
CLASS CC.4
R600A 85GR.
TEMP.RISE TO 0 C
IN 0 HOURS
FUSE RATING AMP.
63976.44 TM05 08/05
FOCUS 131
MADE IN DENMARK BY ELCOLD FREEZER ApS.


embraco
NBY1118Y
THERMALLY PROTECTED
220-240 V~50 Hz
R 600a
AB. OIL 280CC
1 PH
SUCTION
MADE IN SLOVAKIA
NO START WITHOUT STARTING DEVICE
816BA42
MD
PB6HLSC0
CAUTION
RISK OF FIRE
R 600a

ENCLOSURE 2

No energy label or declared values

ENCLOSURE 3

No.:	**D3.13**		DANISH TECHNOLOGICAL INSTITUTE
Edition:	6		
Area:	KLAB-T		
Date:	03-05-2011		

Determination of volume - Freezer

Brand & model	**Report no.**
Elcold Focus 131	KLAB-17-139

Freezer:

Gross volume, stated by the manufacturer [L]	**Not stated**
Gross volume, measured [L]	**-**
Deviation, calculated [%]	**-**
Net volume, stated by the manufacturer [L]	**254**
Net volume, measured [L]	**256**
Deviation, calculated [%]	**0,8**

No.:	**D3.13**		DANISH TECHNOLOGICAL INSTITUTE
Edition:	6		
Area:	KLAB-T		
Date:	03-05-2011		

Determination of volume - Freezer

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FREEZER

Gross volume:

	No.	Description	Total no.	Factor [x]	H [mm]	W [mm]	D [mm]	Volume [L]
Gross- (Basic)								-
Deduc- tion								-
								-
								-
								-
Addition								-
								-
					Gross volume:			**-**

Net volume:

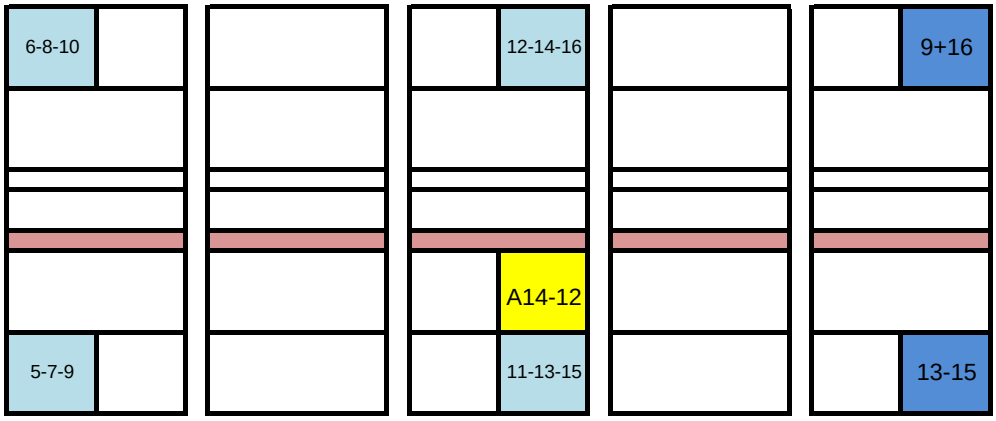
Deduc- tion	2	Compressor box	1	1	250,00	199,00	499,00	24,83
								-
								-
Addition	1	Basic net volume	1	1	488,00	1.151,50	499,00	280,40
								-
								-
					Net volume:			**255,58**

ENCLOSURE 4

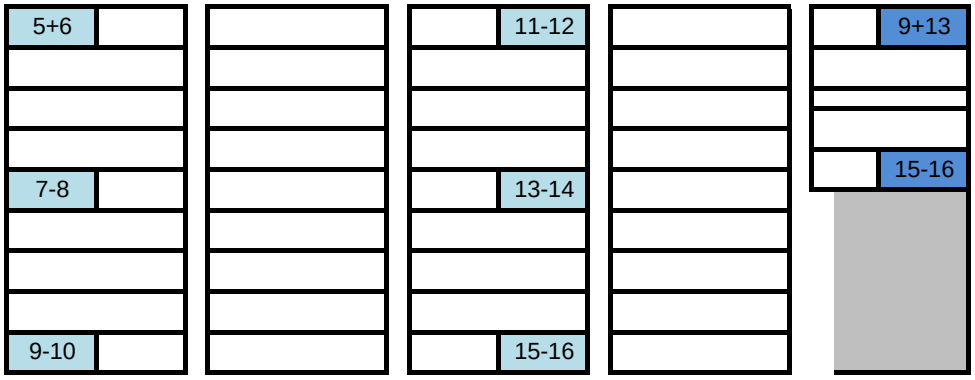
No.:	**D5.05**		DANISH TECHNOLOGICAL INSTITUTE
Edition:	9		
Made by:	LBK		
Laboratory:	KLAB-T		
Date:	16-04-2012		
		Storage plan - energy consumption	KLAB- 17-139
Compartment 1: Loaded to the load line +0/-25			
Total load: kg			

Compartment 1
Top view

kg



Compartment 1
Front view



Anville 17
Anville 14
Anville 14 (pakke ikke i henhold til standard)

Further tests and measurements

In addition to the energy consumption test, a lid opening test was carried out, multiple points of interest where measured regarding their temperature and an energy optimization proposal consisting of the decoupling of the heating element was studied.

A total of 15 thermoelements where added in the attempt to gather information on internal temperature fluctuations, key temperatures of the refrigeration cycle and potential thermal bridges. In addition to the energy consumption test, a lid opening sequence was undertaken for 24 hours in accordance with EN 16901:2016 (1). Lastly, the electrical heating element was decoupled to determine the reduction in the energy consumption and the resulting change in temperature on the lids as well as temperature close to the element itself.

Lid opening sequence

Figure 1 depicts the measured temperatures of all m-packages through a 24h period as well as the ambient temperature. The test shows that at no point in time is does temperature of the warmest m-package experience an in increase of more than 2 °C and it has therefore passed the door opening test in accordance with EN 16901:2016

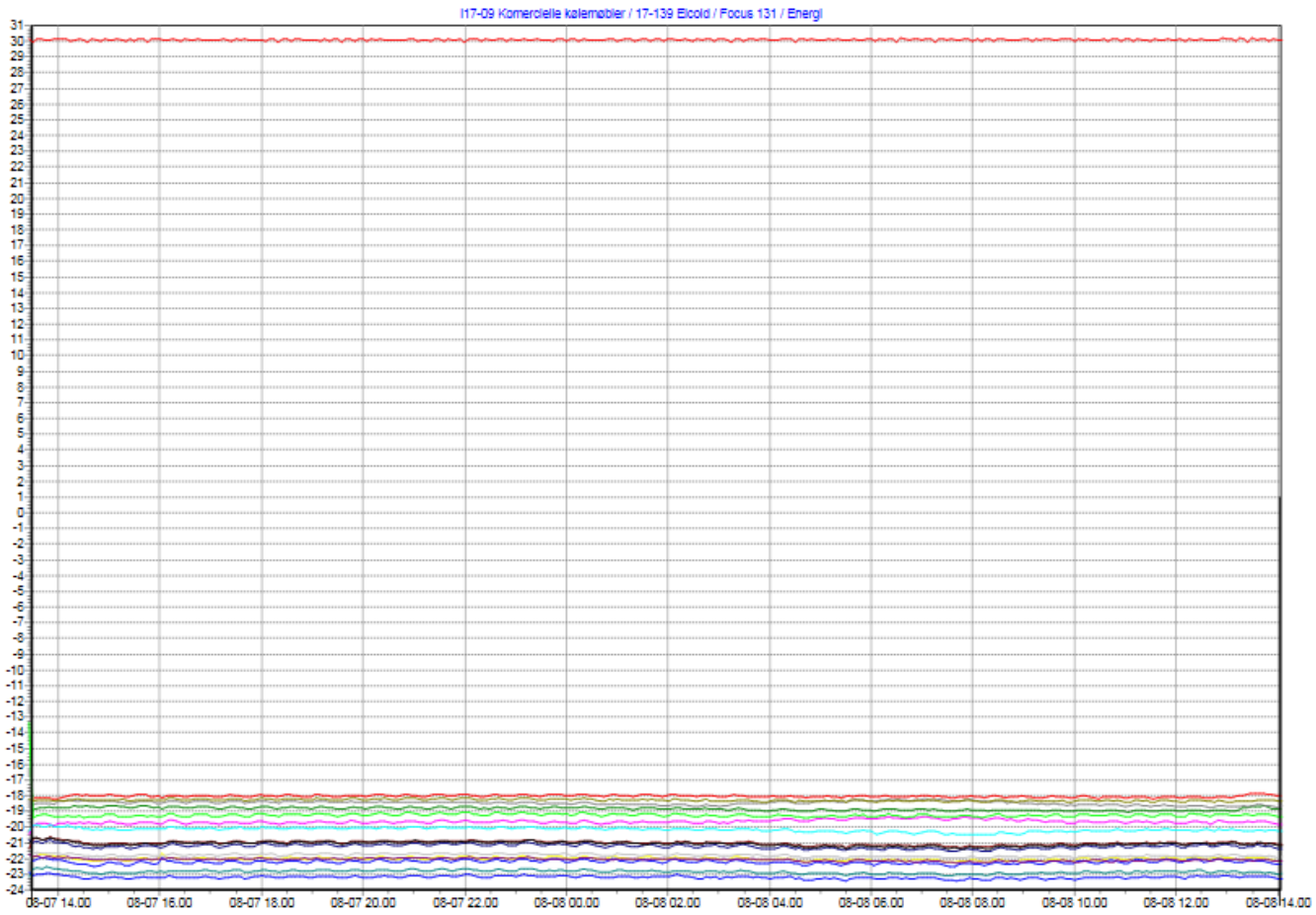


Figure 1 Temperature profile of all m-packets + ambient throughout door opening test

Placement of additional temperature sensors

Figure 2 shows the placement of thermoelements placed internally on the surface of the freezer as well as the external measuring points (x marks the spot), in addition to the 13 points seen in the figure below, one was placed externally on the front of the freezer (condenser) and one of the upper glass lid.

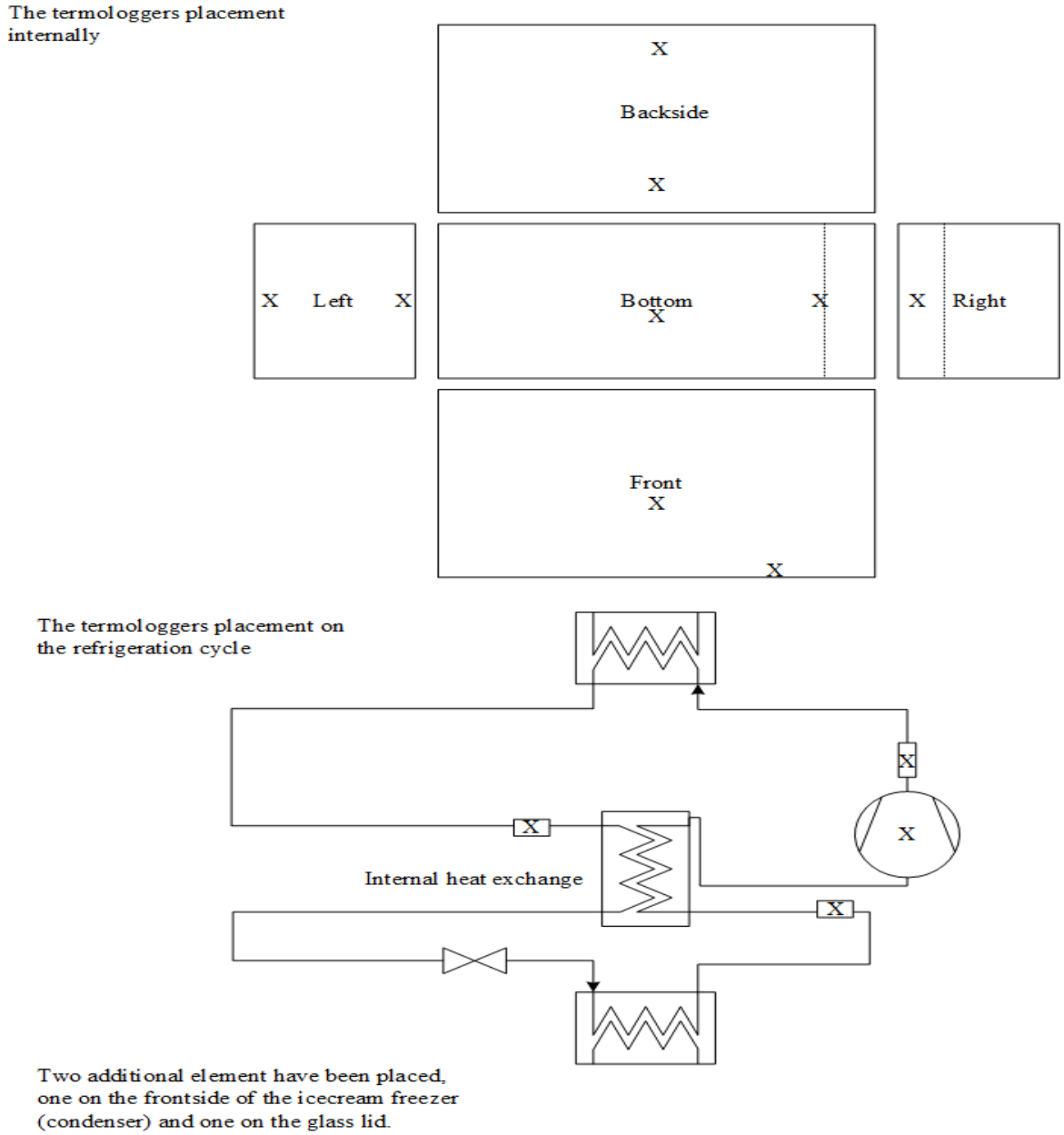


Figure 2 Placement of thermal elements

External measurements

Figure 3 depicts the temperatures in the higher end of the spectrum throughout a compression cycle. The highest temperatures are measured immediately after the compressor whereas the temperatures the temperature measured on the front of the freezer and the temperature between the condenser and the capillary tube follow a close to identical development in temperature. The temperature measured on the upper glass lid remain constant at 26 °C throughout. It should be noted that the values showcased in figures 2,3 and 4 refer to the same timeframe.

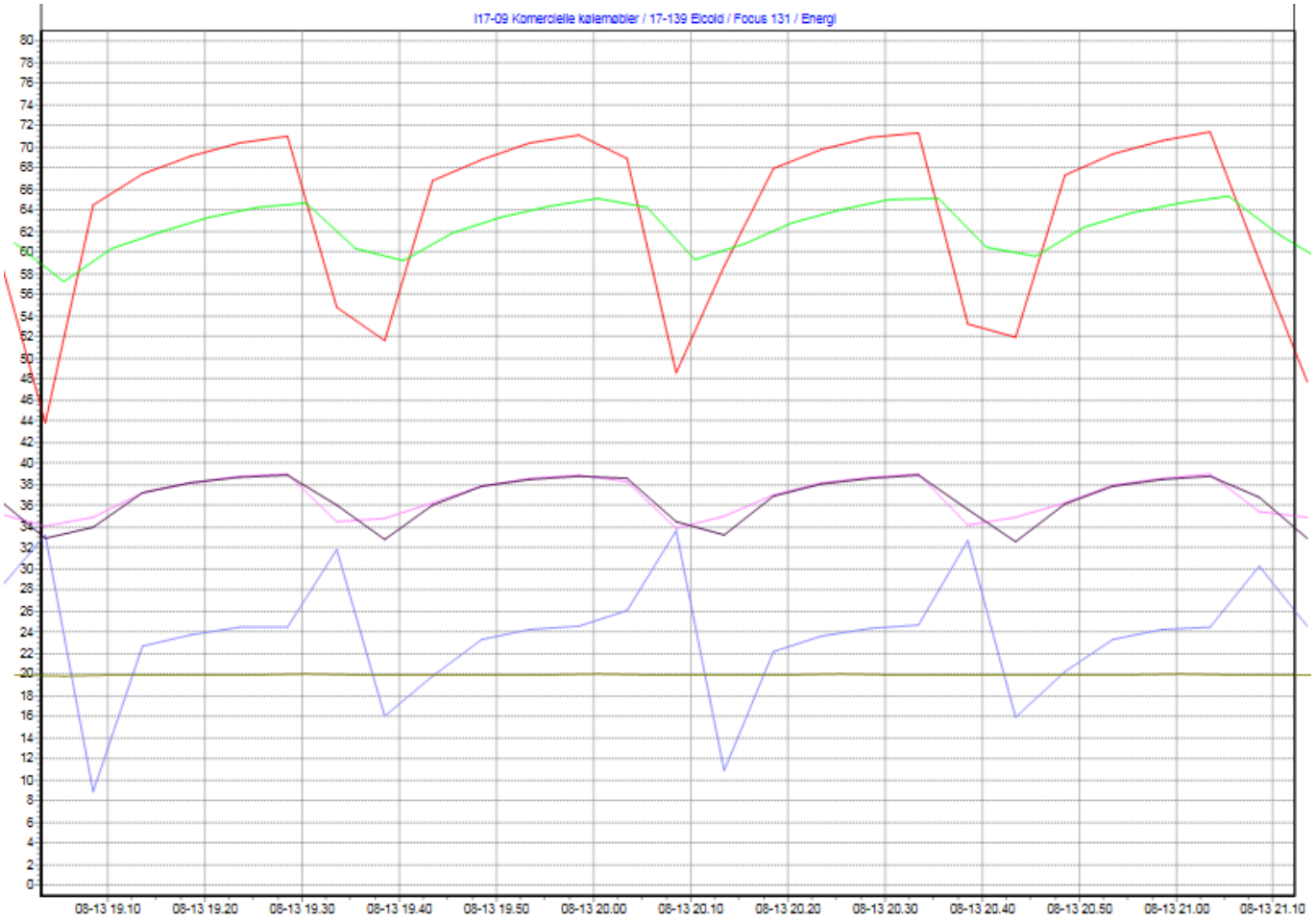


Figure 3 Measurements of external temperatures for a compressor cycle

Compressor inlet	
Compressor outlet	
Compressor casing	
After condenser	
Frontside outer	
Glass lid outer	

Internal measurements

Figure 4 shows the freezers internal surface temperature in correspondence with Figure 1. The figure shows that all point of measurement show the same cyclical tendency albeit with different average values, degree of fluctuation and peak periods.

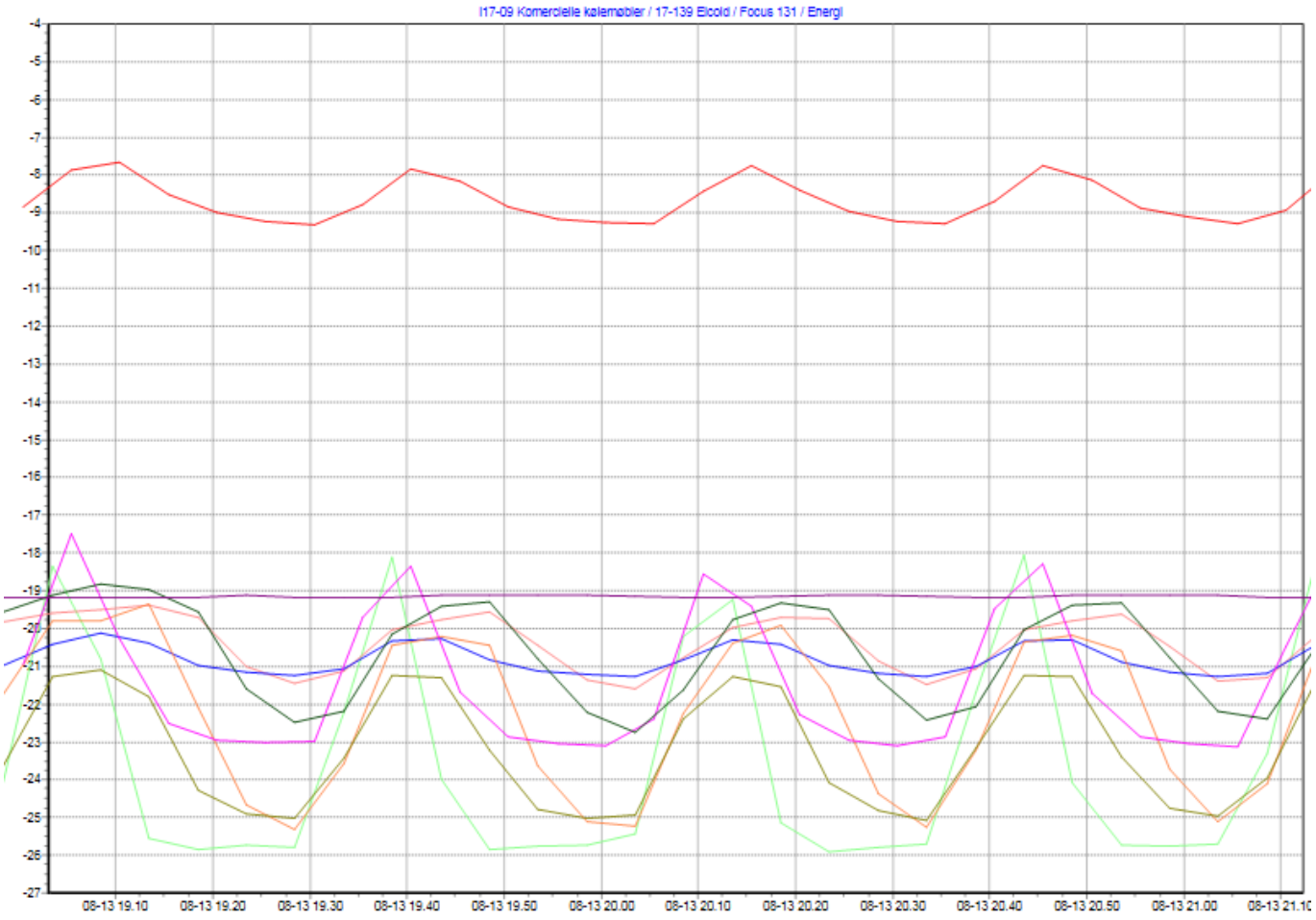


Figure 4 Measurements of internal temperatures for a compressor cycle

Heating element	
Backside upper	
Backside lower	
On compressor box	
Front middle	
Bottom (Right side)	
Bottom	
Left upper	
Left lower	

Power

Figure 5 shows the power utilized by the freezer throughout several compression cycles. The figure shows a clear peak when the cycle is initiated and a subsequent stable power demand for the remainder of the cycle. In the period the freezer was tested the compressor had an operating percentage of 78,8%.

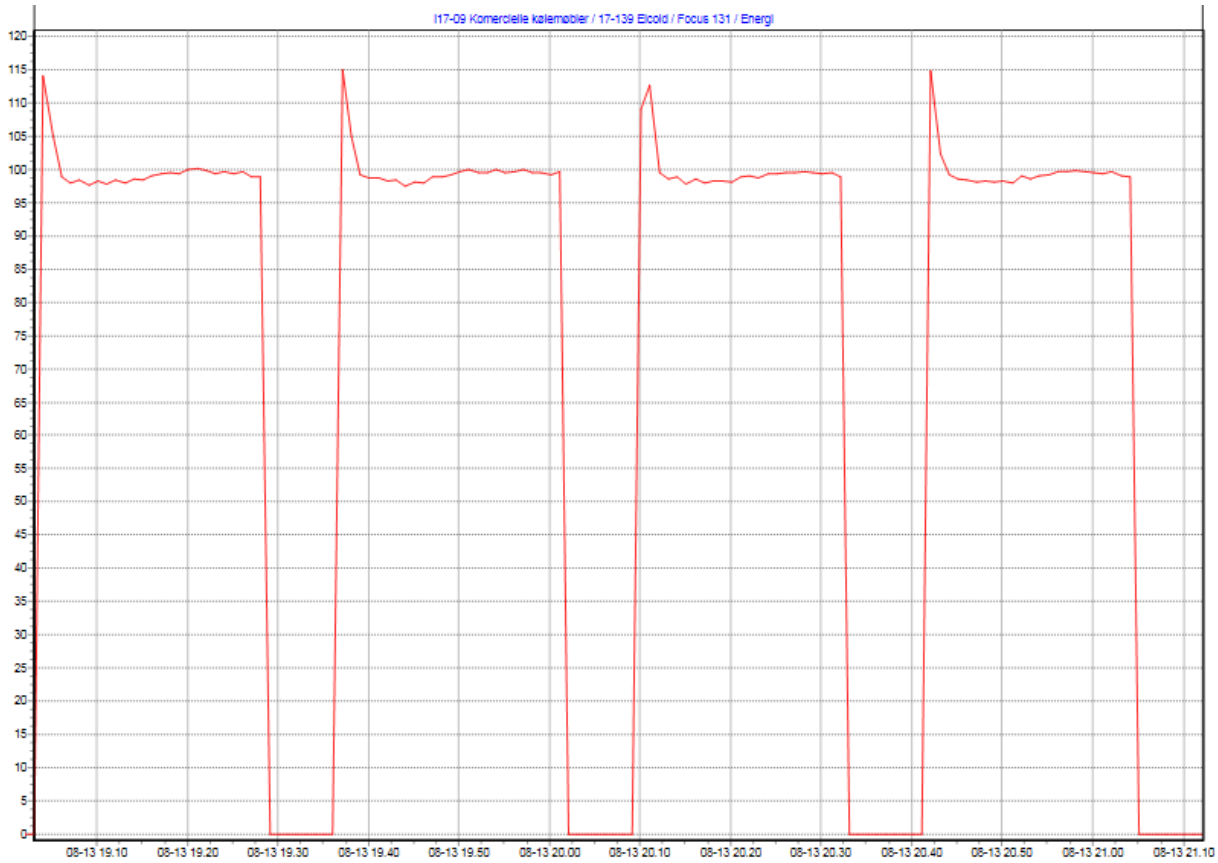


Figure 5 Power [W]

Heating element

Figure 6 shows the temperature of both the upper lid and the lower lid. Assuming that the ambient pressure is 1013 mbar and the relative humidity is 55% the dew point is 19,98 °C which results in condensation on both lids, as can be seen in the picture to the right.

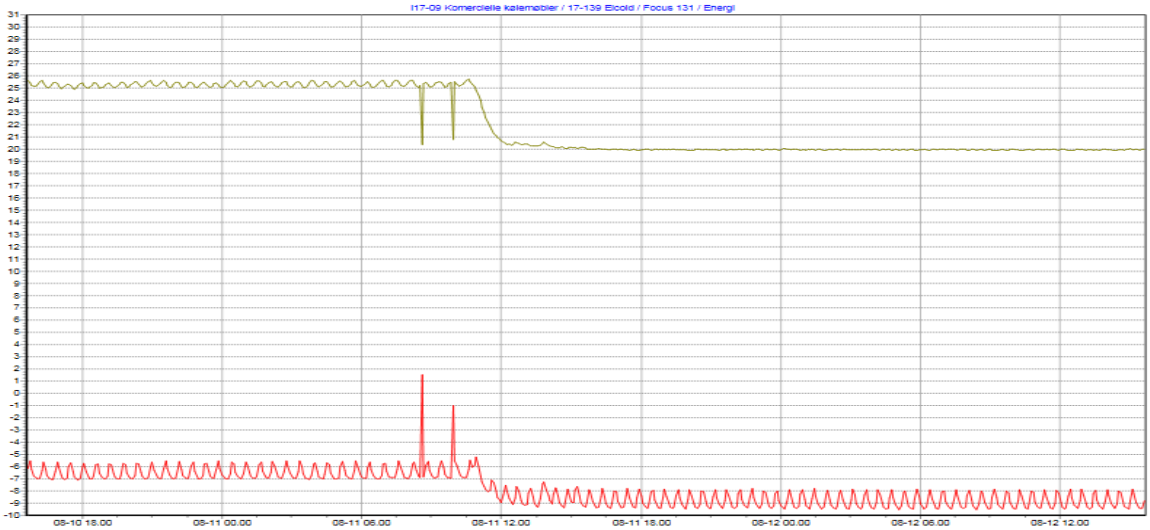


Figure 6 Temperature on lid and near electrical heating element, before and after the decoupling of the heating element.

Figure 7 shows the surface temperature of the lid and the subsequent replacement of the thermoelement from the upper lid (left side) to the lower lid (right side) after the decoupling of the heating element. Both lids have a temperature close to or below the dew point.

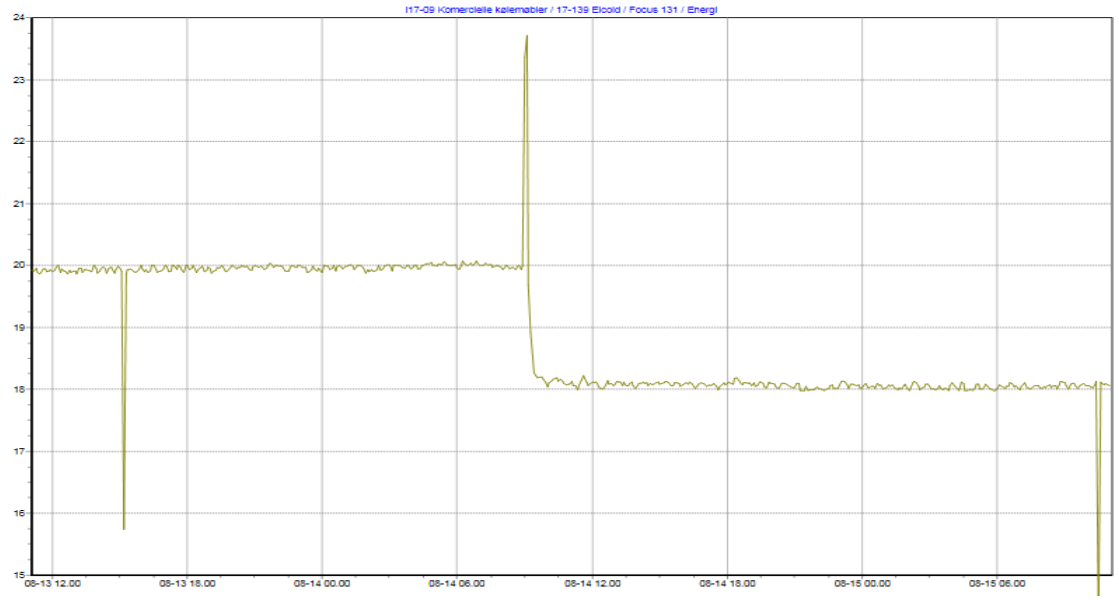


Figure 7 Temperature on outer surface on first the upper lid and later the lower lid (Both after decoupleling of the heating element)

Below two pictures document the build-up of condensate along the front rim on both lids after decoupling the electrical heating element. The lower lying lid (to the right) showed to have both a lower surface temperature as well as a broader band of condensate along the front.

Figure 8 Condensate on both lids

Power consumption after decoupling

Figure 9 shows the consumption stated in the energy consumption report and the daily energy consumption for four consecutive days from the 12/08/17-15/08/17.

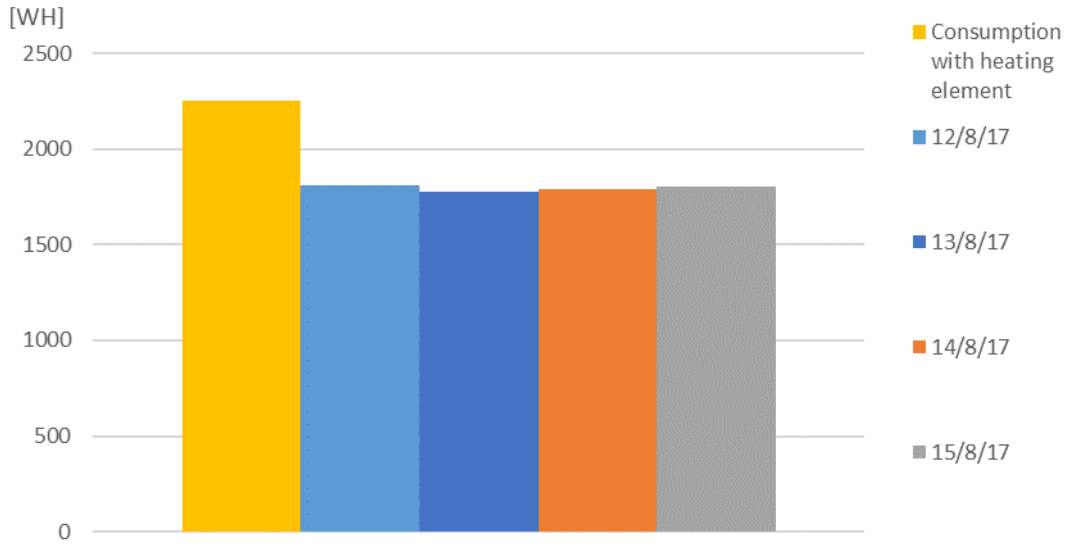


Figure 9 Daily energy consumption with and without the heating element

Overall, a decoupling of the heating element has shown to decrease the daily energy consumption between 20,3-20,5%.

Table 1 Heating elements impact on daily energy consumption

Consumption reported in the energy consumption test	2252	Wh/24h
Average from the 12 - 15.	1795	Wh/24h
% reduction in consumption	20,3%	-