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Verpackungsprüfstelle
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Your Ref	Your Message from	Our Ref	Telephone	Date
	26.04.2015	VP/Do	+49 (30) 45080-225	23.02.2016

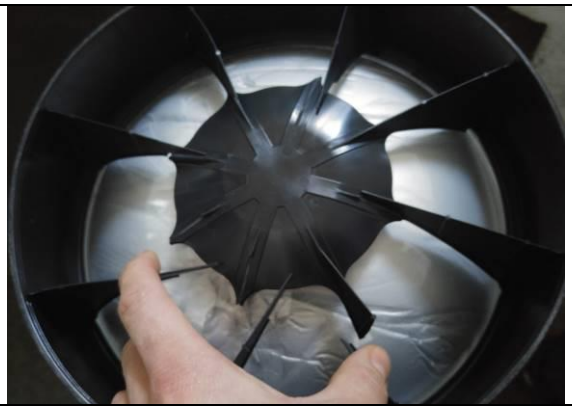
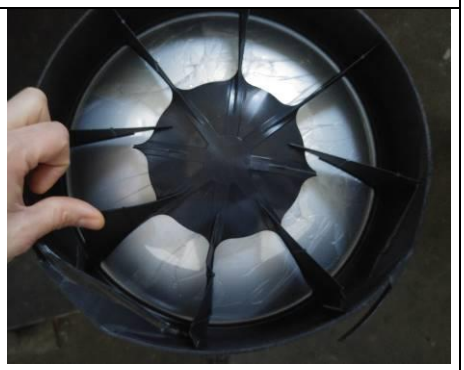
REPORT ABOUT THE TESTING OF ONE-WAY-PLASTIC-KEGS

Test report no.:	VP-TR-227b/15 (replaced report 227/15 and 227a/15)
This test report consists of:	10 pages text and 6 pages appendix
Client:	Addressee
test item:	One-way-plastic-kegs
Date of sampling:	No declaration
Location of sampling:	No declaration
Sampling plan:	No declaration
Sampling procedure:	No declaration
Date of receipt of sample:	04.05.2015
Date(s) of duration of test:	07.05.2015 – 11.12.2015
Test Characteristic(s):	stability tests, measuring of O_2-/CO_2-permeation microbiological tests, colour measurement, sensory tests
Test methode:	MEBAK, EBC, VLB
Journal no.:	227, 255, 256
Producer (acc. to declaration):	Addressee
Produkt (acc. to declaration)	227/15 - Keykeg Slimline 30 l (Fitting-Typ G) / ~ 20 °C 255/15 - Keykeg Slimline 30 l (Fitting-Typ G) / ~ 40 °C 256/15 - Keykeg Slimline 20 l (Fitting-Typ G) / ~ 20 °C

Test results

Impact resistance by dropping 227/15 - Keykeg Slimline 30 l (Fitting-Typ G)

30 l one-way-plastic-kegs KK Slimline (Fitting-Typ G) filled with Water and pressurized with 2 bar were dropped from a height of 1,20 m horizontal, vertical and in an angle of 45 ° on a steel plate. For each test 1 Keg was used.

sample	**horizontal dropping**	
keg 1	damage of the bottom	
sample	**vertical dropping**	
keg 2	damage of the bottom	
sample	**45 ° dropping**	
keg 3	deformation and damage of the bottom	 

The Keg bottoms were damaged, however the kegs could still stand up right and be pressurized.

Resistance to stacking pressure 227/15 - Keykeg Slimline 30 l (Fitting-Typ G)

30 l one-way-plastic-kegs KK Slimline (Fitting-Typ G) filled with water and under a pressure of 2 bar were loaded with 2500 N/Keg over 3 days. For the trial the height of the kegs was measured at each handle. After 3 days with a load of 2500 N the kegs were unloaded and the height were measured directly and after 24h. For this test 3 kegs were used.

sample 1	starting condition	after 3 days	24 h after unloading
handle 1 [mm]	57,3	56,55	57,3
handle 2 [mm]	57,3	56,55	57,3
handle 3 [mm]	57,3	56,55	57,3
handle 4 [mm]	57,3	56,55	57,3
mean value	**57,3**	**56,55**	**57,3**
compression [mm]		**0,75**	**0**
compression [%]		**1,3**	**0**

sample 1	starting condition	after 3 days	24 h after unloading
handle 1 [mm]	57,15	56,4	57,1
handle 2 [mm]	57,15	56,4	57,1
handle 3 [mm]	57,15	56,4	57,1
handle 4 [mm]	57,15	56,4	57,1
mean value	**57,15**	**56,4**	**57,1**
compression [mm]		**0,75**	**0,05**
compression [%]		**1,3**	**0,09**

sample 1	starting condition	after 3 days	24 h after unloading
handle 1 [mm]	57,45	56,75	57,35
handle 2 [mm]	57,45	56,75	57,35
handle 3 [mm]	57,45	56,75	57,35
handle 4 [mm]	57,45	56,75	57,35
mean value	**57,45**	**56,75**	**57,35**
compression [mm]		**0,7**	**0,10**
compression [%]		**1,2**	**0,17**

The tested one-way-plastic-kegs showed a low compression caused of the load of 2500 N. During the test the kegs didn’t show any damages or destructions.

Puncture resistance test 227/15 - Keykeg Slimline 30 l (Fitting-Typ G)

9 x 30 l one-way-plastic-kegs KK Slimline (Fitting-Typ G) under a pressure of 2, 3 and 4 bar were used for these test. After each increase of pressure always 3 kegs were penetrated with a knife at one position. First position was the side seam, second position was at the lower area and the third position was at the upper area.

position 1: punctures at the mould division at the middle area of the keg

before puncture **after puncture**

2 bar

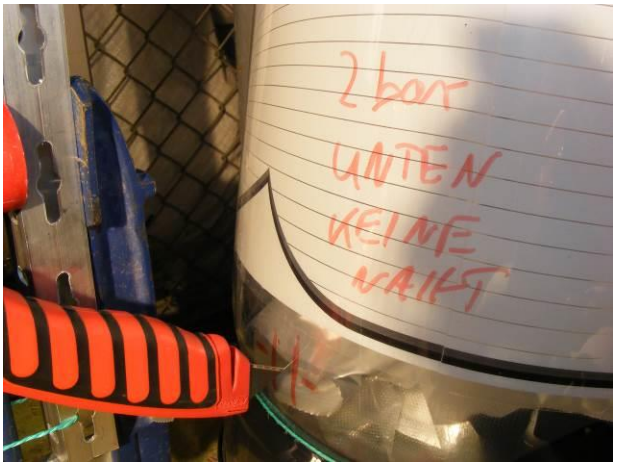
3 bar

4 bar

The tested kegs showed a pressure loss at the puncture site, but none of the them burst during the test.

position 2: puncture at the lower area at the keg (not at the mould division)

before puncture **after puncture**



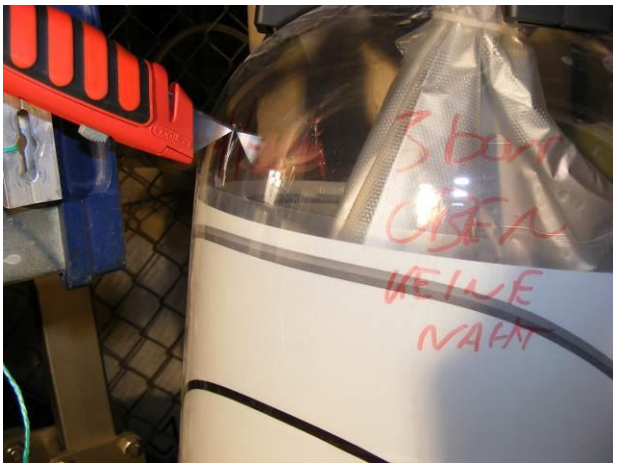
2 bar

3 bar

4 bar

The tested kegs showed a pressure loss at the puncture site, but none of the them burst during the test.

position 3: puncture at the upper area of the keg (not at the mould division)

before puncture	**after puncture**
	
2 bar	
	
3 bar	
	
4 bar	

The tested kegs showed a pressure loss at the puncture site, but none of the them burst during the test.

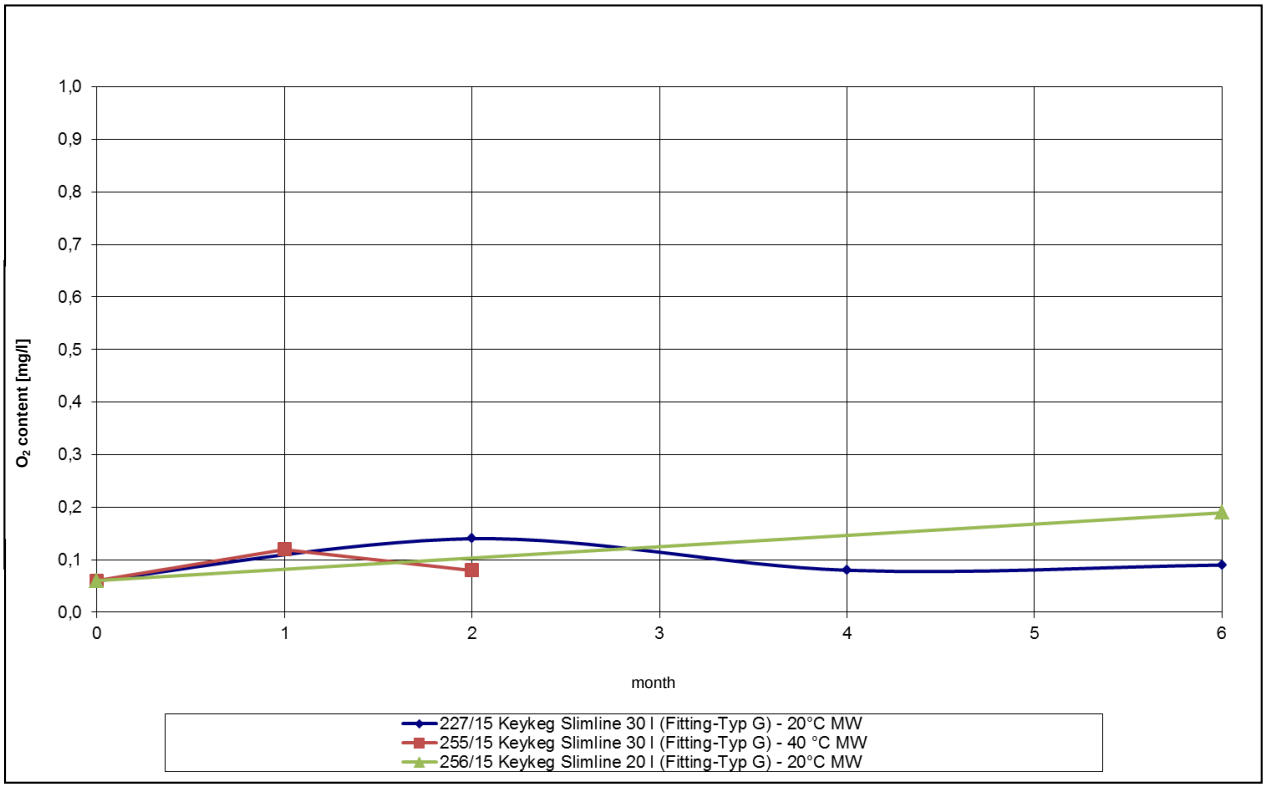
Permeation – CO_2-loss and O_2-intake

The one-way-plastic-kegs were filled with carbonized water (CO_2 content: 5,0 ± 0,3 g/l) and a low oxidation content of approx. 0,05 mg/l. Than they were stored at 20°C and 40°C. The measurement of the CO_2- und O_2 – content was carried out as double determination at each measurement day.

227/15 - Keykeg Slimline 30 l (Fitting-Typ G)
Measurement interval: 0, 2, 4 and 6 month
Storage tempreature: 20 °C
255/15 - Keykeg Slimline 30 l (Fitting-Typ G)
Measurement interval: 0, 1, and 2 month
Storage tempreature: 40 °C
256/15 - Keykeg Slimline 20 l (Fitting-Typ G)
Measurement interval: 0, and 6 month
Storage tempreature: 20 °C

O_2 -intake

The following graph 1 shows the oxygen increase of the liquid in the tested kegs to the oxygen content after filling over the measurement period of 6 months. Table 1 contains mean values of the respective measurement values over the period of time.



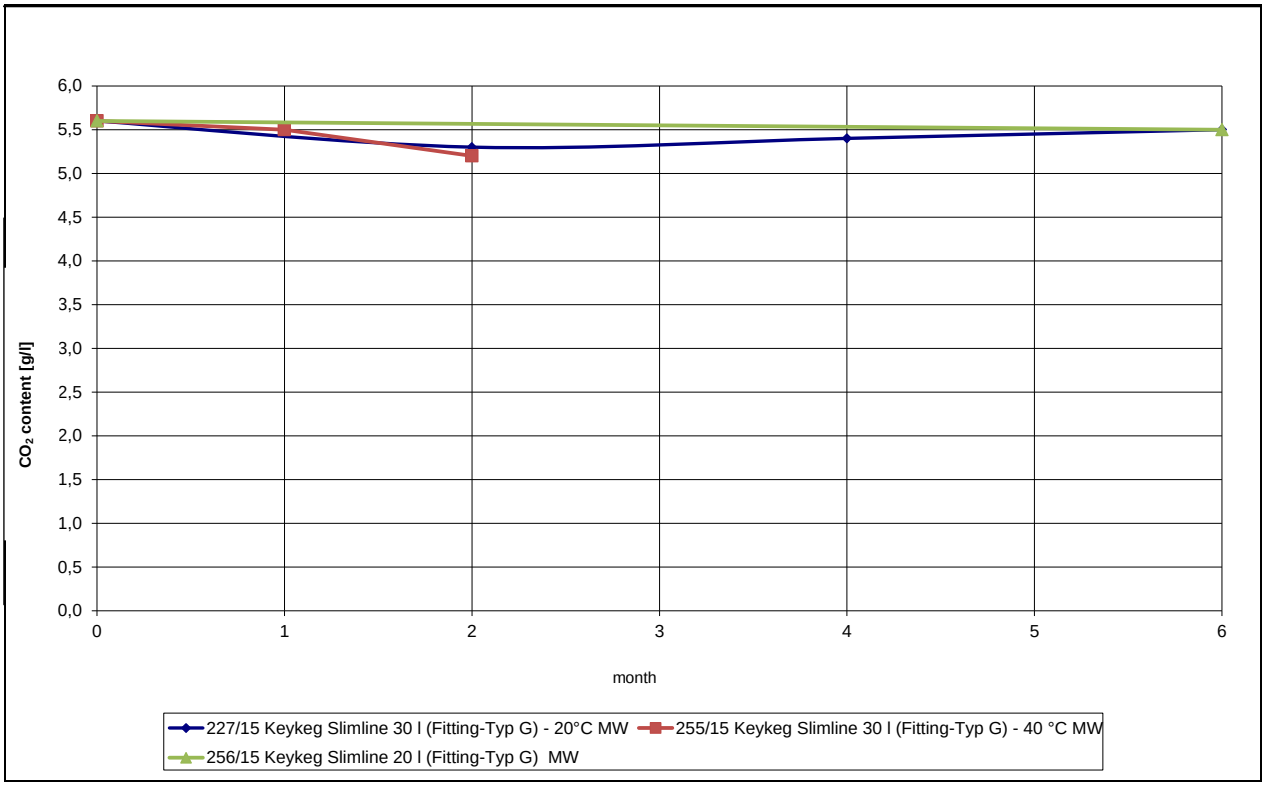
Graph 1: Oxygen ingress over a time period of 6 months

Table 1: O_2 content of the liquid over the testing period of 6 months

month	O_2 content in mg/l		
	227/15	255/15	256/15
	Keykeg Slimline 30 l (Fitting-Typ G) - 20°C	Keykeg Slimline 30 l (Fitting-Typ G) - 40 °C	Keykeg Slimline 20 l (Fitting-Typ G) - 20°C
	mean value	mean value	mean value
0	0,06	0,06	0,06
1	no measurement	0,12	no measurement
2	0,14	0,08	no measurement
4	0,08	no measurement	no measurement
6	0,09	no measurement	0,19

CO_2-loss

The following graph 2 shows the carbon dioxide reduction of the liquid in the tested kegs to the carbon dioxide content after filling over the measurement period of 6 months. Table 2 contains mean values of the respective measurement values over the period of time.



Graph 2: CO_2 reduction over a time period of 6 months

Table 2: CO_2 content of the liquid over the testing period of 6 months

month	CO_2 content in g/l		
	227/15	255/15	256/15
	Keykeg Slimline 30 l (Fitting-Typ G) - 20°C	Keykeg Slimline 30 l (Fitting-Typ G) - 40 °C	Keykeg Slimline 20 l (Fitting-Typ G) - 20°C
	mean value	mean value	mean value
0	5,6	5,6	5,6
1	no measurement	5,5	no measurement
2	5,3	5,2	no measurement
4	5,4	no measurement	no measurement
6	5,5	no measurement	5,5

RESEARCH AND TEACHING INSTITUTE FOR BREWING IN BERLIN (VLB)

Research Institute for Beer and Beverage Production

Testing Laboratory for Packaging

M.Eng./Dipl.-Ing.(FH) Susan Dobrick
Head of testing laboratory

M.Eng. Thomas Drogott
Scientific assistant

appendix 1 – microbiological results

month 0:

VERSUCHS- UND LEHRANSTALT FÜR BRAUEREI IN BERLIN E.V.

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FIBGP
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REPORT

code:	your message of	date
Ms Dobrick	07.05.15	15. 05. 2015

arrival: 07.05.15
tests: 07.05.15 to 15.05.15
sampling: 06.05.2015
sampling by: Mr. Holewa
samples: 4 Filtered Beers

Journal-No.: V2015 008 695 - 008 698
page 1 of 1

Analysis according to MEBAK Vol. III, 2. Edition, Chap.: 10.6/10.11
EBC Analytica Microbiologica II, Chap.: 2.3.

Journal-No. V2015	Results Sample Name		
008 695	0,5 L BVF P1	250 ml, wort agar: 0 colonies	250 ml, VLB S7-S agar: 0 colonies
008 696	0,5 L BVF P2	250 ml, wort agar: 0 colonies	250 ml, VLB S7-S agar: 0 colonies
008 697	0,5 L BVF P3	250 ml, wort agar: 0 colonies	250 ml, VLB S7-S agar: 0 colonies
008 698	0,5 L BVF P4	250 ml, wort agar: 0 colonies	250 ml, VLB S7-S agar: 0 colonies

Dr. Johannes Hinrichs
Laborleitung

The results relate only to the items tested. Content copies of this analytical report only with permission from the laboratory. Uncertainty of measurement equates to analytical methods.

month 3:

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REPORT

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code:	your message of	date
Ms. Dobrick	06.08.15	14. 08. 2015

arrival: 07.08.15
tests: 07.08.15 to 14.08.15
sampling: 06.08.15
sampling by: Mr. Holewa
samples: 2 Filtered Beers

Journal-No.: V2015 018 890, 018 891
page 1 of 1

Analysis according to MEBAK Vol. III, 2. Edition, Chap.: 10.6/10.11
EBC Analytica Microbiologica II, Chap.: 2.3.

Journal-No. V2015	Results Sample Name		
018 890	Steel Keg	250 ml, wort agar: 2 colonies moulds	250 ml, VLB S7-S agar: 0 colonies
018 891	Key Keg	250 ml, wort agar: 1 colony moulds	250 ml, VLB S7-S agar: 0 colonies

VERSUCHS- UND LEHRANSTALT
FÜR BRAUEREI IN BERLIN (VLB) E.V.
-Biologisches Laboratorium-
Dr. Johannes Hinrichs
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Amtsgericht Berlin-Charlottenburg

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month 6:

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code:	your message of	date
Ms. Dobrick	10.11.15	17. 11. 2015

arrival: 10.11.15
tests: 10.11.15 to 17.11.15
sampling: 10.11.15
sampling by: Mr. Holewa
samples: 2 Filtered Beers

Journal-No.: V2015 026 898, 026 899
page 1 of 1

Analysis according to MEBAK Vol. III, 2. Edition, Chap.: 10.6/10.11
EBC Analytica Microbiologica II, Chap.: 2.3.

Journal-No. V2015	Results Sample Name		
026 898	Key Keg 10.11.	250 ml, wort agar: 0 colonies	250 ml, VLB S7-S agar: 0 colonies
026 899	Steel Keg 10.11.	250 ml, wort agar: 0 colonies	250 ml, VLB S7-S agar: 0 colonies

VERSUCHS- UND LEHRANSTALT
FÜR BRAUEREI IN BERLIN (VLB) E.V.
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Dr. Johannes Hinrichs
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Commerzbank AG
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Swift Code (BIC): DRESDEFF100

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Appendix 2 – results of the colour measurement and sensor tests

Versuchs- und Lehranstalt für Brauerei in Berlin e.V.

Results – 0-value:

- **Sensory Analysis:**

Date: 07.05.2015
Number of Tasters: 10
Type of Tasting: Triangle Test
Analysed Samples: P – Oneway-PET-Keg
S – Stainless-Steel-Keg

Results:

Number of correct answers	3
Number of false answers	7

For a significance level of α = 0,05%, no difference was detected between the analysed samples.

Additional Comments:

No comments.

- **Colour Measurement:**

Date: 07.05.2015
Method: MEBAK WBB, 2.12.2, 2013
Analysed Samples: P – Oneway-PET-Keg
S – Stainless-Steel-Keg

	Unit	P (Oneway-PET-Keg)	S (Stainless-Steel-Keg)
Colour	*EBC*	8,06	7,99

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Versuchs- und Lehranstalt für Brauerei in Berlin e.V.

Results – after 3 months of storage:

- **Sensory Analysis:**

Date: 07.08.2015
Number of Tasters: 10
Type of Tasting: Triangle Test
Analysed Samples: P – Oneway-PET-Keg
S – Stainless-Steel-Keg

Results:

Number of correct answers	6
Number of false answers	4

For a significance level of α = 0,05%, no difference was detected between the analysed samples.

Additional Comments:

No comments.

- **Colour Measurement:**

Date: 07.08.2015
Method: MEBAK WBB, 2.12.2, 2013
Analysed Samples: P – Oneway-PET-Keg
S – Stainless-Steel-Keg

	Unit	P (Oneway-PET-Keg)	S (Stainless-Steel-Keg)
Colour	*EBC*	7,63	7,60

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Versuchs- und Lehranstalt für Brauerei in Berlin e.V.

Results – after 6 months of storage:

- **Sensory Analysis:**

Date: 16.11.2015
Number of Tasters: 10
Type of Tasting: Triangle Test
Analysed Samples: P – Oneway-PET-Keg
S – Stainless-Steel-Keg

Results:

Number of correct answers	5
Number of false answers	5

For a significance level of α = 0,05%, no difference was detected between the analysed samples.

Additional Comments:

No comments.

- **Colour Measurement:**

Date: 16.11.2015
Method: MEBAK WBB, 2.12.2, 2013
Analysed Samples: P – Oneway-PET-Keg
S – Stainless-Steel-Keg

	Unit	P (Oneway-PET-Keg)	S (Stainless-Steel-Keg)
Colour	*EBC*	7,90	7,60

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