



Product Service

**Mehr Sicherheit.  
Mehr Wert.**

**Technical Report No. 71323978  
Revision 1  
dated 11. 12. 2007**

Customer: Grohe AG  
Industriepark Edelburg  
  
58653 Hemer  
Germany

Place of manufacture: Not known or not applicable

Object of the assessment: Single-lever mixers for wash basins  
Models: see section 1.2

Test specification: Based on DIN EN 817 (10/1997)

Based on NF 077 (07/2005)

Test program of TÜV SÜD Product Service GmbH "Comparison test on wash basin fittings" (06/2007)

Purpose of the assessment: Comparison testing of the mechanical wear characteristics of single-lever mixers for wash basins from the manufacturers Delta, Grohe, Hansa, Hansgrohe, Ideal Standard, Jacob Delafon, Kludi, Kohler and Roca

Test result: The following ranking was obtained following completion of the comparison test:

Placing	Company	Fitting name
1	Grohe	Eurodisc
2	Jacob Delafon	Clip
3	Hansgrohe	Metris S
4	Ideal Standard	Ceramix 2000
5	Delta	Brizo Riviera
6	Kludi	Kludi Mix
6	Kohler	Fairfax
8	Hansa	Hansamix
8	Roca	Victoria R44 P

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File name:  
Report number: 71323978  
Revision: 1  
Page 1 of 53

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### **Notice**

The following report is an English translation of the respective German report. In case of any doubt the German version of this technical report shall prevail.

## **1 Product description**

### **1.1 Function of the products to be tested**

Mechanically adjustable single-lever mixers (SLMs) for furnishing sanitary objects that can be installed in areas used for hygiene purposes. The SLMs are generally suitable for a nominal pressure of PN 10 and are normally operated under the following conditions:

	<b>Application</b>	<b>Recommended application (flow pressure)</b>
Flow pressure	Min. 0.05 MPa (0.5 bar)	0.1 MPa • P • 0.5 MPa (1 bar • P • 5 bar)
Static pressure	Max. 1 MPa (10 bar)	
Temperature	• 90° C	• 65° C

### **1.2 Comparison samples**

<b>Manufacturer</b>	<b>Fitting range</b>	<b>Product number</b>	<b>Test specimen number</b>
Hansa	Hansamix (WB)	01092173	77487-1 77487-2
Hansgrohe	Metris S (WB)	31060000	77488-1 77487-2
Ideal Standard	Ceramix 2000 (WB)	A 5000 AA	77490-1 77490-2
Kludi	Kludi Mix (WB)	331230562	77491-1 77491-2
Jacob Delafon	Clip (WB)	E 72051 - CP	77492-1 77492-2
Roca	Victoria Plus R44 P (WB)	5261659B0	77589-1 77589-2
Delta	Brizo Riviera (WB)	6515521 - PC	77496-1 77496-2
Kohler	Fairfax (WB)	12182 - CP	77497-1 77497-2
Grohe	Eurodisc (WB)	33.178.001	77498-1 77498-2

WB = Wash basin fitting



## **2 Order**

### **2.1 Order date and customer signature**

Order date: July 3, 2007  
Order number: 89 730

### **2.2 Date and location of receipt of the comparison samples**

CW 26 in the testing laboratory of TÜV SÜD Product Service GmbH, Eschborn.

### **2.3 Selection of the comparison samples**

The comparison samples were purchased by the Purchasing department of Grohe AG at various wholesalers in Europe and the USA under the supervision of and assisted by TÜV SÜD Product Service GmbH. Three specimens of each of the indicated manufacturers' single-lever mixers were purchased. The comparison samples are standard production products.

### **2.4 Date of the comparison test**

CW 26 to CW 41.

### **2.5 Location of the comparison test**

TÜV SÜD Product Service GmbH, Mergenthalerallee 27, 65760 Eschborn / Ts., Germany.

Under the supervision of TÜV SÜD Product Service GmbH in the laboratory for continued use suitability of Grohe AG in 77933 Lahr, Germany.

Under the supervision of TÜV SÜD Product Service GmbH in the laboratory for experimental development of Grohe AG in 58706 Menden, Germany.

## **3 Procedure for the comparison test**

Two single-lever mixers from each manufacturer are tested.

The operating lever of the SLM is subjected to a specific number of movements using a test machine. These movements take place at defined pressures and temperatures for cold and hot water. The single-lever mixers to be tested are mounted on a test machine and connected to the water supply. In accordance with DIN EN 817, the SLMs are subjected to 70,000 cycles using a drive device. These 70,000 cycles include 210,000 open/close actuations and 140,000 hot/cold actuations. Each cycle comprises the movement sequence described below.

Item	Movement sequence
0	Start with mixer closed in mixed water setting
1	Open in mixed water setting
2	Close in mixed water setting
3	Swivel in closed position to cold water setting
4	Open in cold water setting
5	Swivel in open position to hot water setting (5 s pause period)
6	Swivel in open position to cold water setting (5 s pause period)
7	Close in cold water setting
8	Swivel in closed position to hot water setting
9	Open in hot water setting
10	Close in hot water setting
11	Swivel in closed position back to mixed water setting

The criteria for the comparison test are:

- actuating forces
- dead play of the operating lever
- precision
- watertightness

At the start of the comparison test, an initial test is performed. This involves measuring the sensitivity of the SLMs as well as determining the hysteresis behaviour. The actuating forces on the operating lever as well as the dead play of the operating lever are also determined and a watertightness test is performed.

During the course of the comparison test, reference intermediate tests are performed after 15,000 cycles and 30,000 cycles.



Product Service

The final test is performed after 70,000 cycles and has the same scope as the initial test.

The overall result is composed from the individual results obtained during the initial, intermediate and final tests.

The results are evaluated as follows:

- Ø The mean value of the measurements for the two test specimens from a manufacturer is calculated.
- Ø The mean values are arranged by value.
- Ø The best value is given a score of 1 (one), the second best a score of 2 (two), and so on.

An arithmetic mean value is calculated for each category and evaluated as described. At the end of the comparison test, the final score is determined from the individual scores.

## 4 Results of the comparison test

### 4.1 Hysteresis (accuracy) of the temperature control in new condition

The hysteresis describes the reproducibility of the temperature setting in a specific lever position. The temperature in the chosen lever position can depend on whether this lever position is approached by swivelling from "cold to hot" or from "hot to cold". The hysteresis is defined as the difference between these two temperatures.

The hysteresis is evaluated according to NF 077 Rev.14 (application date from July 1, 2005 onwards), Section 10.6.3.5. The evaluation is performed on the basis of the difference in temperature between the two measurement curves determined at 38° C. The smaller the difference in temperature, the better the hysteresis.

Manufacturer	Sample no.	Hysteresis acc. to NF at 38° C in °C	Mean hysteresis value in °C	Ranking
Hansa	77487-1	7.7	7.60*	9
	77487-2	7.5		
Hansgrohe	77488-1	3.5	3.90	5
	77488-2	4.3		
Ideal Standard	77490-1	4.0	5.10*	7
	77490-2	6.2		
Kludi	77491-1	4.2	3.95	6
	77491-2	3.7		
Jacob Delafon	77492-1	3.3	3.35	3
	77492-2	3.4		
Roca	77589-1	7.1	6.05*	8
	77589-2	5.0		
Delta	77496-1	1.6	1.60	1
	77496-2	1.6		
Kohler	77497-1	4.3	3.55	4
	77497-2	2.8		
Grohe	77498-1	3.3	3.30	2
	77498-2	3.3		

\* Negative result according to NF 077, Section 10.6.3.4 due to violation of the 5° C criterion

#### 4.2 Hysteresis (accuracy) of the temperature control after 70,000 cycles (test end)

Manufacturer	Sample no.	Hysteresis acc. to NF at 38° C in °C	Mean value in °C	Ranking
Hansa	77487-1	7.4	7.05*	9
	77487-2	6.7		
Hansgrohe	77488-1	2.4	2.15	1
	77488-2	1.9		
Ideal Standard	77490-1	2.3	3.55	5
	77490-2	4.8		
Kludi	77491-1	2.2	2.40	3
	77491-2	2.6		
Jacob Delafon	77492-1	2.4	2.70	4
	77492-2	3.0		
Roca	77589-1	5.2	5.80*	8
	77589-2	6.4		
Delta	77496-1	3.5	3.70	6
	77496-2	3.9		
Kohler	77497-1	7.2	5.70*	7
	77497-2	4.2		
Grohe	77498-1	1.8	2.30	2
	77498-2	2.8		

\* Negative result according to NF 077, Section 10.6.3.4 due to violation of the 5° C criterion

### 4.3 Sensitivity in new condition

The term sensitivity describes how sensitively a single-lever mixer can adjust temperature. The sensitivity is the distance that the end of the lever needs to be moved to effect a specific change in temperature. The greater the distance, the more sensitively the temperature can be adjusted. According to DIN EN 817, the distance at the end of the lever needed to effect a change in temperature from 34° C to 42° C should be at least 12 mm for wash basin fittings. The test is performed according to DIN EN 817 (1997), Section 10.6.2.

Evaluation: The greatest sensitivity over the entire adjustment range scores highest, the second greatest sensitivity scores second highest, etc.

Manufacturer	Sample no.	Sensitivity (mm)	Mean sensitivity value in mm	Ranking
Hansa	77487-1	9.6	9.80*	9
	77487-2	10.0		
Hansgrohe	77488-1	18.9	18.70	4
	77488-2	18.5		
Ideal Standard	77490-1	14.8	14.30	8
	77490-2	13.8		
Kludi	77491-1	17.2	18.85	3
	77491-2	20.5		
Jacob Delafon	77492-1	19.1	18.95	2
	77492-2	18.8		
Roca	77589-1	13.5	15.45	7
	77589-2	17.4		
Delta	77496-1	18.2	18.10	5
	77496-2	18.0		
Kohler	77497-1	15.8	15.90	6
	77497-2	16.1		
Grohe	77498-1	21.8	22.05	1
	77498-2	22.3		

\* Negative result according to DIN EN 817 (1997), Section 10.6.2 due to violation of the 12 mm criterion



#### 4.4 Sensitivity after 70,000 cycles (test end)

Manufacturer	Sample no.	Sensitivity (mm)	Mean value in mm	Ranking
Hansa	77487-1	9.5	9.40*	9
	77487-2	9.3		
Hansgrohe	77488-1	19.5	19.95	3
	77488-2	20.4		
Ideal Standard	77490-1	15.2	14.40	8
	77490-2	13.6		
Kludi	77491-1	22.8	22.85	2
	77491-2	22.9		
Jacob Delafon	77492-1	19.1	19.15	4
	77492-2	19.2		
Roca	77589-1	16.5	16.85	6
	77589-2	17.2		
Delta	77496-1	16.8	16.90	5
	77496-2	17.0		
Kohler	77497-1	14.9	16.00	7
	77497-2	17.1		
Grohe	77498-1	23.8	23.30	1
	77498-2	22.8		

\* Negative result according to DIN EN 817 (1997), Section 10.6.2 due to violation of the 12 mm criterion

#### 4.5 Friction release force for opening in new condition

The friction release force describes the force required to actuate the fitting for the first time following a period of inactivity.

The maximum values in the adjustment range are determined.

Evaluation: The lowest friction release force required scores highest, the second lowest friction release force scores second highest, etc.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	7.5	7.95	3
	77487-2	8.4		
Hansgrohe	77488-1	11.0	11.10	7
	77488-2	11.2		
Ideal Standard	77490-1	8.8	9.20	5
	77490-2	9.6		
Kludi	77491-1	12.8	11.95	9
	77491-2	11.1		
Jacob Delafon	77492-1	10.8	10.35	6
	77492-2	9.9		
Roca	77589-1	11.4	11.3	8
	77589-2	11.2		
Delta	77496-1	7.5	7.60	2
	77496-2	7.7		
Kohler	77497-1	10.3	8.80	4
	77497-2	7.3		
Grohe	77498-1	5.1	5.60	1
	77498-2	6.1		

#### 4.6 Friction release force for opening after 15,000 cycles

The maximum values in the adjustment range are determined.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	10.0	9.75	6
	77487-2	9.5		
Hansgrohe	77488-1	9.5	9.90	8
	77488-2	10.3		
Ideal Standard	77490-1	8.7	9.35	5
	77490-2	10.0		
Kludi	77491-1	8.9	8.40	2
	77491-2	7.9		
Jacob Delafon	77492-1	10.4	9.90	8
	77492-2	9.4		
Roca	77589-1	9.0	9.75	6
	77589-2	10.5		
Delta	77496-1	7.3	8.40	2
	77496-2	9.5		
Kohler	77497-1	8.5	8.50	4
	77497-2	8.5		
Grohe	77498-1	5.7	5.50	1
	77498-2	5.3		

#### 4.7 Friction release force for opening after 30,000 cycles

The maximum values in the adjustment range are determined.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	9.4	9.50	5
	77487-2	9.6		
Hansgrohe	77488-1	9.4	9.45	4
	77488-2	9.5		
Ideal Standard	77490-1	10.1	10.05	6
	77490-2	10.0		
Kludi	77491-1	9.2	9.40	3
	77491-2	9.6		
Jacob Delafon	77492-1	10.6	10.20	7
	77492-2	9.8		
Roca	77589-1	11.6	11.05	8
	77589-2	10.5		
Delta	77496-1	20.6	19.80	9
	77496-2	19.0		
Kohler	77497-1	8.0	9.15	2
	77497-2	10.3		
Grohe	77498-1	5.3	5.15	1
	77498-2	5.0		

#### 4.8 Friction release force for opening after 70,000 cycles (test end)

The maximum values in the adjustment range are determined.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	9.2	8.30	3
	77487-2	7.4		
Hansgrohe	77488-1	10.1	9.05	5
	77488-2	8.0		
Ideal Standard	77490-1	9.3	10.40	6
	77490-2	11.5		
Kludi	77491-1	8.7	8.30	3
	77491-2	7.9		
Jacob Delafon	77492-1	10.3	10.90	7
	77492-2	11.5		
Roca	77589-1	10.8	11.10	8
	77589-2	11.4		
Delta	77496-1	17.4	19.90	9
	77496-2	22.4		
Kohler	77497-1	8.9	7.75	2
	77497-2	6.6		
Grohe	77498-1	6.1	5.65	1
	77498-2	5.2		

#### 4.9 Actuating force for opening in new condition

The actuating force is the force required to move the operating lever in the desired direction.

The maximum values in the adjustment range are determined.

In the case of SLMs with "eco detent", the force required to override this setting is not evaluated.

Evaluation: The lowest actuating force required scores highest, the second lowest actuating force scores second highest, etc.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	5.8	6.05	7
	77487-2	6.3		
Hansgrohe	77488-1	5.8	5.70	4
	77488-2	5.6		
Ideal Standard	77490-1	5.3	5.75	5
	77490-2	6.2		
Kludi	77491-1	9.7	9.30	9
	77491-2	8.9		
Jacob Delafon	77492-1	5.3	5.80	6
	77492-2	6.3		
Roca	77589-1	6.3	6.60	8
	77589-2	6.9		
Delta	77496-1	4.4	4.40	2
	77496-2	4.4		
Kohler	77497-1	6.1	5.50	3
	77497-2	4.9		
Grohe	77498-1	4.0	4.05	1
	77498-2	4.1		

#### 4.10 Actuating force for opening after 15,000 cycles

The maximum values in the adjustment range are determined.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	5.1	5.35	5
	77487-2	5.6		
Hansgrohe	77488-1	4.2	3.90	1
	77488-2	3.6		
Ideal Standard	77490-1	5.8	5.30	4
	77490-2	4.8		
Kludi	77491-1	6.8	6.70	8
	77491-2	6.6		
Jacob Delafon	77492-1	4.3	4.65	3
	77492-2	5.0		
Roca	77589-1	5.8	5.35	5
	77589-2	4.9		
Delta	77496-1	4.9	7.65	9
	77496-2	10.4		
Kohler	77497-1	7.3	5.95	7
	77497-2	4.6		
Grohe	77498-1	4.4	4.20	2
	77498-2	4.0		

#### 4.11 Actuating force for opening after 30,000 cycles

The maximum values in the adjustment range are determined.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	5.7	5.60	4
	77487-2	5.5		
Hansgrohe	77488-1	4.4	4.05	2
	77488-2	3.7		
Ideal Standard	77490-1	6.0	6.45	7
	77490-2	6.9		
Kludi	77491-1	7.6	7.70	8
	77491-2	7.8		
Jacob Delafon	77492-1	5.6	4.90	3
	77492-2	4.2		
Roca	77589-1	5.4	5.75	5
	77589-2	6.1		
Delta	77496-1	19.4	19.10	9
	77496-2	18.8		
Kohler	77497-1	7.6	6.10	6
	77497-2	4.6		
Grohe	77498-1	3.9	4.00	1
	77498-2	4.1		



#### 4.12 Actuating force for opening after 70,000 cycles (test end)

The maximum values in the adjustment range are determined.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	5.1	5.55	3
	77487-2	6.0		
Hansgrohe	77488-1	6.3	5.15	2
	77488-2	4.0		
Ideal Standard	77490-1	7.3	6.85	6
	77490-2	6.4		
Kludi	77491-1	9.4	9.45	8
	77491-2	9.5		
Jacob Delafon	77492-1	5.0	6.45	5
	77492-2	7.9		
Roca	77589-1	7.0	7.40	7
	77589-2	7.8		
Delta	77496-1	16.9	17.20	9
	77496-2	17.5		
Kohler	77497-1	6.8	5.80	4
	77497-2	4.8		
Grohe	77498-1	4.6	4.45	1
	77498-2	4.3		

#### 4.13 Actuating force for closing in new condition

The actuating force is the force required to move the operating lever in the desired direction.

The maximum values in the adjustment range are determined.

In the case of SLMs with "eco detent", the force required to override this setting is not evaluated.

Evaluation: The lowest actuating force required scores highest, the second lowest actuating force scores second highest, etc.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	4.8	5.05	8
	77487-2	5.3		
Hansgrohe	77488-1	5.3	4.95	7
	77488-2	4.6		
Ideal Standard	77490-1	3.6	4.30	5
	77490-2	5.0		
Kludi	77491-1	9.5	8.95	9
	77491-2	8.4		
Jacob Delafon	77492-1	3.4	3.80	2
	77492-2	4.2		
Roca	77589-1	4.1	4.35	6
	77589-2	4.6		
Delta	77496-1	2.4	2.85	1
	77496-2	3.3		
Kohler	77497-1	4.1	3.95	4
	77497-2	3.8		
Grohe	77498-1	3.6	3.85	3
	77498-2	4.1		

#### 4.14 Actuating force for closing after 15,000 cycles

The maximum values in the adjustment range are determined.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	3.5	3.55	4
	77487-2	3.6		
Hansgrohe	77488-1	3.8	3.90	5
	77488-2	4.0		
Ideal Standard	77490-1	2.8	3.00	1
	77490-2	3.2		
Kludi	77491-1	7.2	7.25	9
	77491-2	7.3		
Jacob Delafon	77492-1	3.0	3.45	3
	77492-2	3.9		
Roca	77589-1	3.3	3.05	2
	77589-2	2.8		
Delta	77496-1	3.5	6.70	8
	77496-2	9.9		
Kohler	77497-1	4.7	4.10	7
	77497-2	3.5		
Grohe	77498-1	3.9	3.90	5
	77498-2	3.9		

#### 4.15 Actuating force for closing after 30,000 cycles

The maximum values in the adjustment range are determined.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	3.3	3.45	1
	77487-2	3.6		
Hansgrohe	77488-1	4.3	3.85	5
	77488-2	3.4		
Ideal Standard	77490-1	3.3	3.65	3
	77490-2	4.0		
Kludi	77491-1	7.5	7.25	8
	77491-2	7.0		
Jacob Delafon	77492-1	2.8	3.45	1
	77492-2	4.1		
Roca	77589-1	4.8	4.70	6
	77589-2	4.6		
Delta	77496-1	15.1	16.60	9
	77496-2	18.1		
Kohler	77497-1	5.2	4.85	7
	77497-2	4.5		
Grohe	77498-1	3.5	3.70	4
	77498-2	3.9		

#### 4.16 Actuating force for closing after 70,000 cycles (test end)

The maximum values in the adjustment range are determined.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	3.1	3.65	2
	77487-2	4.2		
Hansgrohe	77488-1	4.4	5.00	6
	77488-2	5.6		
Ideal Standard	77490-1	4.1	4.05	3
	77490-2	4.0		
Kludi	77491-1	8.2	8.00	8
	77491-2	7.8		
Jacob Delafon	77492-1	2.4	3.50	1
	77492-2	4.6		
Roca	77589-1	4.8	6.00	7
	77589-2	7.2		
Delta	77496-1	18.8	20.70	9
	77496-2	22.6		
Kohler	77497-1	4.1	4.05	3
	77497-2	4.0		
Grohe	77498-1	4.2	4.15	5
	77498-2	4.1		

#### 4.17 Actuating force for adjusting the temperature with the single-lever mixer open in new condition

The maximum values in the adjustment range are determined.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	20.3	21.30	9
	77487-2	22.3		
Hansgrohe	77488-1	7.8	7.55	3
	77488-2	7.3		
Ideal Standard	77490-1	10.7	10.45	6
	77490-2	10.2		
Kludi	77491-1	12.4	12.80	8
	77491-2	13.2		
Jacob Delafon	77492-1	7.2	7.45	2
	77492-2	7.7		
Roca	77589-1	11.9	12.50	7
	77589-2	13.1		
Delta	77496-1	5.6	5.50	1
	77496-2	5.4		
Kohler	77497-1	9.0	10.40	5
	77497-2	11.8		
Grohe	77498-1	9.3	8.60	4
	77498-2	7.9		

#### 4.18 Actuating force for adjusting the temperature with the single-lever mixer open after 15,000 cycles

The maximum values in the adjustment range are determined.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	21.4	27.60	9
	77487-2	33.8		
Hansgrohe	77488-1	8.6	8.75	3
	77488-2	8.9		
Ideal Standard	77490-1	11.9	10.95	6
	77490-2	10.0		
Kludi	77491-1	9.8	8.80	4
	77491-2	7.8		
Jacob Delafon	77492-1	6.9	7.30	2
	77492-2	7.7		
Roca	77589-1	11.4	10.65	5
	77589-2	9.9		
Delta	77496-1	13.7	18.15	8
	77496-2	22.6		
Kohler	77497-1	17.4	13.05	7
	77497-2	8.7		
Grohe	77498-1	6.2	6.40	1
	77498-2	6.6		

#### 4.19 Actuating force for adjusting the temperature with the single-lever mixer open after 30,000 cycles

The maximum values in the adjustment range are determined.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	26.8	32.25	9
	77487-2	37.7		
Hansgrohe	77488-1	10.2	10.05	4
	77488-2	9.9		
Ideal Standard	77490-1	14.0	13.20	6
	77490-2	12.4		
Kludi	77491-1	12.0	9.90	3
	77491-2	7.8		
Jacob Delafon	77492-1	6.8	7.10	2
	77492-2	7.4		
Roca	77589-1	12.7	12.00	5
	77589-2	11.3		
Delta	77496-1	23.7	29.70	8
	77496-2	35.7		
Kohler	77497-1	18.7	14.10	7
	77497-2	9.5		
Grohe	77498-1	5.5	5.25	1
	77498-2	5.0		



#### 4.20 Actuating force for adjusting the temperature with the single-lever mixer open after 70,000 cycles (test end)

The maximum values in the adjustment range are determined.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	25.7	29.25	9
	77487-2	32.8		
Hansgrohe	77488-1	11.6	11.80	4
	77488-2	12.0		
Ideal Standard	77490-1	14.9	13.50	5
	77490-2	12.1		
Kludi	77491-1	11.9	9.55	3
	77491-2	7.2		
Jacob Delafon	77492-1	7.4	7.80	2
	77492-2	8.2		
Roca	77589-1	15.0	16.50	7
	77589-2	18.0		
Delta	77496-1	31.7	27.20	8
	77496-2	22.7		
Kohler	77497-1	19.3	14.50	6
	77497-2	9.7		
Grohe	77498-1	6.4	7.00	1
	77498-2	7.6		

#### 4.21 Actuating force for adjusting the temperature with the single-lever mixer closed in new condition

The maximum values in the adjustment range are determined.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	13.0	11.95	9
	77487-2	10.9		
Hansgrohe	77488-1	6.6	6.55	6
	77488-2	6.5		
Ideal Standard	77490-1	6.5	6.45	5
	77490-2	6.4		
Kludi	77491-1	7.0	6.85	7
	77491-2	6.7		
Jacob Delafon	77492-1	4.9	5.00	3
	77492-2	5.1		
Roca	77589-1	7.6	7.90	8
	77589-2	8.2		
Delta	77496-1	3.0	3.00	1
	77496-2	3.0		
Kohler	77497-1	6.1	6.20	4
	77497-2	6.3		
Grohe	77498-1	4.7	4.75	2
	77498-2	4.8		

#### 4.22 Actuating force for adjusting the temperature with the single-lever mixer closed after 15,000 cycles

The maximum values in the adjustment range are determined.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	10.3	10.55	9
	77487-2	10.8		
Hansgrohe	77488-1	6.9	7.30	7
	77488-2	7.7		
Ideal Standard	77490-1	5.9	6.45	5
	77490-2	7.0		
Kludi	77491-1	6.6	5.25	3
	77491-2	3.9		
Jacob Delafon	77492-1	4.7	4.95	2
	77492-2	5.2		
Roca	77589-1	7.2	6.85	6
	77589-2	6.5		
Delta	77496-1	5.6	5.70	4
	77496-2	5.8		
Kohler	77497-1	11.0	8.85	8
	77497-2	6.7		
Grohe	77498-1	3.8	3.65	1
	77498-2	3.5		

#### 4.23 Actuating force for adjusting the temperature with the single-lever mixer closed after 30,000 cycles

The maximum values in the adjustment range are determined.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	11.4	13.45	9
	77487-2	15.5		
Hansgrohe	77488-1	8.0	8.70	6
	77488-2	9.4		
Ideal Standard	77490-1	7.8	7.35	4
	77490-2	6.9		
Kludi	77491-1	5.8	5.15	3
	77491-2	4.5		
Jacob Delafon	77492-1	4.8	5.00	2
	77492-2	5.2		
Roca	77589-1	7.7	7.35	4
	77589-2	7.0		
Delta	77496-1	13.0	12.70	8
	77496-2	12.4		
Kohler	77497-1	12.7	9.95	7
	77497-2	7.2		
Grohe	77498-1	3.9	4.20	1
	77498-2	4.5		

**4.24 Actuating force for adjusting the temperature with the single-lever mixer closed after 70,000 cycles (test end)**

The maximum values in the adjustment range are determined.

Manufacturer	Sample no.	Force N	Mean value N	Ranking
Hansa	77487-1	8.9	11.65	8
	77487-2	14.4		
Hansgrohe	77488-1	9.1	10.45	7
	77488-2	11.8		
Ideal Standard	77490-1	9.4	8.75	5
	77490-2	8.1		
Kludi	77491-1	6.1	5.20	2
	77491-2	4.3		
Jacob Delafon	77492-1	6.1	6.20	3
	77492-2	6.3		
Roca	77589-1	7.7	8.35	4
	77589-2	9.0		
Delta	77496-1	13.2	13.40	9
	77496-2	13.6		
Kohler	77497-1	11.7	9.70	6
	77497-2	7.7		
Grohe	77498-1	4.1	4.35	1
	77498-2	4.6		

#### 4.25 Dead play of the lever when controlling the temperature in new condition

The dead play describes the distance from the stop in the closed lever position to the point at which there is noticeable entraining of the closing mechanism.

The values are determined at the end of the lever.

Evaluation: The lowest dead play scores highest, the second lowest dead play scores second highest, etc.

Manufacturer	Sample no.	Play mm	Mean value mm	Ranking
Hansa	77487-1	0.0	0.0	1
	77487-2	0.0		
Hansgrohe	77488-1	0.0	0.0	1
	77488-2	0.0		
Ideal Standard	77490-1	0.0	0.0	1
	77490-2	0.0		
Kludi	77491-1	0.0	0.0	1
	77491-2	0.0		
Jacob Delafon	77492-1	0.0	0.0	1
	77492-2	0.0		
Roca	77589-1	0.9	0.85	9
	77589-2	0.8		
Delta	77496-1	0.0	0.0	1
	77496-2	0.0		
Kohler	77497-1	0.0	0.0	1
	77497-2	0.0		
Grohe	77498-1	0.0	0.0	1
	77498-2	0.0		

#### 4.26 Dead play of the lever when controlling the temperature after 15,000 cycles

The values are determined at the end of the lever.

Manufacturer	Sample no.	Play mm	Mean value mm	Ranking
Hansa	77487-1	2.0	1.20	8
	77487-2	0.4		
Hansgrohe	77488-1	0.0	0.0	1
	77488-2	0.0		
Ideal Standard	77490-1	0.0	0.0	1
	77490-2	0.0		
Kludi	77491-1	0.0	0.0	1
	77491-2	0.0		
Jacob Delafon	77492-1	0.0	0.0	1
	77492-2	0.0		
Roca	77589-1	1.6	1.55	9
	77589-2	1.5		
Delta	77496-1	0.0	0.0	1
	77496-2	0.0		
Kohler	77497-1	0.0	0.0	1
	77497-2	0.0		
Grohe	77498-1	0.0	0.0	1
	77498-2	0.0		

#### 4.27 Dead play of the lever when controlling the temperature after 30,000 cycles

The values are determined at the end of the lever.

Manufacturer	Sample no.	Play mm	Mean value mm	Ranking
Hansa	77487-1	1.6	0.85	8
	77487-2	0.1		
Hansgrohe	77488-1	0.0	0.0	1
	77488-2	0.0		
Ideal Standard	77490-1	0.0	0.0	1
	77490-2	0.0		
Kludi	77491-1	0.0	0.0	1
	77491-2	0.0		
Jacob Delafon	77492-1	0.0	0.0	1
	77492-2	0.0		
Roca	77589-1	1.4	1.25	9
	77589-2	1.1		
Delta	77496-1	0.0	0.0	1
	77496-2	0.0		
Kohler	77497-1	0.0	0.0	1
	77497-2	0.0		
Grohe	77498-1	0.0	0.0	1
	77498-2	0.0		



#### 4.28 Dead play of the lever when controlling the temperature after 70,000 cycles (test end)

The values are determined at the end of the lever.

Manufacturer	Sample no.	Play mm	Mean value mm	Ranking
Hansa	77487-1	2.2	1.30	8
	77487-2	0.4		
Hansgrohe	77488-1	0.0	0.0	1
	77488-2	0.0		
Ideal Standard	77490-1	0.0	0.0	1
	77490-2	0.0		
Kludi	77491-1	0.0	0.25	7
	77491-2	0.5		
Jacob Delafon	77492-1	0.0	0.0	1
	77492-2	0.0		
Roca	77589-1	1.7	1.65	9
	77589-2	1.6		
Delta	77496-1	0.0	0.0	1
	77496-2	0.0		
Kohler	77497-1	0.0	0.0	1
	77497-2	0.0		
Grohe	77498-1	0.0	0.0	1
	77498-2	0.0		

#### 4.29 Dead play of the lever when controlling the flow in new condition

The values are determined at the end of the lever.

Manufacturer	Sample no.	Play mm	Mean value mm	Ranking
Hansa	77487-1	1.0	0.85	8
	77487-2	0.7		
Hansgrohe	77488-1	0.0	0.15	6
	77488-2	0.3		
Ideal Standard	77490-1	0.0	0.0	1
	77490-2	0.0		
Kludi	77491-1	0.0	0.0	1
	77491-2	0.0		
Jacob Delafon	77492-1	0.0	0.0	1
	77492-2	0.0		
Roca	77589-1	0.5	0.25	7
	77589-2	0.0		
Delta	77496-1	0.0	0.0	1
	77496-2	0.0		
Kohler	77497-1	0.7	0.90	9
	77497-2	1.1		
Grohe	77498-1	0.0	0.0	1
	77498-2	0.0		

#### 4.30 Dead play of the lever when controlling the flow after 15,000 cycles

The values are determined at the end of the lever.

Manufacturer	Sample no.	Play mm	Mean value mm	Ranking
Hansa	77487-1	2.4	1.80	9
	77487-2	1.2		
Hansgrohe	77488-1	0.3	0.50	6
	77488-2	0.7		
Ideal Standard	77490-1	0.0	0.0	1
	77490-2	0.0		
Kludi	77491-1	0.0	0.0	1
	77491-2	0.0		
Jacob Delafon	77492-1	0.0	0.0	1
	77492-2	0.0		
Roca	77589-1	0.6	0.50	6
	77589-2	0.4		
Delta	77496-1	0.0	0.0	1
	77496-2	0.0		
Kohler	77497-1	0.7	0.95	8
	77497-2	1.2		
Grohe	77498-1	0.0	0.0	1
	77498-2	0.0		

#### 4.31 Dead play of the lever when controlling the flow after 30,000 cycles

The values are determined at the end of the lever.

Manufacturer	Sample no.	Play mm	Mean value mm	Ranking
Hansa	77487-1	2.5	2.05	9
	77487-2	1.6		
Hansgrohe	77488-1	0.6	0.80	7
	77488-2	1.0		
Ideal Standard	77490-1	0.0	0.30	5
	77490-2	0.6		
Kludi	77491-1	0.0	0.20	4
	77491-2	0.4		
Jacob Delafon	77492-1	0.0	0.15	3
	77492-2	0.3		
Roca	77589-1	0.7	0.65	6
	77589-2	0.6		
Delta	77496-1	0.0	0.0	1
	77496-2	0.0		
Kohler	77497-1	0.7	0.90	8
	77497-2	1.1		
Grohe	77498-1	0.0	0.0	1
	77498-2	0.0		

#### 4.32 Dead play of the lever when controlling the flow after 70,000 cycles (test end)

The values are determined at the end of the lever.

Manufacturer	Sample no.	Play mm	Mean value mm	Ranking
Hansa	77487-1	2.4	2.10	9
	77487-2	1.8		
Hansgrohe	77488-1	0.9	1.00	7
	77488-2	1.1		
Ideal Standard	77490-1	0.5	0.60	5
	77490-2	0.7		
Kludi	77491-1	0.0	0.25	3
	77491-2	0.5		
Jacob Delafon	77492-1	0.4	0.45	4
	77492-2	0.5		
Roca	77589-1	0.7	0.70	6
	77589-2	0.7		
Delta	77496-1	0.0	0.0	1
	77496-2	0.0		
Kohler	77497-1	1.0	1.05	8
	77497-2	1.1		
Grohe	77498-1	0.0	0.0	1
	77498-2	0.0		

### 4.33 Lateral tipping of the lever in new condition

Values determined at the lever head, 25 mm to the side from the centre line of the lever.

Manufacturer	Sample no.	Play mm	Mean value mm	Ranking
Hansa	77487-1	0.0	0.0	1
	77487-2	0.0		
Hansgrohe	77488-1	0.0	0.0	1
	77488-2	0.0		
Ideal Standard	77490-1	0.0	0.0	1
	77490-2	0.0		
Kludi	77491-1	0.0	0.0	1
	77491-2	0.0		
Jacob Delafon	77492-1	0.0	0.0	1
	77492-2	0.0		
Roca	77589-1	0.0	0.0	1
	77589-2	0.0		
Delta	77496-1	0.0	0.0	1
	77496-2	0.0		
Kohler	77497-1	0.0	0.0	1
	77497-2	0.0		
Grohe	77498-1	0.0	0.0	1
	77498-2	0.0		

#### 4.34 Lateral tipping of the lever after 15,000 cycles

Values determined at the lever head, 25 mm to the side from the centre line of the lever.

Manufacturer	Sample no.	Play mm	Mean value mm	Ranking
Hansa	77487-1	0.8	0.60	9
	77487-2	0.4		
Hansgrohe	77488-1	0.0	0.0	1
	77488-2	0.0		
Ideal Standard	77490-1	0.0	0.0	1
	77490-2	0.0		
Kludi	77491-1	0.5	0.45	8
	77491-2	0.4		
Jacob Delafon	77492-1	0.0	0.0	1
	77492-2	0.0		
Roca	77589-1	0.4	0.35	7
	77589-2	0.3		
Delta	77496-1	0.0	0.0	1
	77496-2	0.0		
Kohler	77497-1	0.0	0.0	1
	77497-2	0.0		
Grohe	77498-1	0.0	0.0	1
	77498-2	0.0		

#### 4.35 Lateral tipping of the lever after 30,000 cycles

Values determined at the lever head, 25 mm to the side from the centre line of the lever.

Manufacturer	Sample no.	Play mm	Mean value mm	Ranking
Hansa	77487-1	0.6	0.55	9
	77487-2	0.5		
Hansgrohe	77488-1	0.0	0.0	1
	77488-2	0.0		
Ideal Standard	77490-1	0.0	0.0	1
	77490-2	0.0		
Kludi	77491-1	0.4	0.35	7
	77491-2	0.3		
Jacob Delafon	77492-1	0.0	0.0	1
	77492-2	0.0		
Roca	77589-1	0.4	0.35	7
	77589-2	0.3		
Delta	77496-1	0.0	0.0	1
	77496-2	0.0		
Kohler	77497-1	0.0	0.0	1
	77497-2	0.0		
Grohe	77498-1	0.0	0.0	1
	77498-2	0.0		



#### 4.36 Lateral tipping of the lever after 70,000 cycles (test end)

Values determined at the lever head, 25 mm to the side from the centre line of the lever.

Manufacturer	Sample no.	Play mm	Mean value mm	Ranking
Hansa	77487-1	0.6	0.60	9
	77487-2	0.6		
Hansgrohe	77488-1	0.0	0.05	5
	77488-2	0.1		
Ideal Standard	77490-1	0.0	0.0	1
	77490-2	0.0		
Kludi	77491-1	0.3	0.35	7
	77491-2	0.4		
Jacob Delafon	77492-1	0.0	0.0	1
	77492-2	0.0		
Roca	77589-1	0.4	0.40	8
	77589-2	0.4		
Delta	77496-1	0.0	0.0	1
	77496-2	0.0		
Kohler	77497-1	0.0	0.05	5
	77497-2	0.1		
Grohe	77498-1	0.0	0.0	1
	77498-2	0.0		



#### 4.37 Watertightness in new condition

The watertightness test is performed based on DIN EN 817, Section 7.

This is followed by an evaluation of whether or not the SLM exhibits any leaks. In the event of an SLM exhibiting a leak, the degree of leaking is ignored, i.e. there is no differentiation of whether the SLM is leaking just a little or a lot.

Manufacturer	Sample no.	Watertightness	Ranking
Hansa	77487-1	0	1
	77487-2	0	
Hansgrohe	77488-1	0	1
	77488-2	0	
Ideal Standard	77490-1	0	1
	77490-2	0	
Kludi	77491-1	0	1
	77491-2	0	
Jacob Delafon	77492-1	0	1
	77492-2	0	
Roca	77589-1	0	1
	77589-2	0	
Delta	77496-1	0	1
	77496-2	0	
Kohler	77497-1	0	1
	77497-2	0	
Grohe	77498-1	0	1
	77498-2	0	

0 = No leaks found

1 = Leaks found



#### 4.38 Watertightness after 15,000 cycles

Manufacturer	Sample no.	Watertightness	Ranking
Hansa	77487-1	0	1
	77487-2	0	
Hansgrohe	77488-1	0	1
	77488-2	0	
Ideal Standard	77490-1	0	1
	77490-2	0	
Kludi	77491-1	0	1
	77491-2	0	
Jacob Delafon	77492-1	0	1
	77492-2	0	
Roca	77589-1	0	1
	77589-2	0	
Delta	77496-1	0	1
	77496-2	0	
Kohler	77497-1	0	1
	77497-2	0	
Grohe	77498-1	0	1
	77498-2	0	

0 = No leaks found

1 = Leaks found



#### 4.39 Watertightness after 30,000 cycles

Manufacturer	Sample no.	Watertightness	Ranking
Hansa	77487-1	0	1
	77487-2	0	
Hansgrohe	77488-1	0	1
	77488-2	0	
Ideal Standard	77490-1	0	1
	77490-2	0	
Kludi	77491-1	0	1
	77491-2	0	
Jacob Delafon	77492-1	0	1
	77492-2	0	
Roca	77589-1	0	1
	77589-2	0	
Delta	77496-1	0	1
	77496-2	0	
Kohler	77497-1	0	1
	77497-2	0	
Grohe	77498-1	0	1
	77498-2	0	

0 = No leaks found

1 = Leaks found

#### 4.40 Watertightness at the end of the test

Manufacturer	Sample no.	Watertightness	Ranking
Hansa	77487-1	0	1
	77487-2	0	
Hansgrohe	77488-1	0	1
	77488-2	0	
Ideal Standard	77490-1	0	1
	77490-2	0	
Kludi	77491-1	0	1
	77491-2	0	
Jacob Delafon	77492-1	0	1
	77492-2	0	
Roca	77589-1	1	8
	77589-2	1	
Delta	77496-1	1	8
	77496-2	1	
Kohler	77497-1	0	1
	77497-2	0	
Grohe	77498-1	0	1
	77498-2	0	

0 = No leaks found

1 = Leaks found

#### 5 Determination of the overall result

The following tables summarise the placings achieved for the new condition, for the intermediate tests after 15,000 and 30,000 cycles and for the end of the test. A ranking code is calculated from the individual placings. This code is evaluated and this evaluation gives the final overall result.



Product Service

## 5.1 Result for new condition

The specified values indicate the respective score in the corresponding test section.

Manufacturer	Hyste- resis	Sensitiv- ity	Friction release force for opening	Actuating force for opening	Actuating force for closing	Tempera- ture ad- justment, mixer open	Tempera- ture ad- justment, mixer closed	Dead play and tem- perature control	Dead play and flow control	Lateral tipping	Water- tight- ness	Mean value	Rank- ing
	Section 4.1	Section 4.3	Section 4.5	Section 4.9	Section 4.13	Section 4.17	Section 4.21	Section 4.25	Section 4.29	Section 4.33	Section 4.37		
Hansa	9	9	3	7	8	9	9	1	8	1	1	5.91	<b>8</b>
Hansgrohe	5	4	7	4	7	3	6	1	6	1	1	4.09	<b>5</b>
Ideal Standard	7	8	5	5	5	6	5	1	1	1	1	4.09	<b>5</b>
Kludi	6	3	9	9	9	8	7	1	1	1	1	5.00	<b>7</b>
Jacob Delafon	3	2	6	6	2	2	3	1	1	1	1	2.55	<b>3</b>
Roca	8	7	8	8	6	7	8	9	7	1	1	6.36	<b>9</b>
Delta	1	5	2	2	1	1	1	1	1	1	1	1.55	<b>1</b>
Kohler	4	6	4	3	4	5	4	1	9	1	1	3.82	<b>4</b>
Grohe	2	1	1	1	3	4	2	1	1	1	1	1.64	<b>2</b>

File name:  
Report number: 71323978  
Revision: 1  
Page 46 of 53

Created by: Kristen, Horst

Created on: 11.12.2007



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## 5.2 Result after 15,000 cycles

The specified values indicate the respective ranking in the corresponding test section.

Manufacturer	Friction release force for opening	Actuating force for opening	Actuating force for closing	Temperature adjustment, mixer open	Temperature adjustment, mixer closed	Dead play and temperature control	Dead play and flow control	Lateral tipping	Water-tightness	Mean value	Ranking
	Section 4.6	Section 4.10	Section 4.14	Section 4.18	Section 4.22	Section 4.26	Section 4.30	Section 4.34	Section 4.38		
Hansa	6	5	4	9	9	8	9	9	1	6.67	<b>9</b>
Hansgrohe	8	1	5	3	7	1	6	1	1	3.67	<b>4</b>
Ideal Standard	5	4	1	6	5	1	1	1	1	2.78	<b>3</b>
Kludi	2	8	9	4	3	1	1	8	1	4.11	<b>6</b>
Jacob Delafon	8	3	3	2	2	1	1	1	1	2.44	<b>2</b>
Roca	6	5	2	5	6	9	6	7	1	5.22	<b>8</b>
Delta	2	9	8	8	4	1	1	1	1	3.89	<b>5</b>
Kohler	4	7	7	7	8	1	8	1	1	4.89	<b>7</b>
Grohe	1	2	5	1	1	1	1	1	1	1.56	<b>1</b>



### 5.3 Result after 30,000 cycles

The specified values indicate the respective ranking in the corresponding test section.

Manufacturer	Friction release force for opening	Actuating force for opening	Actuating force for closing	Temperature adjustment, mixer open	Temperature adjustment, mixer closed	Dead play and temperature control	Dead play and flow control	Lateral tipping	Water-tightness	Mean value	Ranking
	Section 4.7	Section 4.11	Section 4.15	Section 4.19	Section 4.23	Section 4.27	Section 4.31	Section 4.35	Section 4.39		
Hansa	5	4	1	9	9	8	9	9	1	6.22	<b>9</b>
Hansgrohe	4	2	5	4	6	1	7	1	1	3.44	<b>3</b>
Ideal Standard	6	7	3	6	4	1	5	1	1	3.78	<b>4</b>
Kludi	3	8	8	3	3	1	4	7	1	4.22	<b>5</b>
Jacob Delafon	7	3	1	2	2	1	3	1	1	2.33	<b>2</b>
Roca	8	5	6	5	4	9	6	7	1	5.67	<b>8</b>
Delta	9	9	9	8	8	1	1	1	1	5.22	<b>7</b>
Kohler	2	6	7	7	7	1	8	1	1	4.44	<b>6</b>
Grohe	1	1	4	1	1	1	1	1	1	1.33	<b>1</b>





#### 5.4 Result after 70,000 cycles (test end)

The specified values indicate the respective ranking in the corresponding test section.

Manufacturer	Hysteresis	Sensitivity	Friction release force for opening	Actuating force for opening	Actuating force for closing	Temperature adjustment, mixer open	Temperature adjustment, mixer closed	Dead play and temperature control	Dead play and flow control	Lateral tipping	Water-tightness	Mean value	Ranking
	Section 4.2	Section 4.4	Section 4.8	Section 4.12	Section 4.16	Section 4.20	Section 4.24	Section 4.28	Section 4.32	Section 4.36	Section 4.40		
Hansa	9	9	3	3	2	9	8	8	9	9	1	6.36	<b>8</b>
Hansgrohe	1	3	5	2	6	4	7	1	7	5	1	3.82	<b>3</b>
Ideal Standard	5	8	6	6	3	5	5	1	5	1	1	4.18	<b>4</b>
Kludi	3	2	3	8	8	3	2	7	3	7	1	4.27	<b>5</b>
Jacob Delafon	4	4	7	5	1	2	3	1	4	1	1	3.00	<b>2</b>
Roca	8	6	8	7	7	7	4	9	6	8	8	7.09	<b>9</b>
Delta	6	5	9	9	9	8	9	1	1	1	8	6.00	<b>7</b>
Kohler	7	7	2	4	3	6	6	1	8	5	1	4.55	<b>6</b>
Grohe	2	1	1	1	5	1	1	1	1	1	1	1.45	<b>1</b>



## 6 Overall result

The following table indicates the respective ranking from the individual evaluations. A code (mean value) is calculated from all of the ranking values for each manufacturer. This code is the basis for the final result or final placing.

Manufacturer	Result in new condition Section 5.1	Result after 15,000 cycles Section 5.2	Result after 30,000 cycles Section 5.3	Result after 70,000 cycles Section 5.4	Mean value	Final placing
Hansa	8	9	9	8	8.50	<b>8</b>
Hansgrohe	5	4	3	3	3.75	<b>3</b>
Ideal Standard	5	3	4	4	4.00	<b>4</b>
Kludi	7	6	5	5	5.75	<b>6</b>
Jacob Delafon	3	2	2	2	2.25	<b>2</b>
Roca	9	8	8	9	8.50	<b>8</b>
Delta	1	5	7	7	5.00	<b>5</b>
Kohler	4	7	6	6	5.75	<b>6</b>
Grohe	2	1	1	1	1.25	<b>1</b>



Product Service

## 7 Documentation

- Logs from the automatic measurement recording devices
- Test logs by the testers or test persons
- Monitoring logs for the automatic test stands
- Monitoring logs for the water supply

## 8 Summary

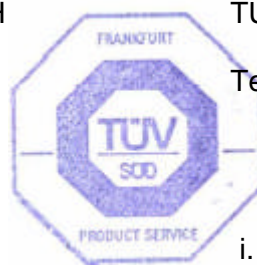
The following ranking is produced following completion of the comparison test and evaluation of the individual results obtained:

Placing	Company	Fitting name
1.	Grohe	Eurodisc
2.	Jacob Delafon	Clip
3.	Hansgrohe	Metris S
4.	Ideal Standard	Ceramix 2000
5.	Delta	Brizo Riviera
6.	Kludi	Kludi Mix
6.	Kohler	Fairfax
8.	Hansa	Hansamix
8.	Roca	Victoria R44 P

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File name:  
Report number: 71323978  
Revision: 1  
Page 51 of 53

Created by: Kristen, Horst  
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Product Service

## Appendix

### Glossary

In this section you will find explanations for the terms used in this report.

#### **Hysteresis (accuracy):**

The hysteresis describes the reproducibility of the temperature setting in a specific lever position. The temperature in the chosen lever position can depend on whether this lever position is approached by swivelling from "cold to hot" or from "hot to cold". The hysteresis is defined as the difference between these two temperatures. An evaluation is performed on the basis of the difference in temperature between the two measurement curves determined at the measuring point 38° C. The smaller the difference in temperature, the better the hysteresis.

#### **Sensitivity:**

The term sensitivity describes how sensitively a single-lever mixer can adjust temperature. The sensitivity is the distance that the end of the lever needs to be moved to effect a specific change in temperature. The greater the distance, the more sensitively the temperature can be adjusted. According to DIN EN 817, the distance at the end of the lever needed to effect a change in temperature from 34° C to 42° C should be at least 12 mm for wash basin fittings.

#### **Friction release force:**

Describes the force required to actuate the fitting for the first time following a period of inactivity.

#### **Actuating force:**

Is the force required to move the operating lever in the desired direction. The maximum value in the corresponding adjustment range was measured. In the case of single-lever mixers with an "eco detent", the force required to override this setting was not evaluated.



Product Service

### **Dead play and flow control:**

Dead play is a measured variable. It describes the distance from the stop in the closed lever position to the point at which there is noticeable entraining of the closing mechanism.

### **Dead play and temperature control:**

This measured variable describes the distance by which the lever end in middle position can be moved in the direction of cold water/hot water without resulting in a temperature change.

File name:  
Report number: 71323978  
Revision: 1  
Page 53 of 53

Created by: Kristen, Horst  
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