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Tone Kristin Bergh and Kari Vereide

Comparative test of seven electrically operated food preparation appliances

SIFO

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NATIONAL INSTITUTE FOR CONSUMER RESEARCH
Sandakerveien 24 C, Building B
P.O. Box 4682 Nydalen
N-0405 Oslo
www.sifo.no

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Title: Comparative test of seven electrically operated food preparation appliances

SUMMARY:


Seven electrically operated food preparation appliances have undergone a comparative test where their ability to whisk, whip, beat and knead were examined. In addition the usability and their instructions for use were evaluated. With all the machines it is possible to make satisfactory sponge-cakes, cut-cakes, whipped cream and bread. Differences in the performance tests are mainly marginal. The capacity varies. Kenwood Major, Assistent and Bosch MUM 86 are a good choice if you need help for making more than one loaf of bread. Kenwood Major shows better performance for whisking and whipping than Assistent and Bosch MUM 86. These machines perform better with six eggs than three eggs. Assistent gives low volume of whipped cream. It seemed quite laborious for KitchenAid to knead: Kneading one kg bread mix was most time-consuming: 6 ½ minutes compared to all the others which varied between 2 and 4 minutes. Regarding usability, the machines differ. Overall Kenwood kMix, Kenwood Major, Assistent and Krups are easy to handle. The swivel arm on Bosch MUM 86 is a bit hard to operate. The mounting whisk, beater and kneading equipment on KitchenAid can cause difficulties and the regulation for speed control is a bit severe to handle. The instructions for use differ in size and paper quality. All the instructions contain the required information. In general, the letters are small and they contains information in many languages which is not necessary for the consumers.

CLIENT: Kenwood Limited
New Lane
Havant
Hampshire P09 2NH
Telephone: +47 907 21 000
Fax: + 47 233 84 340
E-mail: martin@vinje.com + Marco.Marcuzzo@Kenwood.co.uk

Client's reference: Martin Vinje

Carried out by: Tone Kristin Bergh and Kari Vereide

Approved: Oslo 26.03.2012


Ingun Gfimstad Klepp
Head of research


Tone Kristin Bergh
Senior Executive Officer

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1. Introduction

On behalf of Martin Vinje Company and Kenwood Limited National Institute for Consumer Research, SIFO, has performed a comparative test of the following electrically operated food preparation appliances:

Test numbers: 11/122 – 01 Kenwood kMix KMX 51
 11/122 – 02 Kitchen Aid 5KSM150PSEPM
 11/122 – 03 Kenwood Major Titanum KMO20
 11/122 – 04 BOSCH MUM 86 Professional
 11/122 – 05 Assistant ORIGINAL AKM 6220 B
 11/122 – 06 Krups Kitchenmaschine KA99OT
 11/122 – 07 BOSCH Universal plus MUM 6 N22/03

The test objects were selected in cooperation with the client and purchased by SIFO during the period of 24.november until 16.December 2011.

Test conditions in the laboratory during the test period from 13. December 2011 until 13. January 2012 were steady:

Temperature: $(23 \pm 2) ^\circ\text{C}$

Humidity: $(55 \pm 5) \% \text{RH}$

2. Test program

The test program consists of:

1. Performance tests
2. Ergonomic evaluation/usability
3. Evaluation of the instructions of use

The performance tests are based on International standard IEC 60 619: 1993 + amendment 1: 1995 and amendment 2: 2004: “Electrically operated food preparation appliances – measuring methods” together with an old Nordic method used in previous test performed in SIFOs laboratory.

Evaluation of handling/usability is based on TemaNord 1994:663 Ergonomic properties of household appliances.

The instructions of use are evaluated according to essential clauses in ISO guide 37: “Instruction of use of products of consumer interest”.

2.1 Performance tests

The following properties will be evaluated:

1. Whisking
2. Whipping
3. Beating
4. Kneading
5. Blending/pureeing

2.1.1 Whisking

Fresh eggs with ambient temperature (20 ± 5) °C are used. 3 eggs + 90 grams sugar and 6 eggs + 180 grams sugar are whisked until three letters retains at least 5 seconds. The time and volume are measured and reported. The tests are repeated and the mean value of the two measurements are reported. The eggnog is mixed with 30 grams of plain flour per egg and sponge cakes are baked in the middle of a preheated oven set to 175 and baking time 30 minutes. After cooling down, the sponge cakes are cut vertically in the middle. The height of the cake is measured and result reported.

2.1.2 Whipping

500 ml cream with no additives made from pasteurised milk with a fat content of 38 % is used. The temperature of the cream shall be (9 ± 1) °C. The whipping starts immediately after pouring the cream into the bowl. The test stops when an impression made with a knife is retained for at least 5 seconds. The time and volume measured with special glass container are reported. The test is repeated and the mean value of the two measurements is reported.

2.1.3. Beating

All the ingredients are at room temperature. 3 eggs, 150 g margarine, cut in to approximately 2 x 2 cm cubes, 150 g sugar, 150 g flour and 3 g baking powder are placed in the bowl. Beat until satisfactorily mixed. Record the time. The batter is put into a greased 1 litre anodized baking tin. Place in a preheated oven set to 170. Baking time 30 – 45 minutes. When cooled down the cake is cut vertically in to halves. The height is measured and comments are made on the structure.

2.1.4 Kneading

Perform one test with 1 kg bread mix, type hole meal (Grovbakst) and one test with the maximum capacity recommended in the instruction for use. All the ingredients are stored overnight in the laboratory. 1 kg bread mix is mixed with 6 dl water, 2 tablespoons with fluid margarine, 2 teaspoons with sugar, 2 teaspoons with salt and 1sachet dried yeast, 12 grams. When baking greater quantity increase the other ingredients proportional except yeast. One sachet, 12 g, yeast was used in all the kneading tests. The water is heated to (40 ± 2) °C. Follow the instruction for use. For all the machines except Kitchen Aid the water was put in the mixing bowl first. In kitchen aid all the dry ingredients were put into the mixing bowl before adding the water. Knead until a pliable mass loose from the walls and kneading utensils. Record the time. After kneading cover with a linen towel and let the dough rest for 45 minutes in the laboratory atmosphere. Perform a short kneading before empty the

bowl, ½ - 1 minute. How is it to get the dough out of the bowl? Weight 900 g and form to one bread. The breads are put into greased 1 ½ litres anodized baking tins. Cover with a linen towel and let raise for another 30 minutes before painting with water and stipple before baking in the middle of an oven which is preheated with thermostat set to 200. Baking time 45 minutes. At least half an hour after baking, weigh the bread before cutting in to halves. Report how it looks, the crust, the pores and scrapping.

2.1.5. Blending/pureeing

60 gram carrot, 60 gram potato and 20 gram onion are cut in cubes of about 10 gram. Pour 100 g water in a saucepan, bring to boil, add the vegetables and simmer for 10 minutes. Immediately after boiling place the mixture into the blender and operate until there is satisfactory result. Record the time, how easy it is to empty the blender, and describe the consistency.

2.2 Ergonomic evaluation/usability

A kitchen machine is an aid for simplifying work in the kitchen. In other words, it will save you time and effort.

The evaluation of usability is based on the following questions:

1. How does the appliance sit on the table/how stable is the appliance?
2. How long is the cord and does the appliance have a compartment for storing the cord?
3. What is it like to put the bowl on the appliance and what about handling when emptying the bowl?
4. How is it to mount the whisk, beater and kneading equipment?
5. How is it to install the splash guard and how well does it function?
6. How is it to lift and lower the mixer head/swivel arm?
7. What kind of control are on the appliance and how well do they manage? Are they legible? What about the contrast between the knobs and the base of the machine and the size of the letters on the control panel?
8. How is it to clean the used equipment pieces?

2.3 Evaluation of the instructions for use

The evaluation is based on the following questions:

1. Do the instructions clearly identify the product?
2. Do the instructions contain all the information required for correct and safe use?
3. Do the instructions cover information on function and operation, cleaning, maintenance, fault diagnosis and repair and information on destruction/disposal of the product?
4. If the instructions comprise more than one page, are the pages numbered?
5. Does leaflet etc. beyond four pages have a table of content?

6. Are the instructions given in the official language of the country of sale?
7. If the instructions are comprised of more than one language are they distinguished from each other?
8. Are text and illustrations used together and are they supporting each other?
9. Are fold out tables/flow-charts placed in a way that they can be seen adjacent to different pages?
10. Are type and size of on-product information, of printed material and of computerized information as clear and as large as practicable to ensure legibility?
11. Are the sentences short and meaningful?
12. Are the illustrations/symbols on the test objects are explained in the instructions?

During the test period we made photos. A selection showing whisking and whipping test, beating test, kneading test plus evaluating instructions for use and ergonomic skills occur in an appendix to this report.

3. Product description and test results

3.1 KENWOOD kMix kmx51

Test object number	01
Producer/Land	Kenwood/China
Purchase price/Shop	NOK 2 995.00 /Lefdal Elektromarked, Storo



3.1.1 Product description

Standard equipment	Bowl made of steel with handle, Whisk, K-beater, Dough hook, Splashguard and Spatula
Optional attachment	Another bowl, Pasta fresca, Multi food grinder, Roto cutter, Roto cutter & Fruit press, Pasta roller, Tagliatelle pasta cutter, Tagliolini pasta cutter, Trenette pasta cutter and Spaghetti pasta cutter
Measurements (height x width x depth) including bowl	355 mm x 335 mm x 190 mm
Weight without bowl	7 500 grams
Weight bowl	835 grams
Bowl capacity	5 litre
Length of cord	1300 mm
Compartment for cord	No
Rated power	500 W
Following information	Instruction of use + 6 cards A 5 size with recipes + a card with information and pictures of optional attachments and a separate sheet with the following information in twenty languages: "Do not wash the whisk in the dishwasher."

3.1.2 Results performance tests

Whisking and whipping		Test no. 1	Test no. 2	Mean value
3 egg + 90 gram sugar	Whisking time: Volume in ml:	3 min. 40 sec. 1200	3 min. 25 sec. 1210	3 min. 33 sec. 1205
6 egg + 180 gram sugar	Whisking time: Volume in ml:	5 min 0 sec. 2580	4 min. 34 sec. 2490	4 min. 47 sec. 2535
500 ml cream	Whipping time: Volume in ml:	1 min. 34 sec. 1170	1 min. 30 sec. 1250 ml	1 min. 32 sec. 1210
Comments: Started at minimum and gradually increased to maximum speed. The high of the sponge cake made from 3 eggs: Test no. 1: 34 mm and test no. 2: 33 mm.				

Beating	Test no. 1	Test no. 2	Mean value
Beating time	1 min. 30 sec.	1 min. 30 sec.	1 min. 30 sec.
Height of cake	75 mm	75 mm	75 mm
Comments: Used the K-beater. Started at minimum and gradually increased to maximum speed. Stopped after 30 seconds and scratched from the walls with the spatula. After 1 minute some unsolved margarine and not satisfactory mixed in a circle in the centre of the mixing bowl. The colour of the batter in the bottom of the bowl slightly more yellow than rest of the smooth batter when evaluated as finished. Satisfactory result on the baked cake.			

Kneading	Test no. 1 1 kg bread mix	Test no. 2 Max capacity: 1,35 kg bread mix
Kneading time	4 min. 0 sec.	3 min. 45 sec.
Weight of baked bread	790 gram	788 gram
Height of baked bread	109 mm	88 mm
Comments: Started on minimum speed and increased to 1 after 30 seconds. According to the instruction of use, the water was poured into the bowl first. Using the maximum amount the dough reached the splash guard but no problems occurred. The dough dropped easily from the hook and bowl. The baked breads had even pores, even well baked crust close round and some scrapping mainly from the crispy crust.		

3.1.3 Ergonomic evaluation – practical use

The machine has five small rubber knobs on the bottom. It sits in place but is fairly easy to push around when it is sitting on a table.

1,3 meter cord. No system for storing the cord.

The bowl is easy to place in the correct position. There are stickers on the appliance that show whether the bowl is in locked or unlocked position. The bowl is easy to handle.

It is very easy to install and remove the equipment to be attached to the power outlet. They go easily into position and are secured by turning slightly to the right.

The splashguard has slots which makes it easy to fasten it to the mixing head on the appliances. It stays in place, but is also easy to take off. When the head of the appliance is lowered, the splashguard is sealed such that there is no opening. On the lid there is an opening with a hinged door for inserting ingredients when the splashguard is in place.

On the back of the appliance there is a well-positioned button, the head releaser lever. The lever is big enough to be pressed with a large finger. A simple push of the lever while lifting the mixer head make is easy to move the mixer head. Stickers applied to the mixer show that there is danger of crushing one's fingers when the mixer head is raised.

There is also only one operating switch which includes the on/off switch and the speed switch. This is appropriately located and has infinitely variable speed regulating options. It goes from min to max and has markings for 1,2,3,4,5, and 6 as well as markings for half positions. It also has a folding position to the right of the 0/off position. You can hear a click when it is in the zero position. In other words, the machine has both tactile and visual markings for the off position. The cylinder switch for the regulation of the speed has a good grip—it is 16 mm high with a diameter of 43 mm and is attached to the appliance. Dark grey numbers, dots and letters on the silver grey bottom with red in the folding position. It could have been more clear, but it functions well. It can be seen that the markings are affected by wear and tear (wearing off.)

According to the instruction booklet, all the removable parts can be used in the washing machine. There are screws which can attach to things located on the bottom of the machine, where the bowl is attached.

There is an indicator light over the speed switch which indicates whether the machine is on when it is plugged into the outlet.

The appliance will not operate with the mixer head in upright position.

3.1.4 Instruction for use

A leaflet/ book in A 5 size (146 mm X 208 mm), 122 pages, 18 languages. A table of contents on page two – information about which languages on which pages. Norwegian on page 62 – 67.

Clear identification on the front page: Name of the mixer and drawing of the mixer. Common for all the mixers in KMX50 series and KMX80 series.

The size of continuous text is 2 mm. Small letters, short and meaningful sentences and good contrast, black print on white paper.. Many and informative illustrations. The text and illustrations complement each other. Symbols on the machine are explained in the instruction for use: e.g. right fitting of the bowl onto the base. Also good explanation of how to fit and use the splashguard.

Satisfactory information for correct and safe use.

The instructions cover information on basic functions, maintenance, cleaning, troubleshooting and information for correct disposal of the product at the end of its useful life.

3.2 KitchenAid 5KSM150PSEPM

Test object number	02
Ser.	W 11295796
Producer/Land	The mixer: USA, the bowl: Korea
Purchase price/Shop	NOK 5 999.00 Bargain: NOK 4 999.00/ KITCH'N STORO



3.2.1 Product description

Standard equipment	Bowl made of steel with handle, Whisk, Flat-beater, Dough hook and pouring shield
Optional attachment	Multi food grinder, Roto cutter, Fruit press, Citrus press, two different Pasta cutters, Sausage maker, Grain mill, Tin opener, extra bowl either with handle or without, Cover and Cook book.
Measurements (height x width x depth) including bowl	350 mm x 330 mm x 200 mm
Weight without bowl	9 480 grams
Weight bowl	785 grams
Bowl capacity	4,7 litre (according to the instruction for use: 4,83 litre)
Length of cord	1360 mm
Compartment for cord	No
Rated power	300 W
Following information	Instruction of use + leaflet with information and pictures of optional attachments and other products from KitchenAid.

3.2.2 Results performance tests

Whisking and whipping		Test no. 1	Test no. 2	Mean value
3 egg + 90 gram sugar	Whisking time: Volume in ml:	3 min. 58 sec. 1110	3 min. 26 sec. 1070	3 min. 42 sec. 1090
6 egg + 180 gram sugar	Whisking time: Volume in ml:	4 min 40 sec. 2320	4 min. 07 sec. 2290	4 min. 24 sec. 2305
500 ml cream	Whipping time: Volume in ml:	1 min. 35 sec. 1150	1 min. 35 sec. 1135 ml	1 min. 35 sec. 1143
<p>Comments: Started at minimum and gradually increased to maximum speed (10) with eggnog and used 8 when whipping cream . The high of the sponge cake made from 3 eggs: Test no. 1: 33 mm and test no. 2: 35 mm.</p>				

Beating	Test no. 1	Test no. 2	Mean value
Beating time	1 min. 30 sec.	1 min. 0 sec.	1 min.15 sec.
Height of cake	70 mm	70 mm	70 mm
<p>Comments: Used the Flat beater. Started at minimum and gradually increased to 4. Stopped after 1 minute and scratched from the walls with the spatula. Stopped after 1 minute in test no.2 even though the batter in the bottom of the bowl was not mixed as well as the rest of the batter. Satisfactory result on the baked cake.</p>			

Kneading	Test no. 1 1 kg bread mix	Test no. 2 Max capacity: 1 kg bread mix
Kneading time	6 min. 30 sec.	-
Weight of baked bread	802 gram	-
Height of baked bread	106 mm	-
Comments: Placed the dry ingredients first, except 250 g of the bread mix. Used speed 2. Added the rest of the bread mix gradually. Stopped when the dough was smooth and elastic and the dough dropped easily from the hook and bowl. The baked breads had even pores, even well baked crust close round and some scrapping mainly from the crispy crust.		

3.2.3 Ergonomic evaluation – practical use

This appliance has five mounting feet and stands steady on the table. It can be moved around the table, but since the machine is heavy this is not so easy to do. When the motor head is raised it seems top-heavy.

1,36 meter long power cord. No system for storing the cord.

The bowl is easy to set in and out of place. The bowl has a nice ergonomically-designed handle.

It is slightly tricky to install the wire whip/whisk and other attachments. There is a spring loading device which requires a little extra pushing force. In order to correctly attach the attachment, one must push, press and twist to lock into position. There are slots in the attachments that connect to pins on the beater head. It can also be slightly tricky to detach.

The splash guard is easy to mount on and off. It stays fairly well in position and does not cover the whole bowl. When it is placed the way it is directed in the instruction for use, it is possible that it cream could splash up onto the bottom of the motor head.

The appliance has two operating levers, one for raising and lowering the motor head and one for controlling the speed. These are placed on either side of the motor head. The handles on the levers are quite small. They have a gripping area of about 10 mm. They are fairly difficult to operate. There is resistance in the speed control lever which requires a fair amount of power to operate. It is best to hold the mixer with one hand while moving the speed control lever with the other. Because of the resistance it takes a little time to increase the speed and turn off the mixer. The levers are clear and black against a light grey/silver coloured machine. The numbers are very legible.

According to the instructions the bowl, the white flat beater, and the dough hook can be washed in the washing machine while the wire whip must be washed by hand

The appliance can still operate even when the mixer head is in upright position.

3.2.4 Instruction for use

A leaflet/ book in 136 mm X 213 mm. 16 pages x 13 languages. A table of contents on page two – for each languages. Clear identification which language on which pages

Clear identification on the front page: Name of the mixer and picture of two mixers: Covers Model 5K45SS, Model 5KSM150PS and 5KSM156PS.

The size of continuous text fulfil ISO guide 37. Good contrast, small letters, short and meaningful sentences. Many and informative illustrations. The text and illustrations complement each other.

Satisfactory information for correct and safe use. Lots of warning marks. Almost excessive: “DANGER – You can be killed or seriously injured if you don’t immediately follow instructions”.

The instructions cover information on basic functions, maintenance, cleaning, troubleshooting and information for correct disposal of the product at the end of its useful life.

3.3 Kenwood Major Titanium KMO20

Test object number	03
Serial no.	0356225
Producer/Land	Kenwood/China
Purchase price/Shop	NOK 5 999.00 / Jernia Storo



3.3.1 Product description

Standard equipment	Bowl made of steel with two handles, Whisk, K-beater, Flexible beater, Dough hook, Splashguard, Blender glass and Spatula
Optional attachment	Flat pasta maker with attachments for tagliatelle, tagliolini, trenette, spaghetti, Pasta maker with maccheroni rigati die(12 optional dies+ biscuit maker), Roto food cutter with five drums, Fruit press, Multi food grinder, Grain mill, Food processor, Pro slicer/grater includes 7 cutting plates, Mini chopper/mill, Continuous juicer, Ice-cream maker, Potato peeler, Colander and sieve, another stainless steel bowl, Cover
Measurements (height x width x depth) including bowl	350 mm x 380 mm x 210 mm
Weight without bowl	8 130 grams
Weight bowl	970 grams
Bowl capacity	6,7 litre
Length of cord	890 mm
Compartment for cord	Yes
Rated power	1 500 W
Following information	Instruction of use Chef and Major KMO10 – KMO20 series. A 4 format with drawings of the two machines on the front page.+ a leaflet with instruction for the blender + an A 5 sheet with figures how to handle the blender + a A 5 brochure with colour pictures of optional attachment + a A 5 brochure including cards for ordering a recipe book + one CD with recipes + and other CD with information.

3.3.2 Results performance tests

Whisking and whipping		Test no. 1	Test no. 2	Mean value
3 egg + 90 gram sugar	Whisking time: Volume in ml:	3 min. 30 sec. 1150	3 min. 05 sec. 1125	3 min. 18 sec. 1138
6 egg + 180 gram sugar	Whisking time: Volume in ml:	3 min 15 sec. 2285	2 min. 50 sec. 2340	3 min.03 sec. 2313
500 ml cream	Whipping time: Volume in ml:	1 min. 25 sec. 1180	1 min. 14 sec. 1240 ml	1 min. 20 sec. 1210
<p>Comments: Started at minimum and gradually increased to maximum speed. The high of the sponge cake made from 3 eggs: Test no. 1: 28 mm and test no. 2: 31 mm. Forgot to turn the cake tin upside down immediately after removing the cake from the oven in test no.1 This may influence on the height.</p>				

Beating K - beater	Test no. 1	Test no. 2	Mean value
Beating time	1 min. 30 sec.	1 min. 45 sec.	1 min. 38 sec.
Height of cake	77 mm	82 mm	79,5 mm
Comments: Started at minimum and gradually increased to maximum speed. Stopped after 1 minute and scratched from the walls with the spatula. The batter reached more than 50 mm up along the side of the bowl. After 1 minute some unsolved margarine and the colour of the batter in the bottom of the bowl slightly more yellow than rest of the smooth batter. Satisfactory result on the baked cake.			

Beating Flexible beater	Test no. 1	Test no. 2	Mean value
Beating time	1 min. 30 sec.	1 min. 30 sec.	1 min. 30 sec.
Height of cake	80 mm	74 mm	77 mm
Comments: Started at minimum and gradually increased to maximum speed. Stopped after 1 minute. No need to scratch batter from the walls. Some small bits unsolved margarine and slightly more yellow in the bottom of the bowl than in the rest of the smooth batter. Satisfactory result on the baked cake. The cake from test no. 2 didn't rise as much in the middle as the other cakes.			

Kneading	Test no. 1 1 kg bread mix	Test no. 2 Max capacity: 2,6 kg bread mix
Kneading time	2 min.35 sec.	5 min. 30 sec.
Weight of baked bread	800 gram	810 gram
Height of baked bread	98 mm	97 mm
Comments: Started on minimum speed and increased gradually to 1. According to the instruction of use, the water was poured into the bowl first. Using the maximum amount the bowl was filled up. To place the total amount of bread mix we had to level – if not flour would get over the shield on the dough hook. After 4 minutes in test no. 2 the appliance was stopped due to heavy load for the appliance. After a short while the test continued and after another 1 ½ minute the dough get smooth and loosed easily from the dough hook and bowl. Because the high filling the dough was put in another bowl for rising before back in the bowl for re-kneading. The baked breads had even pores, even well baked crust close round and some scrapping mainly from the crispy crust.		

Blender	Time	How to empty	Consistency
Test no. 1	2 min. 30 sec.	Easy, the handle gives good grip. A bit heavy.	Very smooth
Test no. 2	1 min. 00 sec.		
Comments: Started at minimum and gradually increased to 4. Test no 1 first stopped after 1 minute 15 seconds. Smooth purée except one bit of carrot. Still after 2 minutes still one bit unsolved bit of carrot.			

3.3.3 Ergonomic evaluation – practical use

The appliance has five feet. They do not have a large suction effect, but the appliance is large and heavy and rests steadily on the table.

The power cord is 0,89 meters long. The disclaimer here is that one must use an outlet very near to the machine. The cord can be pushed into a storing compartment on the appliance.

The bowl is easy to place in the correct position. The bowl is large and has to handles on each side.

All the covers of the power outlets are easy to remove and put in the right place. It is easy to put together and take apart the whisk and other equipment in the power outlet. It requires little power and fits into place by twisting slightly to the right.

The splashguard has tracks which makes it easy to attach to the mixing head on the appliance. The splashguard stays attached to the mixer head when the mixing head is raised. It is also easy to remove. When the mixing head is lowered, the splashguard covers the whole bowl such that it forms a very tight lid. There is an opening on the lid with a hinged door opening where it is possible to insert ingredients while the machine is running.

The lever to lift the mixer head is on the right side of the bowl. It is well placed and easy to operate with a kind of tweezer grip. Provides plenty of room for your thumb, and the index finger can be used as a support on the other side. The level requires little power and is required both when raising and lowering the mixer head.

There is also only one control switch which includes the speed control and the on and off switch. It is shaped like a cylinder switch. The switch is good size such that it allows for a good grip. It is 15 mm high, and 65 mm diameter inside and 55 mm outside and there is around 2 mm clearance between the switch and the machine. A tickmark marks the zero position. There are both tactile and visual markings of the off position. The switch does not have set speed levels. It has a pulse setting on the left and goes continuously from min to max with 6 numbers in between. The contrast of the font color of the switch and the appliance itself is satisfactory; black and a little red on silver background.

According to the instruction booklet, all parts can be washed in a dishwasher except the slashguard

The appliance can still operate even when the mixer head is in upright position.

3.3.4 Instruction for use

A booklet in A 4 size (146 mm X 296 mm), 184 pages, 18 languages. A table of contents on page two and three – information about which languages on which pages. Norwegian on page 94 – 104.

Clear identification on the front page: Chef and Major KMO10 – KMO20 series.

The size of continuous text fulfil ISO guide 37. Good contrast, small letters, short and meaningful sentences. Many and informative illustrations. The text and illustrations complete each other. Symbols on the machine are explained in the instruction for use: e.g. how to operate the head lift lever.

Satisfactory information for correct and safe use.

The instruction covers information on basic functions, maintenance, cleaning, troubleshooting and information for correct disposal of the product at the end of its useful life.

3.4 BOSCH MUM 86 Proffesional

Test object number	04
E-nr./ Type nr.	MUM 86RI/ 06 FD: 9109/ CNUM70
Producer/Land	Kenwood/China
Purchase price/Shop	NOK 5 999.00 / Elkjøp Megastore Ullevål



3.4.1 Product description

Standard equipment	Bowl made of steel with gripping rim, Whisk, Stirrer, Kneading hook with dough deflector, Splashguard with separate lid, Tool drive cover, Blender in glass and Spatula
Optional attachment	Multi food grinder, Pasta maker, Food processor, Fruit press/ Citrus press and Roto cutter. On the package a list of 23 articles possible to order.
Measurements (height x width x depth) including bowl	330 mm x 300 mm x 320 mm
Weight without bowl	7 435 grams
Weight bowl	970 grams
Bowl capacity	5,3 litre
Length of cord	1060 mm
Compartment for cord	Yes – automatic cable rewind
Rated power	1 600 W
Following information	Instruction of use MUM... BOSCH. A 5 format with 5 pages to fold out. Drawings of a machines on the front page. Separate instruction for the blender in the same size. In addition a A 3 sheet with illustrative drawings how to use the machine and a table with recommended speed when using different equipment.

3.4.2 Results performance tests

Whisking and whipping		Test no. 1	Test no. 2	Mean value
3 egg + 90 gram sugar	Whisking time: Volume in ml:	8 min. 00 sec. 1140	10 min. 30 sec. 1015	9 min. 15 sec. 1078
6 egg + 180 gram sugar	Whisking time: Volume in ml:	6 min 00 sec. 2120	6 min. 55 sec. 2155	6 min.28 sec. 2138
500 ml cream	Whipping time: Volume in ml:	3 min. 55 sec. 1180	3 min. 03 sec. 1250	3 min. 29 sec. 1215
Comments: Started at minimum and gradually increased to maximum speed, 4. The high of the sponge cake made from 3 eggs: Test no. 1: 30 mm and test no. 2: 33 mm. The whisk turns approximately 5 seconds after switch off. The reported time is when turned off.				

Beating	Test no. 1	Test no. 2	Mean value
Beating time	4 min. 00 sec.	4 min. 00 sec.	4 min.00 sec.
Height of cake	82 mm	78 mm	80 mm
Comments: Used the stirrer. Started at minimum. After ½ minute increased to 4, maximum speed. Stopped after 3 minutes: Small bits of margarine, otherwise smooth batter. Satisfactory result on the baked cake.			

Kneading	Test no. 1 1 kg bread mix	Test no. 2 Max capacity: 1,5 kg bread mix
Kneading time	3 min.30 sec.	3 min. 30 sec.
Weight of baked bread	785 gram	800 gram
Height of baked bread	103 mm	102 mm
Comments: Started on speed 1. After ½ minute increased to 2. Recommended time 3 – 6 minutes. After 3 ½ minute smooth and well mixed dough. In test no. 2 the dough crept above the dough reflector. The baked breads had even pores, even well baked crust close round and some scrapping mainly from the crispy crust.		

Blender	Time	How to empty	Consistency
Test no. 1	2 min. 30 sec.	Easy. The handle gives good grip. A bit heavy.	Very smooth but in test no. 2 one bit of carrot still remained.
Test no. 2	2 min. 30 sec.		
Comments: Test no 1 started with maximum, but had to regulate. Test no. 2 started at 1 and increased gradually to maximum speed. After 4 minutes the bit of carrot was satisfactorily homogeneous with the rest of the purée.			

3.4.3 Ergonomic evaluation – practical use

The appliance has five suction feet attached to the bottom that adhere well to the base. There is a little power required to move the machine from the base.

The cord is 1,06 meters long and the appliance is fitted with an automatic cable rewind.

The bowl is easy to place in the correct position. It has a gripping edge that is easy to grasp and a **notch** which indicates which side of the bowl should be the furthest from the user. By twisting to the left, the bowl attaches to the base.

The whisk, stirrer, and other equipment connect to the power outlet on the swivel arm. This requires an extra push to hold the attachment in place. This also requires some force. Removing the equipment required some traction and can cause some splashing.

The lid covers the whole bowl. It needs to be pushed into place after the swivel arm has been lowered. The lid has an opening front and center of the appliance where ingredients can be inserted while the appliance is turned on. This feed tube has a removable lid. When the swivel arm is lifted after use, it is easiest to first remove the lid/splash cover. This can be pulled off by grabbing the opening in the cover.

A great deal of force is required to move the swivel arm. The button at the top of the appliance must be pushed while simultaneously using force to lift the swivel arm. Force is also required to lower the swivel arm. It is important to ensure that the release button is in the correct position after the swivel arm is lowered.

In addition, there is only one control switch that includes on/off, a pulse switch, and speed settings. This rotating switch is located on the right side of the appliance in a user-friendly location. It is designed with half circle recesses with a bar to grip onto and gives good grip: 69 mm long, 18 mm wide, 14 mm high. The speed is regulated with set levels marked 1-4 with tick marks marking the half positions in between. It is straightforward to operate, but a bit confusing that the drive continued to operate for a few seconds after being put into the 0 position. The Pulse Switch is located to the left of the 0 position. The numbers and markings are light grey against red. The legibility is satisfactory. The contrast between the switches and the machine is very good. They are white against red.

According to the instruction for use all the loose parts are dishwasher safe. The directions also give good tips on cleaning the blender.

The appliance will not operate with the swivel arm in upright position or if the unused drives are not covered with drive guards or tools.

3.4.4 Instruction for use

A booklet in A 5 size (146 mm X 208 mm), 140 pages, 18 languages. No table of contents. Norwegian on page 44 – 49.

Identification on the front page: MUM8... and a drawing of a machine + BOSCH.

The size of continuous text is 2 mm. Small letters, short and meaningful sentences. Lots of illustrative figures on 5 fold out pages. The text and illustrations complement each other. The fold out pages can be seen adjacent to the text on the pages for all the languages. The contrast is a bit diffuse, black print on grey. No symbols on the appliance but text on the appliance are explained in the instruction for use: e.g. M= pulse switch and marking on the machine which shows right position of the blender.

Satisfactory information concerning correct and safe use. Lots of warnings in the instruction for use: marked with warning triangles.

The instruction for use covers information on basic functions, maintenance, cleaning, troubleshooting and information for correct disposal of the product at the end of its useful life.

3.5 Assistent ORIGINAL AKM 6220 B

Test object number	05
Product No/Type	930 900 050 / N30
Producer/Land	Ankarsrum Assistent AB/ Sweden
Purchase price/Shop	4 225.13/ Jernia Storo



3.5.1 Product description

Standard equipment	Bowl made of steel, Roller, Scraper, Dough hook, Spatula, Lid, Bowl made of plastic, Double beater/whisk and Double cake beater.
Optional attachment	Citrus fruit press, Blender, Mincer, Sausage pipe, Strainer Passiersatz, Grater, Cookie attachment, Pasta attachment, Grain mill, Flake mill, Vegetable slicer with three additional drums
Measurements (height x width x depth) including bowl	370 mm x 235 mm x 370 mm
Weight without bowl	6 310 grams
Weight bowl	1 545 grams
Bowl capacity	7,1 litre
Length of cord	1750 mm
Compartment for cord	The cord is detachable
Rated power	800 W
Following information	Instruction of use in A 4 format. Picture of the machine on the front page. + A booklet in A 5 format with recipes, Swedish, Norwegian , Danish and Finnish.+ An instructional video.

3.5.2 Results performance tests

Whisking and whipping		Test no. 1	Test no. 2	Mean value
3 egg + 90 gram sugar	Whisking time: Volume in ml:	5 min. 00 sec. 875	7 min. 00 sec. 875	6 min. 00 sec. 875
6 egg + 180 gram sugar	Whisking time: Volume in ml:	5 min 00 sec. 1950	5 min. 00 sec. 2000	5 min.00 sec. 1975
500 ml cream	Whipping time: Volume in ml:	1 min. 15 sec. 875	1 min. 05 sec. 875	1 min. 10 sec. 875
<p>Comments: Used the double beater. In the instruction for use half speed is recommended and in the book with recipes full speed is recommended. We used full speed.</p> <p>The high of the sponge cake made from 3 eggs: Test no. 1: 36 mm and test no. 2: 35 mm.</p>				

Beating	Test no. 1	Test no. 2	Mean value
Beating time	1 min. 30 sec.	1 min. 45 sec.	1 min.38 sec.
Height of cake	73 mm	70 mm	71,5 mm
<p>Comments: Used the cake beater. Operated at speed 4, half speed, according to the instruction for use. Test no. 1 was stopped after 1 minute and scratched from the walls with the spatula. After 1 minute smooth batter except some tiny bits of margarine. Test no. 2 was stopped after 1 minute and 15 seconds. Smooth batter except a few tiny bits of margarine. Satisfactory result on the baked cake.</p>			

Kneading	Test no. 1 1 kg bread mix	Test no. 2 Max capacity: 3 kg bread mix
Kneading time	3 min.00 sec.	12 min. 30 sec.
Weight of baked bread	796 gram	818 gram
Height of baked bread	103 mm	99 mm
Comments: Used roller and scraper in test no. 1. Easy to watch the baking process. Used the dough hook in test no. 2. Started with 2/3 of the bread mix. Started at lowest speed but increased to fast. Because unsatisfactory process in the bowl, the speed was lowered to minimum speed after 3 minutes. Gradually more bread mix was added. When 200 g left the bowl was full but we managed to put the rest into the bowl. The dough crept into the arm where the dough hook was assembled. The dough was soft and pliable and easy to handle. The baked breads had even pores, even well baked crust close round and some scrapping mainly from the crispy crust.		

3.5.3 Ergonomic evaluation – practical use

The machine stands very firmly on four rubber feet.

The cord is 1,75 meters long. The cord is removeable and can be stored however one wishes.

The steel bowl is easy to put into place. There is a slot underneath which fits into the notch on the machine. The bowl has no grip, but it is good to hold the bowl with both hands. The whisking bowl is made of plastic. This bowl comes with a rod in the middle in addition to another loose rod that is inserted in the slot in the bottom of the machine. It is a little awkward to empty the plastic bowl because of the rod in the middle. The plastic bowl has a good handle and a track that eases pouring from the bowl.

The attachments are easy to mount. The scraper is placed in a hole and the roller latches on by pushing the rod into the roller attached to the top arm of the appliance. The same rod is used to attach the dough hook. It requires slight force to push the arm while pushing down on the rod, but both have good ergonomic design which makes this easy to operate. The double beater and cake beater both attach to a specific part. This part is placed very nicely in the middle of the whisking bowl at the top of the rod that is connected to the motordriver.

The appliance does not have a splash guard, but there is also no problem with splashing during use. The design is such that it is very easy to observe what is happening in the mixer while it is being used.

The appliance has two switches. One of the switches controls a timer function of up to 12 minutes while the other operates the speed of the machine. They are shaped like wing switches with a raised bar down the middle of the circular switches means for grabbing. These provide moderate grip as they are a little thick and a little shallow: length 35mm, width 20 mm and height 15 mm. The writing on the switches does not have good contrast. They appear to be engraved in the metal. The off/zero position is marked on the switches with a notch on the wing switches. The switches are located at the front of the appliance next to one another which is practical for use of the appliance.

The appliance has a cover, which is practical to use over the bowl when raising yeast dough.

All the parts excluding the double whisk are dishwasher safe according to the instruction for use.

When we baked with the largest recommended amount of flour, there was dough on the arm where the dough hook was attached. This was cleaned off using a damp cloth.

3.5.4 Instruction for use

A booklet in A 4 size (146 mm X 296 mm), 34 pages, 10 languages. Table of contents on page 3, 4 and 5. Norwegian on page 9. On this page information about safety how to use and disposal. From page 18 the instruction of use contains pictures which show how to use the appliance.

Identification on the front page: Picture of the machine + name: assistent ORIGINAL + made in Ankarsrum Sweden.

The size of continuous text is 2 mm. Small letters, short and meaningful sentences. How to use the machine is mainly shown by pictures – pictures which explain more clearly than lots of text.

Satisfactory information for correct and safe use.

The instruction covers information on basic functions, cleaning and information for correct disposal of the product at the end of its useful life. + advise you to save the instructions and visit www.assistent.nu for more information.

3.6 KRUPS Kitchen machine

Test object number	06
Type/Ref	KA990/ KA990T 42/700-2711-R
Producer/Land	Krups/France
Purchase price/Shop	4 204,68/ Jernia Storo



3.6.1 Product description

Standard equipment	Bowl made of steel with two handles, Balloon whisk, Mixing blade, Kneading hook + blade, Splashguard, Storage lid Spatula, Dough cutter, Tool driver covers.
Optional attachment	Blender, Mincer, Mini chopper, Juice container, Vegetable cutter, Rolling mill, Pasta maker – tagliolini + fettuccine + trenetta and Pasta dryer
Measurements (height x width x depth) including bowl	315 mm x 380mm x 180 mm
Weight without bowl	7 605 grams
Weight bowl	870 grams
Bowl capacity	5,0 litre
Length of cord	1090 mm
Compartment for cord	No
Rated power	1200 W
Following information	Instruction booklet in A 5 format. Picture of the machine on the front page. + A booklet 195 mm x 195 mm with recipes in German and English

3.6.2 Results performance tests

Whisking and whipping		Test no. 1	Test no. 2	Mean value
3 egg + 90 gram sugar	Whisking time: Volume in ml:	4 min. 30 sec. 1120	5 min. 00 sec. 1100	4 min. 45 sec. 1110
6 egg + 180 gram sugar	Whisking time: Volume in ml:	7 min 00 sec. 2140	7 min. 00 sec. 2080	7 min.00 sec. 2110
500 ml cream	Whipping time: Volume in ml:	2 min. 40 sec. 1180	2 min. 40 sec. 1250	2 min. 40 sec. 1215
Comments: Used the balloon whisk. Some spurt on the splashguard when whipping cream The high of the sponge cake made from 3 eggs: Test no. 1: 34 mm and test no. 2: 36 mm.				

Beating	Test no. 1	Test no. 2	Mean value
Beating time	1 min. 30 sec.	1 min. 30 sec.	1 min.30 sec.
Height of cake	75 mm	75 mm	75 mm
Comments: Used the mixing blade. Operated at full speed. Stopped after 1 minute and scratched from the walls with the spatula. Nearly finished after one minute.			

Kneading	Test no. 1 1 kg bread mix	Test no. 2 Max capacity: 1 kg bread mix
Kneading time	4 min. 30 sec.	-
Weight of baked bread	772 gram	-
Height of baked bread	120 mm	-
Comments: Used speed 3. According to the instruction for use speed 1 – 3 is recommended. After 4 minutes the speed automatically was reduced..Stopped when the dough was smooth and elastic and the dough dropped easily from the hook and bowl. The baked breads had even pores, even well baked crust close round and some scrapping mainly from the crispy crust.		

3.6.3 Ergonomic evaluation – practical use

The machine has five suction feet and stands very steadily on the table.

The cord is 1,09 meters long. It is connected to the machine but cannot be stored inside the appliance.

The bowl is easy to place in the correct position. No movements necessary to attach it. The bowl has two rubber handles which are good for gripping.

Very easy to attach and detach the whisk and other attachments from the power outlet.

The splash guard has edges that are inserted into slots on the underside of the mixer arm. This allows it to rest firmly on the machine. The machine will not start if the splash guard is not attached. The splash guard does not cover the whole opening—it is slightly open in the back. There is also no cover over the feed tube opening.

The head releaser lever is located on the backside of the machine. This has a good grip—a tweezer grip which allows for 30 mm for the thumb and 20 mm for the index finger and has a thickness of around 7 mm. By clicking this, the mixer head unlocks and is easy to lift up. It is not necessary to use when the mixer head is lowered, but in this case more force is required to push the mixer head down until one hears a click.

There are also four switches and buttons for operating. These are located near one another and in a user-friendly location. The main switch is a cylinder switch which work as an on/off switch and a speed regulator. This switch is coated with rubber and has a diameter which is 45 mm at the innermost part and 49 at the outermost part. This switch has a very good grip. The speed is regulated without set levels, but a small click can be heard for each setting possibility which goes from 0-12. The number and text on the cylinder switch are small and not very good contrast as they are different shades of grey. There is a pulse function to the right of the on/off position. There is also a small button marked “turbo” to the right of the main switch. When this is pushed in, it rotates the attachments even faster than with setting 12. To the right of this there is a small display with two small push buttons below.

The display shows the time that has elapsed or one can set the desired time up to 16 minutes with the two buttons. The display can also show other messages which are explained in the instruction booklet.

There is a cover included which is made of plastic and can be used when raising dough.

According to the instruction booklets, none of the metal parts are dishwasher safe.

3.6.4 Instruction for use

A book in A 5 size (146 mm X 208 mm), 193 pages, 15 languages. On the back page reference to which languages on which pages. Norwegian on page 103 – 114. On top on each page marked which language on the respective page.

Clearly identification on the front page with picture of the machine and KRUPS.

The size of continuous text is 2 mm. Small letters, short and meaningful sentences. Lots of illustrative figures on 5 fold out pages. Numbers in the text refer to the figures. Four of the five fold out pages can be seen adjacent to the text on the pages for all the languages. The contrast is good, black print on white.

Satisfactory information for correct and safe use. The machine has a timer function and a display. The instruction for use explain how to use and what to do when messages pops up in the display.

The instruction covers information on basic functions, maintenance, cleaning, troubleshooting and information for correct disposal of the product at the end of its useful life. The instruction for use contains a well arranged table “What to do if your appliance does not work”

3.7 BOSCH universal plus

Test object number	07
Type/Ref	E Nr.MUM 6 N 22/03 FD 9103. Type CNUM80. The mincer: MUZ 6 FW
Producer/Land	Robert Bosch Hausgeräte GmbH/ Slovenia
Purchase price/Shop	3 299,00/ Elkjøp Megastore Ullevål



3.7.1 Product description

Standard equipment	Bowl made of steel. Lid rim and lid, Double whisk, Kneading hook, Dough blade, Blender jug with lid, feed tube and funnel, separate blade insert and driver cover. A mincer with housing locking lever, filler tray, pusher, worm gear blade, perforated disc and treading ring are also standard equipment to this machine, but are not used in this test program. Bosch has a model which is identical to this but without the mincer.
Optional attachment	No information about optional attachment in the instruction for use. On the package information pictures of Food processor, Citrus press, Pasta maker and reference to 16 product numbers possible to order.
Measurements (height x width x depth) including bowl	290 mm x 390mm x 310 mm
Weight without bowl	4 250 grams
Weight bowl	1 580 grams
Bowl capacity	4,5 litre
Length of cord	1050 mm
Compartment for cord	Yes
Rated power	1000 W
Following information	Instruction of use in A 5 format. Picture of the machine on the front page. + separate instruction for use for the mincer in the same format and quality.

3.7.2 Results performance tests

Whisking and whipping		Test no. 1	Test no. 2	Mean value
3 egg + 90 gram sugar	Whisking time: Volume in ml:	3 min. 30 sec. 1040	3 min. 30 sec. 1000	3 min.30 sec. 1020
6 egg + 180 gram sugar	Whisking time: Volume in ml:	4 min 00 sec. 1975	4 min. 30 sec. 2000	4 min.15 sec. 1988
500 ml cream	Whipping time: Volume in ml:	1 min. 10 sec. 1000	1 min. 20 sec. 1050	1 min. 15 sec. 1025
<p>Comments: Used the double whisk. Used speed 4, maximum. Recommended in the instruction for use 3 – 4 in 1 ½ - 4 minutes. The high of the sponge cake made from 3 eggs: Test no. 1: 39 mm and test no. 2: 35 mm.</p>				

Beating	Test no. 1	Test no. 2	Mean value
Beating time	1 min. 30 sec.	1 min. 20 sec.	1 min.25 sec.
Height of cake	68 mm	70 mm	69 mm
Comments: Used the mixing blade. Operated at full speed. Stopped after 1 minute and scratched from the walls with the spatula. Nearly finished after one minute.			

Kneading	Test no. 1 1 kg bread mix	Test no. 2 Max capacity: 2 kg
Kneading time	2 min. 00 sec.	2 min 30 sec
Weight of baked bread	801 gram	806 gram
Height of baked bread	115 mm	114 mm
Comments: ½ minute low speed and speed 3 until pliable dough. In test no. 2 not all the bread mix from start – added 400 gram during operating on low speed. The baked breads had even pores, even well baked crust close round and some scrapping mainly from the crispy crust.		

Blender	Time	How to empty	Consistency
Test no. 1	2 min. 00 sec.	Easy. The handle gives good grip.	Very smooth.
Test no. 2	3 min. 00 sec.		
Comments: Used speed 3. Recommended to start on low speed. Observed the knives rotated without getting solid particles			

3.7.3 Ergonomic evaluation – practical use

The appliance has four good suction feet which allow it to stand firmly and steadily on the table.

The power cord is 1,05 meters long. It can be pushed into a storing compartment on the appliance.

It is most practical to insert the drive shaft into the driver before placing the bowl on the driver. The bowl must be turned to the left until it clicks. The click indicates that it is in the correct position. The bowl has nothing to grip onto and it is difficult to get a good grip when removing or emptying the bowl. However if one removes the drive shaft from the bowl one can grip onto the recess that contained the drive shaft.

It is very easy to attach the dough blade and the kneading hook. The double whisks must be pressed into a device that plugs directly into the drive shaft. Removing them requires some force. The dough blade and kneading hook are very easy to attach because they are open. This applies to the machine while it's mixing as well: it is easy to see what is going on inside.

The mixer has a loose, two-part splash guard. The outer ring attaches to the bowl by turning counterclockwise until it sticks into place. The inner lid is also constructed such that it can turn in a way that connects it to the outer portion of the cover.

The appliance has only one switch. This switch works as an on/off switch and speed regulator. It is designed as a bar grip knob and its placement is user-friendly. There is a pulse switch to the left of the 0/off marking and four settings for speed. The wing switch is slightly curved and allows for a good grip. The switch is 35 mm long, 10 mm wide, and 14 mm high. Legibility on the switch is good.

On the portion that connects to the blender there is a list of recommendations (with small symbols/pictures) for which speeds are recommended for use of the different attachments.

The appliance will not start if the driver which is not in use does not have a cover.

According to the instruction booklet, the bowl and all the attachments except for the dough hook are dishwasher safe. The drive shaft must be removed before being washed. All the parts for the blender, with exception of the knife, are also dishwasher safe. When cleaning the blender, water droplets found their way into the handle and were difficult to let out.

3.7.4 Instruction for use

A booklet in A 5 size (146 mm X 208 mm), 122 pages, 18 languages. No table of contents. Norwegian on page 37 – 42. Every page are marked which language on the actual page.

Identification on the front page: MUM6N... and a drawing of a machine + BOSCH.

The size of continuous text is 2 mm. Small letters, short and meaningful sentences. Lots of illustrative figures on 4 fold out pages. The text and illustrations complement each other. The fold out pages can be seen adjacent to the text on the pages for all the languages. The contrast is a bit diffuse, black print

on grey. No symbols on the appliance but text which are explained in the instruction for use: e.g. M = pulse switch and marking on the appliance which shows right position of the blender.

Satisfactory information for correct and safe use. Lots of warnings in the instruction for use: marked with warning triangles.

The instruction for use covers information on basic functions, maintenance, cleaning, troubleshooting and information for correct disposal of the product at the end of its useful life.

4. Summary

4.1 Performance tests

Whisking and whipping

Test object/ machine	Whisking time 3 egg	Volume 3 egg	Height of cake from 3 egg	Whisking time 6 egg	Volume 6 egg	Whipping time 500 ml cream	Volume 500 ml cream
01 - Kenwood kMix kmx 51	3 min. 33 sec.	1205 ml	33, 5 mm	4 min. 47 sec.	2535 ml	1 min. 32 sec.	1210 ml
02- KitchenAid 5KSM150	3 min. 42 sec.	1090 ml	34 mm	4 min. 24 sec.	2305 ml	1 min. 35 sec.	1143 ml
03- Kenwood Major Titanium KMO20	3 min. 18 sec.	1138 ml	29,5 mm	3 min 3 sec.	2313 ml	1 min. 20 sec.	1210 ml
04- BOSCH MUM 86 Proffesional	9 min. 15 sec.	1078 ml	31,5 mm	6 min. 28 sec.	2138 ml	3 min. 29 sec.	1215 ml
05- Assistent ORIGINAL AKM 6220 B	6 min. 0 sec.	875 ml	35,5 mm	5 min. 0 sec.	1975 ml	1 min. 10 sec.	875 ml
06- KRUPS Kitchen machine KA990	4 min. 45 sec.	1110 ml	35 mm	7 min. 0 sec.	2110 ml	2 min 40 sec.	1215 ml
07 - BOSCH universal plus MUM	3 min. 30 sec.	1020 ml	37 mm	4 min. 15 sec.	1988 ml	1 min. 15 sec.	1025 ml

All the machines show satisfactory whisking and whipping skills. Whisking 3 eggs with BOSCH MUM 86 is time consuming but the final result is good. Both Kenwood Major and BOSCH MUM 86 have large capacity and perform better with larger than smaller doses. The volume of eggnog from Assistent is less than the others but the baked cake is as height as cakes from eggnogs from the other machines. Regarding volume of 500 ml whipped cream Assistent reach low score compared with the others.

Beating and kneading

Test object/ machine	Beating time	Height of cake	Kneading time 1 kg	Height of bread	Kneading time max capacity	Height of bread
01 - Kenwood kMix kmx 51	1 min. 30 sec.	75 mm	4 min. 0 sec.	109 mm	3 min. 45 sec.	88 mm
02- KitchenAid 5KSM150	1 min. 15 sec.	70 mm	6 min. 30 sec.	106 mm	-	-
03- Kenwood Major Titanium KMO20	K- beater: 1 min. 38 sec. Flexible beater: 1 min. 30 sec.	79,5 mm 77 mm	2 min. 35 sec.	98 mm	5 min. 30 sec.	97 mm
04- BOSCH MUM 86 Proffesional	4 min 0 sec.	80 mm	3 min. 30 sec.	103 mm	3 min. 30 sec.	102
05- Assistent ORIGINAL AKM 6220 B	1 min 38 sec.	71,5 mm	3 min. 0 sec.	103 mm	12 min. 30 sec.	99 mm
06- KRUPS Kitchen machine KA990	1 min. 30 sec.	75 mm	4 min. 30 sec.	120 mm	-	-
07 - BOSCH universal plus	1 min. 25 sec.	69 mm	2 min. 0 sec.	115 mm	2 min. 30 sec.	114 mm

The beating time is similar for all the machines except BOSCH MUM 86. Talking about the final result none of the machines differs from the others.

All the machines made good, pliable dough. Kneading 1 kg with KitchenAid was most time-consuming. This appliance has the lowest rated power: 300 W compared with BOSCH MUM 86 with highest rated power: 1600 W. It seemed quite difficult for KitchenAid to knead. Assistent has largest capacity: 3 kg bread mix closed followed by Kenwood Major: 2,6 kg bread mix. In both of these appliances the bowls where almost full and the dough crept in to undesirable parts on the machines when used the recommended maximum capacity. When baking with maximum capacity the dough needed to rise outside the bowl. In our test we used the same rising time in all sub experiments.

To obtain the optimal baking result the rising time when baking large dough should have been increased.

Pureeing

Three of the machines had blenders as standard equipment:

03- Kenwood Major

04- BOSCH MUM 86 Professional

07- BOSCH MUM 6 N Universal Plus

Smooth perfect puree was obtained with all of the blenders. Shortest time with Kenwood Major.

4.2 Ergonomic properties/usability

All the machines sit stable on the table.

The power cords vary between 0,89 meters and 1,75 meters. Kenwood Major has the shortest cord while Assistant has the longest power cord. The cord on Assistant is detachable while all the others are fixed to the machines. The length of the cord on Kenwood Major was too short to be tested on the test table where the electric outlets are hanging down from the ceiling. Three of the machines, Kenwood Major, Bosch MUM 86 and Bosch MUM 6 N, have a compartment for storing the cord. The most user-friendly one is on Bosch MUM 86 where the cord automatically rewinds.

It is very easy to put the bowl on all the machines except Bosch MUM 6 N. On this machine a driving shaft has to be mounted before fixing the bowl onto this, twisting until the bowl in right position and then twisting counter clockwise until you hear a click. All the bowls have handles or gripping devices except Assistant and Bosch MUM 6 N. The bowls from these two machines are nearly twice as heavy as the other bowls. Despite the heavy weight of the Assistant, 1,5 kg, this does not cause problems emptying the bowl. Bowls with a centre pole are not as user friendly as other bowls regarding emptying/pouring out for instance eggnog. The bowl from Bosch MUM 6 N and the bowl for mounting the double beater and cake beater on the Assistant have a centre pole.

Mounting the whisk, beaters and kneading equipment are very easy on all the machines except Kitchen Aid. On Bosch MUM 86 a quite hard push was necessary to get the equipment properly mounted. When dismantling some force is required and in some cases a pull caused some splashing.

All the machines except Assistant have a splash shield/splash guard. It is very easy to mount on the Kenwood machines and KitchenAid and easy on Krups and the Bosch machines. It is a plus that the shield stays attached to the machine after the food preparation. This is the case on the Kenwood machines and Krups. It is also a plus that the shield covers the total area of the bowl. This is the case on the Kenwood machines and Bosch machines. The Kenwood machines have the most user-friendly shields.

Both the Kenwood machines, KitchenAid and Krups have a mixer head where the different attachments are mounted while Bosch MUM 86 has a swivel arm. The machines with mixer a head have a mechanism which release the head. These are easy to handle. The swivel arm on Bosch is heavy and not as user-friendly as desired.

All the machines, with exception of Assistent, have a control with combined start/stop functions and a speed regulator. On the Assistent there is an off/on control which can also be used as a timer. This means the mixer can be set to run for a certain amount of time. Krups also has a timer function which allows the user to set a desired running time. Kenwood kMix, Kenwood Major and Krups have ungraded cylinder control which are very good and easy to operate. Krups has the best grip. Both Bosch and Assistent appliances have bar- grip knobs. There are set speed levels on the Bosch machine while the speed control on the Assistent is ungraded (i.e. no set speeds.) All three are good to operate. Kitchen Aid has a lever which glides between the different speed levels. This requires a fair amount of force, and is heavier to operate than the other mixers.

It is easy to clean the kitchen machines. According to the instructions manuals most of the detachable parts withstand cleaning in a dishwasher. All detachable parts from Kenwood kMix and Bosch MUM 86 may be washed in a dishwasher. The splashguard to Kenwood Major should be washed by hand but we assume the splash guard on both the Kenwood machines is the same. The KitchenAid metal whisk, the Assistent double whisk, the Krups metal equipment and the Bosch MUM 6 N kneading hook are not recommended to be washed in a dishwasher.

4.3 Instruction for use

All of the instructions cover selected essential requirements of ISO GUIDE 37. These are summarized in the questions in chapter 2.3 «Evaluation of the instructions for use».

Most of the instruction manuals are organized in the same fashion.

They contain the following information:

- Clear identification of the appliances in the form of photos and/or illustrations and text
- Table of contents with page number and overview of languages
- safe use
- overview of the names of the parts
- practical application
- troubleshooting
- cleaning
- disposal

In spite of the similarities, the different instruction manuals are slightly different:

- The Kenwood kMix and Kenwood Major Titanum instruction manuals are in a different format (A5 and A4), but otherwise organized in the same way. The books are fairly thick as they are printed on thick paper that seems to be of good quality. The text is set up by bullet points concentrated in the middle of the page, with words to the left of the text and illustrations on the right side. Text and illustrations complement each other in a good way. There are wide margins and space between paragraphs.
- The Kitchen Aid instructions have very clear warnings throughout the entire manual. The headlines are big and fat. Text and illustrations alternate and support each other in a good way. Already after a short period of use, the pages have begun to loosen from the manual. In the instructions for Bosch MUM8 and Bosch MUM6N the overview of the languages is listed on the cover. It does not refer to page numbers. Image series illustrating the appliances with the equipment and how the attachments are used are concentrated on the fold-out at the beginning of the manual. The text is compressed. The paper seems a bit thin. It is not as good contrast between text and paper as in the other manuals.
- Regarding the instructions for Assistent original, the producers seem to, in our opinion, have found a good solution for making the instructions easy and user-friendly. They have little, but sufficient text. They have invested in detailed picture series with self-explanatory symbols and references to show how the appliance and attachments are to be used. The table of contents is missing reference to sections on “Using the Ankarsrum Assistent”. The instruction video which is included is informative. The original instructions have few pages, are easy to page through, and are solid. It is stapled together in the fold.
- In the instructions for Krups, the picture series are concentrated in the fold-out portion at the beginning of the manual. The Table of Contents is at the back with an overview of language and with reference to page numbers. The instructions which are in the form of text are compressed. The instructions are in A5 format and printed on plain paper.

The font size in the continuous text is around the same in all the instruction manuals. Larger writing will increase user-friendliness.

Instruction manuals in multiple languages are collected in a single manual which means that most of the instruction manuals become very thick.



Appendix

Testreport no 3-2012

Comparative test of seven electric operated food preparation appliances

Whisking and whipping



Measuring volume of eggnog



Measuring volume of eggnog



Whisked eggnog



Measuring height of sponge cake



Whipped cream



Measuring volume of cream

Beating



Batter, KitchenAid



Batter, flexible beater, Kenwood Major



Batter, Assistent Original



Measuring height of cut cacke

Kneading



Max capacity, Kenwood Major Titanium



Normal capacity, KitchenAid



Max capacity, Bosch Mum 86



Normal capacity, Krups



Max capacity, Assistant Original



Height of bread, max capacity and normal capacity

Instructions for use and ergonomic evaluation

