Candles

Quality Assurance
RAL-GZ 041

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RAL-GZ 041

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Contents

General Quality and Inspection Specifications for candles - RAL-GZ 041

1 Range of application

The Special Quality and Inspection Specifications establish content and scope of monitoring measures as well as comments on the marking of graded candles. Reproducible quality criteria for the candle product areas (household candles, tapered candles, pillar candles, and others), lights, tea lights and grave yard lights are established in the framework of Special Quality and Inspection Specifications.

2 Principle

The General Quality and Inspection Specifications in combination with the respective Special Quality and Inspection Specifications for candles, lights, tea lights or grave yard lights are the basis for testing graded candles, subsequently referred to as “requirements of the Quality Mark for Candles”.

Candles with the quality mark must meet the requirements of preventive health protection.

Annex 1 “Requirements for raw materials and additives to protect health” applies in particular. It is being continuously supplemented in compliance with the state of the art.

3 Applicable regulations, guidelines and standards

Quality assurance requires compliance with the following guidelines. Relevant are the sections relating to the range of application of the General and Special Quality and Inspection Specifications.

- EN 15426 Candles – Specification for sooting behaviour,
- DGF standard methods,
- EN 71, Safety of Toys, Part 3: Migration of specific elements,
- IFRA Standards.

Note: RAL 040 A2 and RAL 040 B2 were withdrawn without any replacement because they had no longer been applied by the industry. The Quality and Testing Specifications do only refer to some technical requirements of these former sets of rules. Referring to these sets of rules for promotional purposes is not admissible.

4 Terms and definitions

4.1 Candles

A candle is a source of light with one or more combustible wicks that are surrounded by a burning mass which is solid or semisolid at room temperature (20 °C to 27 °C).

4.1.1 Paraffin candles

The burning mass consists of paraffin.

4.1.2 Stearin candles

The burning mass consists of a minimum of 90 % wt. of stearin. In this case, it is permissible to provide the candle body with a coat that does not consist of stearin. This coat of dipping wax must not have a weight of more than 10 % wt.

4.1.3 Beeswax candles

The exclusive term beeswax candle is only permissible if the burning mass of the candle consists only of beeswax without any additive.

If scents and/or dyes are added to the beeswax, the term "beeswax candle" has to be accompanied by an explicit reference to this additive.

If only a part of the burning mass is beeswax, e.g. 10 % wt., or if the candle is only coated with beeswax, this beeswax part and/or the beeswax coating can be indicated.

The way of indication must not pretend a higher beeswax content than the candle actually contains however. It is not allowed to use the indication beeswax in a way that implies the impression that the candle is a beeswax candle in accordance with section 4.1.3.

4.1.4 Self-extinguishing candles

The wick of candles referred to as “self-extinguishing”, “self-going-out” and “self-fading” candles must not reach the bottom of the candle when it is still burning.

4.2 Oil lights

Oil lights

Oil lights consist of a solid burning mass and a wick that are surrounded by an inflexible container.

The term "oil light" may only be used if the burning mass exclusively consists of hardened vegetable oils or solid vegetable fats.

For "composition oil lights" not only solid, hardened or unhardened vegetable oils or fats may be used, but also such of animal origin.

They are mixed with waxes, solid fatty acids or solid hydrocarbon compounds.

The share of the solid, hardened or unhardened vegetable or animal oils and fats in composition oil lights has to be indicated in percent and must not be below 30 %.

5 Measures and weights

The length is measured as the distance between candle foot and wick outlet at the candle top. The diameter is measured as the maximum diameter.

The requirements are only relevant if they are stated on the sales packaging.

6 Monitoring

General notes

The monitoring is subdivided into:

- Sampling
- Initial inspection,
- Self-monitoring,
- External monitoring,
- Repeat inspection.

6.1 Sampling

The tests are performed with finished candles that are ready for marketing.

The samples shall be taken from the active production line.

The number of samples, depending on the production output, is agreed upon with the external inspection institute.

6.2 Initial inspection

Passing the initial inspection is the prerequisite for being awarded and permitted to use the quality mark "Candles". The initial inspection focuses on whether the applicant's products completely meet the requirements of the Quality Mark for Candles. The applicant is obliged to prove - by submission of a manufacturer's certificate issued by the applicant's suppliers - that the "Requirements for the Selection of Raw Materials and Additives" according to Appendix 1 of the Quality and Inspection Specifications are fulfilled. The initial inspection is initiated by the Quality Committee of the Quality Association; an independent and accredited testing organization or an attested neutral expert is assigned to perform the inspection.

Furthermore, the initial inspection is dedicated to show whether the prerequisites for continuous compliance with the requirements of the Quality Mark for Candles are given. The manufacturer is obliged to allow the external inspector, upon request, to inspect the records on previous tests (e.g. test protocols) at the initial inspection.

The external inspector issues an inspection report covering the initial inspection. One copy of the inspection report is sent to the applicant and another one to the Quality Committee of the Quality Association.

The assigned inspector must use forms prepared by the Quality Association for the initial inspection.

6.3 Self-monitoring

All users of the quality mark must perform a continuous and verifiable self-monitoring of all graded products in terms of their compliance with the requirements of the Quality Mark for Candles.

Carefully kept records (daily reports) must be maintained on self-monitoring. These records are to be retained for two years in a suitable form and must be provided at the external inspection. When carrying out self-monitoring, the quality mark user has got to use inspection reports specified by the Quality Association.

If general or certified Quality Management Systems are implemented, they have to cover the requirements of the Quality Mark for Candles.

6.4 External monitoring

The external monitoring is dedicated to show whether the requirements of the Quality Mark for Candles are still met by the user of quality mark. External monitoring must be carried out at least once a year without prior notice by an external inspector appointed by the Quality Committee of the Quality Association and at the factory of the quality mark user. It has to be based on the inspection forms specified and provided by the Quality Association. Only products that are not labelled with the quality mark are excluded from the inspection. The assigned external inspector must identify himself on site by presenting a written order issued by the Quality Committee of the Quality Association. The obligation to legitimate must not delay the performance of the inspection.

In the framework of external monitoring, the inspector has got to check the handling of the internal self-monitoring and evaluate its results regarding completeness and conclusiveness. Furthermore, the quality mark user has got to prove that the "Requirements for raw materials and additives to protect health" according to Appendix 1 of the present Quality and Inspection Specifications are still met by submitting manufacturers' certificates issued by their suppliers.

6.5 Repeat inspection

If the assigned external inspector detects short-comings in the quality mark user´s quality assurance during the external inspection, a repeat inspection has got to be performed.

If the repeat inspection is not passed either, further measures according to Section 5 of the implementation requirements may be taken by the Board of the Quality Association in consultation with the Quality Committee.

6.6 Inspection costs

The costs of all monitoring or inspections carried out have to be borne by the applicant or quality mark user respectively.

6.7 Inspection and monitoring reports

An inspection report has to be prepared on any inspection or monitoring carried out by the assigned external inspector. One copy of the inspection report must be sent to the applicant or quality mark user as well as to the Quality Committee of the Quality Association.

7 Labelling

Products manufactured in accordance with the General and the respective Special Quality and Inspection Specifications and for which the quality mark of the Quality Association has been awarded may be labelled using one of the following quality marks:

The quality mark is only allowed to be used in a way that the producer can either be identified by

- his name or
- an identification number that is given and exclusively deposited by the Quality Association or
- the GTIN-Code.

For the awarding and the use of the quality mark only the implementation rules of the Quality Association for Candles are applicable.

8 Amendments

Amendments to the General and Special Quality and Inspection Specifications, even of editorial nature, require the prior written approval by RAL to become effective. They are implemented by the Board of the Quality Association notifying the quality mark users and giving an adequate transition period.

Special Quality and Inspection Specifications for household candles, tapered candles, pillar candles and other candles

RAL-GZ 041/1

1-1 Range of application

The Special Quality and Inspection Specifications apply to candles with a smooth surface for product varieties such as Advent candles, altar candles, Christmas tree candles, anniversary candles, household candles, offering candles, pyramid candles, cake lights, tapered candles, cylindrical candles, pillar candles. They may also be applied to models with ornamental surfaces

1-2 Quality specifications

1-2.1 Optical and technical requirements

1-2.1.1 Appearance / wick position

The wick has got to be positioned in the centre. Exception: Candles with more than one wick.

When viewed with the naked eye and without technical aids, the candle surface has got to be free of bubbles, cracks, chips and damage. Exceptions are only admissible if these features are an integral part of the decoration.

The candle needs to have the required colour shade and intensity.

1-2.1.2 Burning behaviour

After being lit, the candle has to show a bright, calm flame and gradually form a cup rim surrounding the so-called burning bowl.

Furthermore, it must be ensured that

- the wick has a medium curvature while the candle is burning (see section 1-3.3),
- the candle does not drip (see section 1-3.4) and
- the flame burns without visible release of soot (see section 1-3.5).

For technical reasons, the evaluation of the burning behaviour regarding the compliance with these requirements is only possible down to a residual height of 30 mm for pillar candles with a diameter between 31 and 60 mm, a residual height of 40 mm for pillar candles with a diameter of more than 60 mm and a residual height of 80 mm for altar candles respectively.

After the flame has been extinguished, the tip of the wick continues to glow for some time by its very nature. This is associated with releasing a trail of smoke. For candles with a diameter of 30 mm or less, this process should be terminated within a period of 15 seconds. For candles with a diameter of more than 30 mm, the flat wick is only allowed to smoke for up to 20 seconds after the extinction of the flame; however – and in this case this is also binding for round wicks – the wick is not allowed to burn down completely so that the wick can still be relit without any problems and the candle continues to burn properly.

If a burning time is stated on the packaging, it has got to be met (see section 1-3.7).

1-3 Test specifications

1-3.1 Spatial conditions and distances for burning tests

For the burning tests, the testing room temperature has got to range between 20 ^{0}C and 25 ^{0}C. The candles have to be placed upright - protected from draught as far as possible – and spaced adequately from each other depending on the candle format so that the candles do not influence each other by emitting heat.

1-3.2 Burning cycles

The sample candles are to be burned in different burning cycles depending on the candle size.

Burning Cycle 1 for Christmas tree candles, cake lights, egg shaped candles and other candle types with a maximum weight of 40 g:

Cycle 1	Continuous burning to a residual height of approx. 20 mm above the candle foot

Burning Cycle 2 and 3 for candles with a weight above 40 g and a maximum diameter of 30 mm:

Cycle 2	Continuous burning to a residual height of approx. 20 mm above the candle foot
Cycle 3	Burning for 2 hours, at least 1 hour pause, burning for 2 hours

Burning Cycle 4 and 5 for candles with a diameter of 31 to 60 mm (alternating from day to day):

Cycle 4	Burning for 4 hours
Cycle 5	Burning for 4 hours, at least 1 hour pause, burning for 4 hours

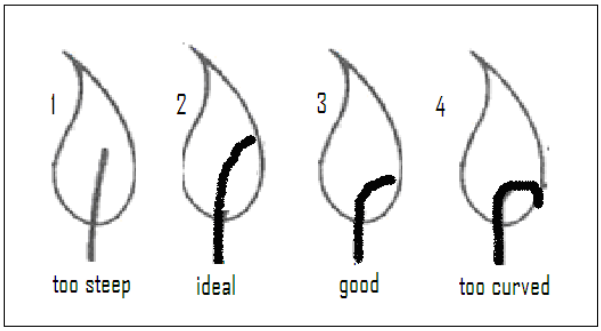
Burning Cycle 6 for candles with a diameter above 60 mm:

Cycle 6	Burning for 4 hours, at least 1 hour pause
	Burning for 4 hours, at least 1 hour pause
	Burning for 4 hours, at least 1 hour pause
	Burning for 4 hours

1-3.3 Wick posture

The wick protrudes straight out of the candle and is supposed to bend evenly to the outer edge of the flame when burning, where the flame temperature is the highest, so that the complete, gradual burning of the wick tip takes place there.

Consequently, a slight wick curvature according to figure 2 is ideal but a wick curvature according to figure 3 is still good.



The wick posture while burning is assessed visually.

Assessment

Wick shows curvature according to figure 2 or 3	Requirements met
Wick curvature deviates significantly from figure 2 or 3	Requirements not met

1-3.4 Dripping resistance

Dripping is to be understood as burning mass running out of the burning bowl of the candle. The candle is dripfast when this is prevented by the cup rim.

In case of candles with a maximum diameter of 30 mm, slight wax run-off is tolerable if the following applies:

When re-lighting the candle, the wick can only reach its full suction and capillary effect after a few minutes. Consequently, this phase may temporarily involve several drops of wax running off. This phenomenon should not be evaluated as insufficient dripping resistance.

The assessment of the dripping resistance is performed visually.

Assessment

Cup rim prevents run-off	Requirements met
Molten burning mass runs down the candle	Requirements not met

1-3.5 Sooting behaviour / aftersmoking

Burning with no release of soot at all is not possible for physicochemical reasons, especially in the lighting phase and directly after the flame has expired. The soot release has to be minimized however, especially by optimally balancing candle material and wick so that the candle emits only very small amounts of soot.

Assessment of the sooting behaviour based on two criteria

a) visually

No visible release of soot	Requirements met
Candle soots visibly	Requirements not met

b) based on the testing procedure according to EN 15426 section 8

For candles, except ball candles, egg candles, special shaped candles and candles with a diameter of more than 70 mm, the sooting behaviour has to be additionally assessed according to the following criteria:

- An hourly soot index of max. 1.0 has to be met (visible sooting can be expected at an hourly soot index of approx. 1.2 or more).

The candle has to fulfil both criteria.

Assessment of the aftersmoke time for candles with a maximum diameter of 30 mm

Average aftersmoke time max. 15 seconds	Requirements met
Average aftersmoke time exceeds 15 seconds	Requirements not met

Assessment of the aftersmoke time for flat wick candles with a diameter above 30 mm diameter

Average aftersmoke time max. 20 seconds	Requirements met
Average aftersmoke time exceeds 20 seconds	Requirements not met

1-3.6 Compliance with dimensions and burning time

Assessment

a) Dimensions

Dimensions adhered to on average	Requirements met
Dimensions not adhered to on average	Requirements not met

A maximum minus tolerance of 2 % but at least 1 mm is admissible for diameter and length.

b) Burning time

The burning time is defined as the sum of all burning periods from the first ignition until self-extinction.

Burning time achieved on average	Requirements met
Burning time not achieved on average	Requirements not met

When declaring a burning time like “approx.” or “±“, a maximum minus tolerance of 10 % is admissible.

1-4 General assessment

The general assessment of the candle is made on basis of the inspection reports on self-monitoring and external monitoring (assessment sheets) specified by the Quality Association.

The modalities for monitoring and amendments derive from the General Quality and Inspection Specifications.

In case of a positive overall assessment, the subsequent quality mark with the additions listed in section 7 of the General Quality and Inspection Specifications is awarded:

Special Quality and Inspection Specifications for lights for indoor use RAL-GZ 041/2

2-1 Range of application

The Special Quality and Inspection Specifications apply to lights for indoor use. Lights are candles that are burned in a non-combustible container made of metal, glass or plastics for example. The container prevents the liquid fuel from running off.

A maxi light is a special type of light with a cylindrical wax body and a typical diameter of 55 to 60 mm and a typical height of 20 to 30 mm. On the market, maxi lights might also be found with names like jumbo light, medi light, deco light etc.

2-2 Quality specifications

2-2.1 Appearance / wick position

When viewed with the naked eye and without technical aids, the wax surface has got to be free of impurities.

The wick has got to be positioned in the centre. Exception: Lights with more than one wick.

2-2.2 Container

The burning mass of lights is positioned in a solid container. The container must not be deformed, destroyed or ignited by the flame.

2-2.3 Burning behaviour

After being lit, the light has to show a bright calm flame and burn evenly.

The flame must burn without visible release of soot.

Once the flame has been extinguished, the tip of the wick continues to glow for some time by its very nature. This is associated with releasing a trail of smoke. This process has to be terminated within 20 seconds.

Self-extinction at the end of the whole burning period must not occur until only a slight wax remainder is left in the container.

2-3 Test specifications

2-3.1 Burning conditions

For the burning test, the testing room temperature has got to range between 20 °C and 25 ^{0}C.

The room shall be protected from draught.

The burning shall be done on a heat resistant, non-flammable surface. The thermal conductivity of this surface should be as low as possible in order to minimize its influence on the burning behaviour of the candles, especially on lights. For this reason, burning lights directly on surfaces like metal or tiles is not suitable.

2-3.2 Burning cycles

- for maxi lights:
  Burning for 4 hours, at least 1 hour pause, afterwards continuous burning until self-extinction.

- for lights with a burning time of max. 12 hours:
  Burning for 3 hours, measuring the aftersmoke time, immediate relighting and continuous burning until self-extinction.

- for any other lights:
  Burning for 4 hours, at least 1 hour pause, repetition until self-extinction.

2-3.3 Sooting behaviour

Burning with no release of soot at all is not possible for physicochemical reasons, especially in the lighting phase and directly after the flame has expired. The soot release has to be minimized however, especially by optimally balancing candle material and wick so that the candle emits only very small amounts of soot.

Assessment of the sooting behaviour based on two criteria

a) visually

No visible release of soot	Requirements met
Candle soots visibly	Requirements not met

b) based on the testing procedure according to EN 15426 section 8

An hourly soot index of max. 1.0 has to be met (visible sooting can be expected at an hourly soot index of approx. 1.2 or more).

The light has to fulfil both criteria.

2-3.4 Aftersmoking

After the flame has been extinguished, the tip of the wick continues to glow for some time by its very nature. This is associated with releasing a trail of smoke. This process should be terminated within a period of 20 seconds.

Assessment

Aftersmoke time max. 20 seconds	Requirements met
Aftersmoke time exceeds 20 seconds	Requirements not met

2-3.5 Burning mass remainder of lights

After self-extinction at the end of the entire burning, the average burning mass remainder of lights with a cylindrical shape and a maximum inner diameter of 70 mm is allowed to come to a maximum of 3 g or 12 % of the initial burning mass – whichever value is higher.

2-4 General assessment

The general assessment of the lights is made on basis of the inspection reports on self-monitoring and external monitoring (assessment sheets) specified by the Quality Association.

The modalities for monitoring and amendments derive from the General Quality and Inspection Specifications.

In case of a positive overall assessment, the subsequent quality mark with the additions listed in section 7 of the General Quality and Inspection Specifications is awarded:

Special Quality and Inspection Specifications for tea lights RAL-GZ 041/3

3-1 Range of application

These Special Quality and Inspection Specifications apply to tea lights.

Tea lights

- have a wax body with an external diameter of 36 - 39 mm and a height of 17mm,
- do not contain any added fragrances, colours, dyes, or beeswax,
- are burned in a non-combustible container made of metal, glass or plastics for example. The container prevents the liquid fuel from running off.

Within this scope, all requirements have to be fulfilled for the product tea lights.

3-2 Quality specifications

3-2.1 Optical and technical requirements

3-2.1.1 Appearance / wick position

When viewed with the naked eye and without technical aids, the wax surface has got to be free of impurities.

The wick has got to be positioned in the centre.

3-2.1.2 Dimensions

Standard tea lights have got the following dimensions (wax body without container, wick holder or wick):

Height	max. 17 mm
Diameter	36-39 mm

Larger dimensions and a wick that is too thick may cause an oversized flame. The dimensions of a warming stand might be insufficient for it and this could possibly result in adverse effects.

3-2.1.3 Burning behaviour / burning time

After being lit, the tea light has to show a bright calm flame and burn evenly.

The flame height has to be at least 14 mm after the initial burning phase until shortly before the flame extinguishes on its own.

The flame must burn without visible release of soot and for at least 4 hours.

Once the flame has been extinguished, the tip of the wick continues to glow for some time by its very nature. This is associated with releasing a trail of smoke. This process has to be terminated within 10 seconds.

Self-extinction at the end of the whole burning period must not occur until only a slight wax remainder is left in the container.

3-3 Test specifications

3-3.1 General notes

10 individual tea lights are subjected to the routine inspections according to sections 3-2.1.1 to 3-2.1.2 and 3-3.2 to 3-3.9 (with the exception of section 3-3.7 b).

The requirements are fulfilled if the average of the 10 tested tea lights meets them, i.e. if the arithmetic mean of all individual measurements meets them, and there are no other specifications in the respective sections.

3-3.2 Sampling for routine tests

The number of samples depends on the production output and has to be agreed upon with the external inspection institute.

Height and diameter as well as the weight of the sample - without container, wick-holder and wick - are measured and recorded in mm or g respectively.

3-3.3 Spatial conditions

For the burning test, the testing room temperature has got to range between 20 ºC and 25 ^{0}C.

The room shall be protected from draught.

3-3.4 Burning cycle for routine testing

The routine testing of the burning properties (flame height, sooting behaviour (visually according to section 3-3.7 a), burning time, wax remainder, aftersmoke time) of the tea lights is performed according to the following burning cycle:

Continuous burning until self-extinction.

The aftersmoke time is measured after a burning time of approx. 90 minutes. The flame is extinguished and the aftersmoke time is measured according to section 3-3.9. The tea light is relit immediately after the measurement and the continuous burning is continued.

The tea lights shall be burned on a heat resistant, non-flammable surface. The thermal conductivity of this surface should be as low as possible in order to minimize its influence on the burning behaviour. For this reason, burning tea lights directly on surfaces like metal or tiles is not suitable.

3-3.5 Flame height

In case of a non-optimal adjustment of burning mass and wick, the flame might be too small. During the initial burning phase (until the surface of the wax body is completely liquefied) and before the self-extinction of the flame (5 minutes before the extinction) height variations might occur however. During the remaining period, the average flame height has got to be at least 14 mm, measured from the surface of the liquid burning mass to the tip of the flame.

Assessment

Flame height at least 14 mm at all times	Requirements met
Flame height partly below 14 mm	Requirements not met

If a maximum of 1 tea lights does not meet the requirements, another 10 tea lights need to be tested. All of these have to meet the requirements in order to pass the test.

3-3.6 Burning time

The average burning time has got to be at least 4 hours. No individual tea light is allowed to go below the minimum burning time by more than 15 minutes.

Assessment

Burning time is at least 4 hours	Requirements met
Burning time is shorter than 4 hours	Requirements not met

3-3.7 Sooting behaviour

Burning with no release of soot at all is not possible for physicochemical reasons, especially in the lighting phase and directly after the flame has expired. The soot release has got to be minimized however, especially by optimally balancing candle material and wick so that the tea light emits only very small amounts of soot.

Assessment of the sooting behaviour based on two criteria

a) visually

No visible release of soot	Requirements met
Tea light soots visibly	Requirements not met

If a maximum of 1 tea lights does not meet the requirements, another 10 tea lights need to be tested. All of these have to meet the requirements in order to pass the test.

b) based on the testing procedure according to EN 15426 section 8

An hourly soot index of max. 1.0 has to be met (visible sooting can be expected at an hourly soot index of approx. 1.2 or more).

The tea light has to fulfil both criteria.

3-3.8 Minimizing of the wax remainder

The wax remainder shall be determined after self-extinction. An average wax remainder of max. 2 g has got to be met.

Assessment

Wax remainder max. 2 g	Requirements met
Wax remainder higher than 2 g.	Requirements not met

3-3.9 Aftersmoking

After the flame has been extinguished, the tip of the wick continues to glow for some time by its very nature. This is associated with releasing a trail of smoke. This process should be terminated within a period of 10 seconds.

Assessment

Aftersmoke time max. 10 seconds	Requirements met
Aftersmoke time exceeds 10 seconds	Requirements not met

3-4 General assessment

The general assessment of the tea lights is made on basis of the inspection reports on self-monitoring and external monitoring (assessment sheets) specified by the Quality Association.

The modalities for monitoring and amendments derive from the General Quality and Inspection Specifications.

In case of a positive overall assessment, the subsequent quality mark with the additions listed in section 7 of the General Quality and Inspection Specifications is awarded:

Special Quality and Inspection Specifications for grave yard lights RAL-GZ 041/4

4-1 Range of application

The present Special Quality and Inspection Specifications apply to the production of candle types described as grave yard lights. They correspondingly apply to devotion lights as well.

Grave yard lights are candle products with a uniformly blended burning mass filled in a container that prevents the molten burning mass from running off while the candle is burning. Oil lights and composition oil lights are special groups within this category.

These products are dedicated to burn uninterruptedly, i.e. until self-extinction, inside or outside cemetery lanterns outdoors, at temperatures above as well as below 0 ^{0}C.

4-2 Quality specifications

4-2.1 Raw material requirements

Annex 1 “Requirements for raw materials and additives to protect health” do not apply.

4-2.2 Optical and technical requirements

4-2.2.1 Appearance / container quality / wick position

The wick and the wick holder have to be positioned in the centre.

When viewed with the naked eye and without technical aids, the candle surface has got to be free of impurities.

After the burning is completed, the container must not show any deformation or significant indications of any scorching or smouldering caused by the flame.

4-2.2.2 Burning time

A graded product may be marketed either with the minimum burning time clearly stated or without such references. In case of a clear indication, the average fulfilment of the burning time has got to be tested.

4-2.2.3 Burning behaviour

After being lit, the product has to show a bright calm flame and burn evenly.

The flame must burn without a clearly visible release of soot.

Self-extinction at the end of the entire burning period must not occur until only a slight average wax remainder of maximal 12 % of the initial weight of the burning mass is left in the container – provided that the burning takes place under normal conditions, i.e. in the absence of atypical interferences.

4-3 Test specifications

The burning test is performed in a testing room with the temperature ranging between 15 °C and 25 ^{0}C.

Two cases have to be differentiated between:

- Grave yard lights without caps have to be burned in a cemetery lantern.
- Grave yard lights with caps have to be burned free standing.

The cemetery lantern used for the test has got to be suitably designed, i.e. the following design features are recommended:

- Dimensions: e. g. 10 cm width, 10 cm depth, 20 cm height, i.e. the interior of the lantern has got to be large enough to leave sufficient space between the light and the walls and top of the lantern - at least 3 cm sideways and 5 cm upwards.
- The lantern has got to guarantee fresh air supply and removal of the burning gas emissions.

4-4 General assessment

The general assessment of grave yard lights is made on basis of the inspection reports on self-monitoring and external monitoring (assessment sheets) specified by the Quality Association.

The modalities for monitoring and amendments derive from the General Quality and Inspection Specifications.

In case of a positive overall assessment, the subsequent quality mark with the additions listed in section 7 of the General Quality and Inspection Specifications is awarded:

Requirements for raw materials and additives to protect health

Neither the raw materials nor the additives used to manufacture graded candles nor possible impurities are allowed to have characteristics that - in the normal intended use or foreseeable misuse of candles – may have a harmful effect on the users' health or adversely affect the aesthetic appearance of the candles or their suitability for use.

In particular the following requirements I to VIII have to be met at the point in time when the raw materials or additives are handed over from supplier to candle manufacturer.

If the total of all added contents to a burning mass according to I to IV exceeds 5 percent by weight, this will be a mixture of burning masses by definition. Wicks, colours, lacquers and fragrances are exempted from this.

The individual components of burning mass mixtures made of different base materials have to meet the respective requirements I to IV.

Burning masses for which there have been no specific requirements according to I to IV defined yet are only allowed to be used at a fraction of more than 5 percent by weight for producing graded candles if they are registered for the use as candle burning mass according to REACH regulation (EC) No. 1907/2006. If there is only a pre-registration available or it is exempted from the obligation to register or REACH in general, the external monitoring institute has got to confirm that there are no health risks according to the General Quality and Testing Specifications no. 2 before the first use.

I. Requirements for paraffin wax:

Paraffin waxes have got to match "hydrogenation quality". This term represents a product purity that is characterized by the following criteria of purity irrespective of the refining methods used:

Colour Index		
Test Criteria	**Method**	**Reference value**
Saybolt colour index	ASTM D 156	≥ +24

No impairment of the colour. Colour impairment indicates the presence of unsaturated compounds as well as beginning oxidation processes. They have to be prevented so that no scent or colour changes will occur in the finished products.

Odour		
Test Criteria	**Method**	**Reference value**
Odour	ASTM D 1833	no distinctly noticeable atypical odours

No distinctly noticeable atypical odours, e.g. no odours that are typical for solvents or oxidation products. Atypical odours indicate oxidation processes and may result in odour adulterations in the finished product.

Test Method

Chosen procedure according to ASTM D 1833 section 8.2:

10 g of fine slices of the solid paraffin are put into a glass container with a capacity of 250 ml which is subsequently closed. The odour will be evaluated by at least 5 persons after 15-60 minutes.

Evaluation

The odour limit "2" ("moderate odour") must be fulfilled.

Ash Content		
Test Criteria	**Method**	**Reference value**
Ash content	DIN EN ISO 6245	max. 0.1 % wt.

If this limit is exceeded, the suction effect of the wick might be impaired.

Polycyclic Aromatic Hydrocarbons (PAH)		
Test Criteria	**Method**	**Reference value**
PAH in - paraffin waxes - microcrystalline waxes	UV absorption Ph. Eur. 7th Edition monograph 1034 FDA 172.886	Below the absorption limits of the respective method

Polycyclic aromatic hydrocarbons may be harmful to health.

Sulphur Content		
Test Criteria	**Method**	**Reference value**
Sulphur content	DIN EN ISO 20884 ASTM D 2622	max. 20 mg/kg

Exceeding this limit indicates an insufficient purification processes and may lead to undesirable sulphur dioxide emission during the burning process.

Solvent Remainders		
Test Criteria	**Method**	**Reference value**
Benzene	EWF standard method 002/03 for the determination of benzene and toluene in paraffin with HeadSpace GC	max. 0.5 mg/kg
Toluene		max. 5.0 mg/kg

UV Stability of paraffin waxes with an oil content ≤ 1,5 %		
Test Criteria	**Method**	**Reference value**
UV stability	Method*	Saybolt colour index ≥ +15**

UV Stability of paraffin waxes with an oil content > 1,5 % and microcrystalline waxes		
Test Criteria	**Method**	**Reference value**
UV stability	Method*	Saybolt colour index ≥ +5**

* enclosed
** Determination of the Saybolt colour index according to ASTM D 156

The UV stability provides indications regarding the shelf-life of the products. Poor UV stability may entail the risk of later changes in the shade of colour in the finished products.

II. Requirements for stearin:

Acid Number		
Test Criteria	**Method**	**Reference value**
Acid number	DGF C-V 2	195-215

The acid number depends on the fatty acid content and the chain length of the fatty acids. It represents a purity criteria with regard to the C chain length which is particularly favoured in stearin for candles. Higher acid numbers point to higher percentage of short-chain fatty acids, lower acid numbers point to higher percentage of long-chain fatty acids. The range of 195-215 cited here represents an ideal value for stearin for candles consisting predominantly of C-16 and C-18 fatty acids.

Ester Number		
Test Criteria	**Method**	**Reference value**
Ester number	DGF C-V 4	max. 2

The ester number is a measurement for the content of non-saponified fatty acid esters.

Iodine Number		
Test Criteria	**Method**	**Reference value**
Iodine number	DGF C-V 11 d	max. 1

Too high iodine numbers indicate a high content of unsaturated fatty acids (e.g. oleic acid) in stearin for candles. On the one hand this leads to a low melting point, on the other hand to discolouration and to impairment of the odour (= rancidity).

Peroxide Number		
Test Criteria	**Method**	**Reference value**
Peroxide number according to Wheeler	DGF C-VI 6a	max. 10

The peroxide number is a measurement for the degree of beginning oxidation processes in the candle stearin.
High values indicate possible oxidative decomposition that may lead to ageing phenomena and off-odour.

Congealing Point / Titre		
Test Criteria	**Method**	**Reference value**
Congealing point / titre	DGF C-IV 3c	52-61 °C

The congealing point is a function of the C chain length, C chain mixture ratios and the iodine number; it should ideally range between 52 and 61 ^{0}C to guarantee optimum properties such as stability and shrinking behaviour.

Lovibond Tint Index (FF 5¼")		
Test Criteria	**Method**	**Reference value**
Lovibond tint index (FF 5¼")	DGF C-IV 4b	max. 5.0 yellow max. 1.0 red

Candles require raw materials that are ideally light in colour. The Lovibond tint index provides information on the colouration; both its red and yellow values should be as low as possible.

Non-saponifiable Matter		
Test Criteria	**Method**	**Reference value**
Non-saponifiable matter	DGF C-III 1a-1b	max. 1 % wt.

This value is a criterion for the purity. Upward deviation results in poorer or irregular burning behaviour.

Ash Content		
Test Criteria	**Method**	**Reference value**
Ash content	DGF C-III 10	max. 0.1 % wt.

A low ash content is necessary to avoid an impaired suction effect of candle wicks.

III. Requirements for beeswax:

Prior to processing into wax compositions or pure beeswax candles, beeswax has got to be genuine and unadulterated and possess sufficient purity from undesired components. Genuine beeswax is a metabolic product of the honeybee and used to build honeycombs.

Test Criteria	Test methods	Reference values
Dripping point	according to DAB 10	61-65 °C
Acid number	according to DAB 10	17-24
Saponification number	according to DAB 10	87-104
Ester number	according to DAB 10	70-80
Ratio number	according to DAB 10	3.3-4.3
Total hydrocarbons	according to DGF M-V 6	max. 18 %

To identify adulterations, a gas chromatogram may be utilized additionally. It shows additions of foreign hydrocarbons, esters, fatty alcohols and fatty acids.

The Mettler apparatus may be used to determine the drop point (see table above) as well.

IV. Requirements for fats and oils

The vegetable and animal fats and oils used for manufacturing candles are characterized by the following requirements:

Elements		
Test Criteria	**Method**	**Reference value**
Iron	DIN EN 13805	max. 1 mg/kg
Copper	DIN EN 15763	max. 0.1 mg/kg
Nickel		max. 2 mg/kg
Cadmium		max. 0.1 mg/kg
Mercury		max. 0.1 mg/kg
Lead		max. 0.1 mg/kg
Arsenic		max. 0.1 mg/kg

Metals and other elements contained in the base materials can result in undesirable changes because of their catalytic activity. There are also indoor air limits for some elements.

Free fatty acids (FFA)		
Test Criteria	**Method**	**Reference value**
Free Fatty Acids	DGF C-V 2	max. 2.0 % wt.

The presence of short-chained fatty acids can be an indication of deterioration.

Peroxide number		
Test Criteria	**Method**	**Reference value**
Peroxide number according to Wheeler	DGF C-VI 6a	max. 10

The peroxide number is an indication of the degree of beginning oxidation processes. High values indicate a possible oxidative decomposition that may impair the appearance and smell.

Lovibond tint index (FF 5¼")		
Test Criteria	**Method**	**Reference value**
Lovibond tint index (FF 5¼")	DGF C-IV 4b	max. 3.5 red

The Lovibond tint index provides information on colouration; both its red and yellow values should be as low as possible since fats and oils get increasingly prone to oxidation with increasing colouration.

Ash content		
Test Criteria	**Method**	**Reference value**
Ash content	DGF C-III 10	max. 0.1 % wt.

Low ash contents are necessary to avoid an impaired suction effect of candle wicks.

Water content		
Test Criteria	**Method**	**Reference value**
Water content	DGF C-III 13a or 13b	max. 0.15 % wt.

High water contents may impair proper combustion.

Odour		
Test Criteria	**Method**	**Reference value**
Odour	DGF C-II	no distinctly noticeable atypical odours

Deviations from test method:

The fats are assessed at a temperature between 10 and 15 °C above their melting point.

Only the smell is assessed.

The assessment does not need to be done with the listed evaluation categories.

A sample fails the test if it shows distinctly noticeable atypical odours and odours indicating deterioration. Please note that fats and oils with different origin may

partly have a significant characteristic smell of their own that is typical however and does not result in a negative evaluation.

Oxidative Stability (OSI)		
Test Criteria	**Method**	**Reference value**
Oil Stability Index (OSI) at 120 °C	ISO 6886	no reference value; the OSI is only supposed to be stated

There is not enough experience yet to assess the actual oxidation stability based on the OSI. With the suppliers showing the OSI on their certificates for information only, the quality and quantity of data is supposed to be improved with the objective to define a reference value later.

V. Requirements for wicks

a. The wick consists of uniform, tear-resistant yarn made of medium-stapled and long-stapled fibres on cellulosic basis.
b. Cotton has got to fulfil the criteria of Öko-Tex Standards 100 I or II.
c. Other materials may be used for supporting threads if their intended use as candle wick is in line with the aspects of preventive health protection.
d. Wicks must not contain more than 5 mg/kg lead or 5 mg/kg nickel.
e. The design of the wick has got to comply with the manufacturer´s documentation.

VI. Requirements for candle colours (formulations with pigment and/or liquid colours and dyes)

a. Toxicology: No health hazard potential as a matter of principle if the candle colour is used according to the candle colour producers´ specifications.

b. EN 71 part 3 (German edition 2002) lists limit values for the migration of certain elements from toys (see table 1). These migration limit values shall also apply to candles produced with candle colours. The limit for chromium shall only apply for hexavalent chromium (Cr (VI)) however.

c. It is not allowed to use candle colours that are classified in the following hazard classes according to Regulation (EC) No. 1272/2008 on classification, labelling and packaging of substances and mixtures:

   Acute toxicity (Category code 1, 2 or 3)
   Carcinogenicity (Category code 1A, 1B or 2)
   Germ cell mutagenicity (Category code 1A, 1B or 2)
   Reproductive toxicity (Category code 1A, 1B or 2)

d. It is not allowed to use candle colours that could result in exceeding the following contents of aromatic solvent remainders in the finished candle:

   Benzene: 0.5 ppm
   Toluene: 5.0 ppm
   Ethylbenzene: 20 ppm
   Total Xylenes: 20 ppm

   Test method corresponding to EWF standard method 002/03 for the determination of benzene and toluene in paraffin with HeadSpace GC.

e. It is not allowed to use candle colours that could release one or more of the amines listed in Regulation (EC) No. 1907/2006 Annex XVII no. 43 in a concentration that exceeds 30 ppm for each individual amine component in the finished candle by splitting azo groups when applying an analysis method published according to § 64 LFGB (German Food and Feed Code).

f. It is not allowed to use candle colours that could result in exceeding the following limits for polycyclic aromatic hydrocarbons (PAH) in the finished candles:

   Benzo[a]pyrene (CAS: 50-32-8): 1 ppm
   Total of the following PAH: 10 ppm
   Benzo[a]pyrene (CAS: 50-32-8)
   Benzo[e]pyrene (CAS: 192-97-2)
   Benzo[a]anthracene (CAS: 56-55-3)
   Chrysene (CAS: 218-01-9)
   Benzo[b]fluoranthene (CAS: 205-99-2)
   Benzo[j]fluoranthene (CAS: 205-82-3)
   Benzo[k]fluoranthene (CAS: 207-08-9)
   Dibenzo[a,h]anthracene (CAS: 53-70-3)
   Naphthalene (CAS: 91-20-3)

g. Candle colours must not contain more than 0.1 % wt. of the following phthalates:

   DEHP Bis(2-ethylhexyl)phthalate
   DBP Dibutylphthalate
   BBP Benzylbutylphthalate
   DINP Diisononylphthalate
   DIDP Diisodecylphthalate
   DNOP Di-n-octylphthalate
   DIBP Diisobutylphthalate

   Test method: DIN EN 15777 (GC-MS)

VII. Requirements for candle lacquers:

a. Toxicology: No health hazard potential as a matter of principle if the lacquer is used according to the lacquer producers´ specifications.

b. EN 71 part 3 (German edition 2002) lists limit values for the migration of certain elements from toys (see table 1). These migration limit values shall also apply to candles produced with lacquers. The limit for chromium shall only apply for hexavalent chromium (Cr (VI)) however.

c. It is not allowed to use lacquers that are classified in the following hazard classes according to Regulation (EC) No. 1272/2008 on classification, labelling and packaging of substances and mixtures:

   Acute toxicity (Category code 1, 2 or 3)
   Carcinogenicity (Category code 1A, 1B or 2)
   Germ cell mutagenicity (Category code 1A, 1B or 2)
   Reproductive toxicity (Category code 1A, 1B or 2)

d. Maximum tolerable content of selected aromatic solvent remainders in the dry film of the candle lacquer on the finished candle:

Benzene:	0.5 ppm
Toluene:	5.0 ppm
Ethylbenzene:	20 ppm (50 ppm for screen printing lacquers)
Total Xylenes:	20 ppm (50 ppm for screen printing lacquers)

Test method corresponding to EWF standard method 002/03 for the determination of benzene and toluene in paraffin with HeadSpace GC.

e. It is not allowed to use lacquers that could release one or more of the amines listed in Regulation (EC) No. 1907/2006 Annex XVII no. 43 in a concentration that exceeds 30 ppm for each individual amine component in the finished candle by splitting azo groups when applying an analysis method published according to § 64 LFGB (German Food and Feed Code).

f. It is not allowed to use candle colours that could result in exceeding the following limits for polycyclic aromatic hydrocarbons (PAH) in the finished candles:

Benzo[a]pyrene (CAS: 50-32-8):	1 ppm
Total of the following PAH:	10 ppm

Benzo[a]pyrene (CAS: 50-32-8)
Benzo[e]pyrene (CAS: 192-97-2)
Benzo[a]anthracene (CAS: 56-55-3)
Chrysene (CAS: 218-01-9)
Benzo[b]fluoranthene (CAS: 205-99-2)
Benzo[j]fluoranthene (CAS: 205-82-3)
Benzo[k]fluoranthene (CAS: 207-08-9)
Dibenzo[a,h]anthracene (CAS: 53-70-3)
Naphthalene (CAS: 91-20-3)

g. Lacquers must not contain more than 0.1 % wt. of the following phthalates:

DEHP	Bis(2-ethylhexyl)phthalate
DBP	Dibutylphthalate
BBP	Benzylbutylphthalate
DINP	Diisononylphthalate
DIDP	Diisodecylphthalate
DNOP	Di-n-octylphthalate
DIBP	Diisobutylphthalate

Test method: DIN EN 15777 (GC-MS)

VIII. Requirements for fragrances

a. Fragrances have to comply with the IFRA Standards[1], particularly regarding possible purity requirements for or prohibitions or restrictions of ingredients for the use in candles.
b. Fragrances must not contain halogenated ingredients or contaminations above a technically unavoidable level.
c. The Quality Committee may set rules for the use or labelling of fragrances in candles that go beyond legal requirements.

[1] The Standards of the International Fragrance Association (IFRA) form the basis for the globally accepted and recognized risk management system for the safe use of fragrance ingredients and are part of the IFRA Code of Practice.

Table 1:
Limit values for the migration of elements from toy materials

Element		**Sb**	**As**	**Ba**	**Cd**	**Cr**	**Pb**	**Hg**	**Se**
max. migrated element in mg/kg toy material	all materials listed in section 1, except for moulding compounds	60	25	1000	75	60	90	60	500
	Moulding compounds	60	25	250	50	25	90	25	500

Regulations for the Award and Use of the Candle Quality Mark

1 Quality basis

The quality basis for the quality mark consists of the General Quality and Test Specifications for Candles and the respective Special Quality and Inspection Specifications for the single product range (grave yard lights, tea lights, etc.). They will be supplemented and developed further in line with technical progress.

2 Award

2.1 The Quality Association for Candles awards applying manufacturers the right to use the Quality Mark for Candles.

2.2 The application needs to be made in writing to the Office of the Quality Association for Candles. A notice of obligation (pattern 1) with a legally binding signature on it needs to be enclosed with the application.

2.3 The application will be examined by the Quality Committee. The Quality Committee will instruct sworn experts or officially recognized testing organizations to test the applicant´s products according to the General and applicable Special Quality and Testing Specifications. The expert or testing organization staff are authorised to inspect the applicant´s company and to check the performed efforts according to the General and applicable Special Quality and Testing Specifications and the documentation mentioned in the Quality basis. They will issue an inspection report and send it to the applicant and the Quality Association´s Board. The inspector has got to show his credentials before commencing his inspection. The costs of the inspection shall be borne by the applicant.

2.4 If the test is positive, the Executive Board of the Quality Association will award the quality mark to the applicant after having received a proposal from the Quality Committee. The award will be certified (pattern 2). If the test is negative, the Quality Committee defers the application. The deferral must be justified in writing.

3 Use

3.1 Users of the mark may only use the quality mark for products that comply with the General and applicable Special Quality and Testing Specifications.

3.2 The Quality Association and, after having requested, also the quality mark users are allowed to produce equipment to apply the quality mark (metal stamps, coining dies, printing blocks, seals, seal stamps, rubber stamps, etc.). The Quality Association defines their way of use.

3.3 The Executive Board can issue special rules and regulations concerning the use of the quality mark in advertising and in association advertising to maintain the integrity of competition and to prevent misuse of the mark. Individual advertising may not be hindered by this. The same maxim of integrity applies to this.

3.4 If the right to use the mark has been legally removed, then the certificate of the award and all markers of the quality mark must be returned; there is no right to reimbursement. The same applies if the right to use the quality mark has expired for other reasons.

4 Monitoring

4.1 The Quality Association is entitled and obliged to monitor use of the quality mark and compliance with the respective quality and testing specifications. Continuity of monitoring is to be proven to RAL by a monitoring agreement with a neutral testing institute or testing agent.

4.2 All quality mark users must take their own measures to ensure that the general and applicable special quality and test specifications are complied with. Continuous quality control becomes obligatory. Company-internal tests carried out must be meticulously recorded. The Quality Committee representative can view the records at any time. The user of the quality mark subjects his quality mark assured products to the monitoring tests of the Quality Committee and its representatives to the extent and frequency appropriate for the corresponding requirements of the general and applicable special quality and testing specifications. He will bear the testing costs.

The inspector´s duty to legitimize before commencing his inspection must not delay the course of action.

4.3 If a test is negative or if fault is found with a product, then the Quality Committee will have the test repeated.

4.4 A certificate is to be issued on every test result attained by the commissioned inspector or testing institute. The Quality Association and the quality mark user will each be given an official copy of this.

4.6 If fault is unjustly found with products, then the faultfinder will bear the test costs; if fault is justly found with them, then the costs will be borne by the respective user of the quality mark.

5 Penalties for violations

5.1 If deficiencies are ascertained in quality assurance by the Quality Committee, then the committee will suggest penalties to the Executive Board of the Quality Association. These are, depending on the seriousness of the violation:

5.1.1 Additional tasks within the framework of internal monitoring,

5.1.2 Increase in external monitoring,

5.1.3 Issue of a warning on pain of a contractual fine,

5.1.4 A contractual fine of up to € 5.000,- depending on the severity of the infringement. The payment to the Quality Association has got to be made within a period of 14 days after the fine has become legally binding.

If the user gains any cost savings because of the infringement, the contractual fine shall financially countervail these cost savings and may therefore exceed the amount of € 5.000,-.

5.1.5 Temporary (for at least 12 months) or permanent withdrawal of the quality mark,

5.1.6 Exclusion from the Quality Association.

5.2 In case of violations according to section 5.1.4 second paragraph, the quality mark user shall inform his concerned customers with a letter. This letter will be sent by the Quality Association together with a constructive cover letter.

In case of repeated violations, a fine of at least € 5.000,- has got to be imposed and more frequent external monitoring inspections have got to be ordered or the quality mark has got to be withdrawn (section 5.1.6).

5.3 Section 5.1.6 of these regulations applies to quality mark users who violate sections 3 or 4 repeatedly or seriously. Section 5.1.5 applies if inspections are intentionally prevented or delayed.

5.4 The measures listed in section 5.1 can be combined.

5.5 The person concerned must be listened to before any measures are taken.

5.6 The penalty measures become effective with their legal validity.

5.7 In urgent cases the Managing Director of the Quality Association can withdraw the quality mark temporarily with immediate effect. Such action must be confirmed by the Board of the Quality Association within 14 days.

6 Complaint

6.1 Users of the mark can object to a notice of penalty within 4 weeks of its receipt. Such written objections must be addressed to the Managing Director who will decide on it together with the Quality Committee and the Executive Board.

6.2 If the Executive Board rejects the objection, the complaining user can take legal action within 4 weeks after receiving notice of the rejection. Section 11 of the Statues of the Quality Association for Candles shall apply.

7 Reinstatement

If the right to use the quality mark has been withdrawn, then it cannot be reinstated for at least twelve months. Procedure is determined in accordance with section 2. The Executive Board of the Quality Association can, however, impose additional conditions.

8 Amendments

These implementation regulations and samples (notice of obligation, awarding certificate) are recognized by RAL. Amendments, including editorial ones, need prior permission from RAL in writing to be effective. They come into force within a suitable period after the Executive Board of the Quality Association having given notice of them.

Notice of Obligation

1. The signing person/company herewith applies to the Quality Association for Candles

   - o for membership *
   - o for being awarded the right to use the RAL candle quality mark*
     in connection with the product-related reference in accordance with section 2 of this notice of obligation

2. The signatory confirms that he has taken note of

   - the General Quality Inspection Specifications for Candles in connection with the
     - o Special Quality and Inspection Specifications for household candles, tapered candles, pillar candles, etc. (RAL-GZ 041/1)*
     - o Special Quality and Inspection Specifications for lights for indoor use (RAL-GZ 041/2)*
     - o Special Quality and Inspection Specifications for tea lights (RAL-GZ 041/3)*
     - o Special Quality and Inspection Specifications for grave yard lights (RAL-GZ 041/4)*
   - the Statutes of the Quality Association for Candles
   - the Quality Mark Statutes,
   - the Regulations for the Award and Use of the Candle Quality Mark, including patterns 1 and 2

   and acknowledges them as unreservedly binding.

_____ _____

Place, date (Stamp and legally binding signature)

* mark valid with a cross

Pattern 2 – Awarding Certificate

Awarding Certificate

The Quality Association for Candles herewith awards,
due to the present test report of its Quality Committee, the following mark for

_____
(candle type)

to

_____
(company)

which is accepted by RAL
(RAL German Institute for Quality Assurance and Marking) and
protected by the law of trademarks and registered at the German Patent Office:

“Quality Mark Candles”

RAL
QUALITY MARK
CANDLES

Quality Association for Candles

_____,
(Place)

_____
(Date)

_____
Chairman

_____
Manager