

## DIRECTIVES

## COMMISSION DIRECTIVE 2008/128/EC

of 22 December 2008

## laying down specific purity criteria concerning colours for use in foodstuffs

(Codified version)

(Text with EEA relevance)

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Community,

Having regard to Council Directive 89/107/EEC of 21 December 1988 on the approximation of the laws of the Member States concerning food additives authorized for use in foodstuffs intended for human consumption<sup>(1)</sup>, and in particular Article 3(3)(a) thereof,

Whereas:

- (1) Commission Directive 95/45/EC of 26 July 1995 laying down specific criteria concerning colours for use in foodstuffs<sup>(2)</sup> has been substantially amended several times<sup>(3)</sup>. In the interests of clarity and rationality the said Directive should be codified.
- (2) It is necessary to establish purity criteria for all colours mentioned in European Parliament and Council Directive 94/36/EC of 30 June 1994 on colours for use in foodstuffs<sup>(4)</sup>.
- (3) It is necessary to take into account the specifications and analytical techniques for colours as set out in the Codex Alimentarius as drafted by the Joint FAO/WHO Expert Committee on Food Additives (JECFA).
- (4) Food additives prepared by production methods or starting materials significantly different from those evaluated by the Scientific Committee for Food or different from those mentioned in this Directive should be submitted for safety evaluation by the European Food Safety Authority with emphasis on the purity criteria.
- (5) The measures provided for in this Directive are in accordance with the opinion of the Standing Committee on the Food Chain and Animal Health.

- (6) This Directive should be without prejudice to the obligations of the Member States relating to the time-limits for transposition into national law of the Directives set out in Annex II, Part B,

HAS ADOPTED THIS DIRECTIVE:

*Article 1*

The purity criteria referred to in Article 3(3)(a) of Directive 89/107/EEC for colours mentioned in Directive 94/36/EC are set out in Annex I hereto.

*Article 2*

Directive 95/45/EC, as amended by the Directives listed in Annex II, Part A, is repealed, without prejudice to the obligations of the Member States relating to the time-limits for transposition into national law of the Directives set out in Annex II, Part B.

References to the repealed Directive shall be construed as references to this Directive and shall be read in accordance with the correlation table in Annex III.

*Article 3*

This Directive shall enter into force on the 20th day following that of its publication in the *Official Journal of the European Union*.

*Article 4*

This Directive is addressed to the Member States.

Done at Brussels, 22 December 2008.

*For the Commission*

*The President*

José Manuel BARROSO

<sup>(1)</sup> OJ L 40, 11.2.1989, p. 27.

<sup>(2)</sup> OJ L 226, 22.9.1995, p. 1.

<sup>(3)</sup> See Annex II, Part A.

<sup>(4)</sup> OJ L 237, 10.9.1994, p. 13.

## ANNEX I

## A. GENERAL SPECIFICATIONS FOR ALUMINIUM LAKES OF COLOURS

<b>Definition</b>	Aluminium lakes are prepared by reacting colours complying with the purity criteria set out in the appropriate specification monograph with alumina under aqueous conditions. The alumina is usually freshly prepared undried material made by reacting aluminium sulfate or chloride with sodium or calcium carbonate or bicarbonate or ammonia. Following lake formation, the product is filtered, washed with water and dried. Unreacted alumina may also be present in the finished product.
HCl insoluble matter	Not more than 0,5 %
Ether extractable matter	Not more than 0,2 % (under neutral conditions)
	Specific purity criteria for the corresponding colours are applicable.

## B. SPECIFIC CRITERIA OF PURITY

## E 100 CURCUMIN

<b>Synonyms</b>	CI Natural Yellow 3, Turmeric Yellow, Diferoyl Methane
<b>Definition</b>	Curcumin is obtained by solvent extraction of turmeric i.e. the ground rhizomes of natural strains of <i>Curcuma longa</i> L. In order to obtain a concentrated curcumin powder, the extract is purified by crystallisation. The product consists essentially of curcumins; i.e. the colouring principle (1,7-bis(4-hydroxy-3-methoxyphenyl)hepta-1,6-dien-3,5-dione) and its two desmethoxy derivatives in varying proportions. Minor amounts of oils and resins naturally occurring in turmeric may be present.  Only the following solvents may be used in the extraction: ethylacetate, acetone, carbon dioxide, dichloromethane, n-butanol, methanol, ethanol, hexane.
Class	Dicinnamoylmethane
Colour Index No	75300
Einecs	207-280-5
Chemical names	I 1,7-Bis(4-hydroxy-3-methoxyphenyl)hepta-1,6-diene-3,5-dione II 1-(4-Hydroxyphenyl)-7-(4-hydroxy-3-methoxy-phenyl)-hepta-1,6-diene-3,5-dione III 1,7-Bis(4-hydroxyphenyl)hepta-1,6-diene-3,5-dione
Chemical formula	I $C_{21}H_{20}O_6$ II $C_{20}H_{18}O_5$ III $C_{19}H_{16}O_4$
Molecular weight	I. 368,39 II. 338,39 III. 308,39
Assay	Content not less than 90 % total colouring matters $E_{1\text{ cm}}^{1\%}$ 1 607 at ca 426 nm in ethanol
<b>Description</b>	Orange-yellow crystalline powder
<b>Identification</b>	
A. Spectrometry	Maximum in ethanol at ca 426 nm
B. Melting Range	179 °C-182 °C

<b>Purity</b>									
Solvent residues	<table border="0"> <tr> <td>Ethylacetate</td> <td rowspan="6">}</td> <td rowspan="6">Not more than 50 mg/kg, singly or in combination</td> </tr> <tr> <td>Acetone</td> </tr> <tr> <td>n-butanol</td> </tr> <tr> <td>Methanol</td> </tr> <tr> <td>Ethanol</td> </tr> <tr> <td>Hexane</td> </tr> </table>	Ethylacetate	}	Not more than 50 mg/kg, singly or in combination	Acetone	n-butanol	Methanol	Ethanol	Hexane
Ethylacetate	}	Not more than 50 mg/kg, singly or in combination							
Acetone									
n-butanol									
Methanol									
Ethanol									
Hexane									
	Dichloromethane: not more than 10 mg/kg								
Arsenic	Not more than 3 mg/kg								
Lead	Not more than 10 mg/kg								
Mercury	Not more than 1 mg/kg								
Cadmium	Not more than 1 mg/kg								
Heavy metals (as Pb)	Not more than 40 mg/kg								
E 101 (i) RIBOFLAVIN									
<b>Synonyms</b>	Lactoflavin								
Class	Isoalloxazine								
Einecs	201-507-1								
Chemical names	7,8-Dimethyl-10-(D-ribo-2,3,4,5-tetrahydroxypentyl)benzo(g)pteridine-2,4 (3H,10H)-dione  7,8-dimethyl-10-(1'-D-ribityl)isoalloxazine								
Chemical formula	$C_{17}H_{20}N_4O_6$								
Molecular weight	376,37								
Assay	Content not less than 98 % on the anhydrous basis  $E_{1\text{ cm}}^{1\%}$ 328 at ca 444 nm in aqueous solution								
<b>Description</b>	Yellow to orange-yellow crystalline powder, with slight odour								
<b>Identification</b>									
A. Spectrometry	<table border="0"> <tr> <td>The ratio <math>A_{375}/A_{267}</math> is between 0,31 and 0,33</td> <td rowspan="2">}</td> <td rowspan="2">in aqueous solution</td> </tr> <tr> <td>The ratio <math>A_{444}/A_{267}</math> is between 0,36 and 0,39</td> </tr> </table>	The ratio $A_{375}/A_{267}$ is between 0,31 and 0,33	}	in aqueous solution	The ratio $A_{444}/A_{267}$ is between 0,36 and 0,39				
The ratio $A_{375}/A_{267}$ is between 0,31 and 0,33	}	in aqueous solution							
The ratio $A_{444}/A_{267}$ is between 0,36 and 0,39									
	Maximum in water at ca 444 nm								
B. Specific rotation	$[\alpha]_D^{20}$ between $-115^\circ$ and $-140^\circ$ in a 0,05 N sodium hydroxide solution								
<b>Purity</b>									
Loss on drying	Not more than 1,5 % after drying at 105 °C for 4 hrs								
Sulfated ash	Not more than 0,1 %								
Primary aromatic amines	Not more than 100 mg/kg (calculated as aniline)								
Arsenic	Not more than 3 mg/kg								
Lead	Not more than 10 mg/kg								
Mercury	Not more than 1 mg/kg								
Cadmium	Not more than 1 mg/kg								
Heavy metals (as Pb)	Not more than 40 mg/kg								

## E 101 (ii) RIBOFLAVIN-5'-PHOSPHATE

<b>Synonyms</b>	Riboflavin-5'-phosphate sodium
<b>Definition</b>	These specifications apply to riboflavin 5'-phosphate together with minor amounts of free riboflavin and riboflavin diphosphate

Class	Isoalloxazine
Einecs	204-988-6
Chemical names	Monosodium  (2R,3R,4S)-5-(3')10'-dihydro-7',8'-dimethyl-2',4'-dioxo-10'-benzo[γ]pteridiny]-2,3,4-trihydroxypentyl phosphate;  monosodium salt of 5'-monophosphate ester of riboflavin
Chemical formula	For the dihydrate form: $C_{17}H_{20}N_4NaO_9P \cdot 2H_2O$  For the anhydrous form: $C_{17}H_{20}N_4NaO_9P$
Molecular weight	541,36
Assay	Content not less than 95 % total colouring matters calculated as $C_{17}H_{20}N_4NaO_9P \cdot 2H_2O$  $E_{1\text{ cm}}^{1\%}$ 250 at ca 375 nm in aqueous solution
<b>Description</b>	Yellow to orange crystalline hygroscopic powder, with slight odour and a bitter taste
<b>Identification</b>	
A. Spectrometry	The ratio $A_{375}/A_{267}$ is between 0,30 and 0,34 The ratio $A_{444}/A_{267}$ is between 0,35 and 0,40 Maximum in water at ca 444 nm } in aqueous solution
B. Specific rotation	$[\alpha]_{D20}$ between + 38° and + 42° in a 5 molar HCl solution
<b>Purity</b>	
Loss on drying	Not more than 8 % (100 °C, 5 hrs in vacuum over $P_2O_5$ ) for the dihydrate form
Sulfated ash	Not more than 25 %
Inorganic phosphate	Not more than 1,0 % (calculated as $PO_4$ on the anhydrous basis)
Subsidiary colouring matters	Riboflavin (free): Not more than 6 %  Riboflavine diphosphate: Not more than 6 %
Primary aromatic amines	Not more than 70 mg/kg (calculated as aniline)
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

## E 102 TARTRAZINE

**Synonyms**

CI Food Yellow 4

**Definition**

Tartrazine consists essentially of trisodium 5-hydroxy-1-(4-sulfonatophenyl)-4-(4-sulfonatophenylazo)-H-pyrazole-3-carboxylate and subsidiary colouring matters together with sodium chloride and/or sodium sulfate as the principal uncoloured components.

Tartrazine is described as the sodium salt. The calcium and the potassium salt are also permitted.

Class	Monoazo
Colour Index No	19140
Einecs	217-699-5
Chemical names	Trisodium-5-hydroxy-1-(4-sulfonatophenyl)-4-(4-sulfonatophenylazo)-H-pyrazole-3-carboxylate
Chemical formula	$C_{16}H_9N_4Na_3O_9S_2$

Molecular weight	534,37
Assay	Content not less than 85 % total colouring matters calculated as the sodium salt $E_{1\text{ cm}}^{1\%}$ 530 at ca 426 nm in aqueous solution
<b>Description</b>	Light orange powder or granules
<b>Identification</b>	
A. Spectrometry	Maximum in water at ca 426 nm
B. Yellow solution in water	
<b>Purity</b>	
Water insoluble matter	Not more than 0,2 %
Subsidiary colouring matters	Not more than 1,0 %
Organic compounds other than colouring matters:	
4-hydrazinobenzene sulfonic acid	} Total not more than 0,5 %
4-aminobenzene-1-sulfonic acid	
5-oxo-1-(4-sulfophenyl)-2-pyrazoline-3-carboxylic acid	
4,4'-diazaminodi(benzene sulfonic acid)	
Tetrahydroxysuccinic acid	
Unulfonated primary aromatic amines	Not more than 0,01 % (calculated as aniline)
Ether extractable matter	Not more than 0,2 % under neutral conditions
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

## E 104 QUINOLINE YELLOW

<b>Synonyms</b>	CI Food Yellow 13
<b>Definition</b>	Quinoline Yellow is prepared by sulfonating 2-(2-quinolylyl) indan-1,3-dione. Quinoline Yellow consists essentially of sodium salts of a mixture of disulfonates (principally), monosulfonates and trisulfonates of the above compound and subsidiary colouring matters together with sodium chloride and/or sodium sulfate as the principal uncoloured components.  Quinoline Yellow is described as the sodium salt. The calcium and the potassium salt are also permitted.
Class	Chinophthalone
Colour Index No	47005
Einecs	305-897-5
Chemical name	The disodium salts of the disulfonates of 2-(2-quinolylyl) indan-1,3-dione (principal component)
Chemical formula	$C_{18}H_9N Na_2O_8S_2$ (principal component)
Molecular weight	477,38 (principal component)

Assay	Content not less than 70 % total colouring matters calculated as the sodium salt Quinoline Yellow shall have the following composition: Of the total colouring matters present: — not less than 80 % shall be disodium 2-(2-quinolylyl) indan-1,3-dione-disulfonates — not more than 15 % shall be sodium 2-(2-quinolylyl) indan-1,3-dione-monosulfonates — not more than 7,0 % shall be trisodium 2-(2-quinolylyl) indan-1,3-dione-trisulfonate $E_{1\text{ cm}}^{1\%}$ 865 (principal component) at ca 411 nm in aqueous acetic acid solution
<b>Description</b>	Yellow powder or granules
<b>Identification</b>	
A. Spectrometry	Maximum in aqueous acetic acid solution of pH 5 at ca 411 nm
B. Yellow solution in water	
<b>Purity</b>	
Water insoluble matter	Not more than 0,2 %
Subsidiary colouring matters	Not more than 4,0 %
Organic compounds other than colouring matters:	
2-methylquinoline	} Total not more than 0,5 %
2-methylquinoline-sulfonic acid	
Phthalic acid	
2,6-dimethyl quinoline	
2,6-dimethyl quinoline sulfonic acid	
2-(2-quinolylyl)indan-1,3-dione	Not more than 4 mg/kg
Unulfonated primary aromatic amines	Not more than 0,01 % (calculated as aniline)
Ether extractable matter	Not more than 0,2 % under neutral conditions
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

## E 110 SUNSET YELLOW FCF

**Synonyms**

CI Food Yellow 3, Orange Yellow S

**Definition**

Sunset Yellow FCF consists essentially of disodium 2-hydroxy-1-(4-sulfonatophenylazo) naphthalene-6-sulfonate and subsidiary colouring matters together with sodium chloride and/or sodium sulfate as the principal uncoloured components.

Sunset Yellow FCF is described as the sodium salt. The calcium and the potassium salt are also permitted.

Class

Monoazo

Colour Index No

15985

Einecs

220-491-7

Chemical names

Disodium 2-hydroxy-1-(4-sulfonatophenylazo)naphthalene-6-sulfonate

Chemical formula	$C_{16}H_{10}N_2Na_2O_7S_2$
Molecular weight	452,37
Assay	Content not less than 85 % total colouring matters calculated as the sodium salt $E_{1\text{ cm}}^{1\%}$ 555 at ca 485 nm in aqueous solution at pH 7
<b>Description</b>	Orange-red powder or granules
<b>Identification</b>	
A. Spectrometry	Maximum in water at ca 485 nm at pH 7
B. Orange solution in water	
<b>Purity</b>	
Water insoluble matter	Not more than 0,2 %
Subsidiary colouring matters	Not more than 5,0 %
1-(Phenylazo)-2-naphthalenol (Sudan I)	Not more than 0,5 mg/kg
Organic compounds other than colouring matters:	
4-aminobenzene-1-sulfonic acid	} Total not more than 0,5 %
3-hydroxynaphthalene-2,7-disulfonic acid	
6-hydroxynaphthalene-2-sulfonic acid	
7-hydroxynaphthalene-1,3-disulfonic acid	
4,4'-diazoaminodi(benzene sulfonic acid)	
6,6'-oxydi(naphthalene-2-sulfonic acid)	
Unulfonated primary aromatic amines	Not more than 0,01 % (calculated as aniline)
Ether extractable matter	Not more than 0,2 % under neutral conditions
Arsenic	Not more than 3 mg/kg
Lead	Not more than 2 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg

## E 120 COCHINEAL, CARMINIC ACID, CARMINES

<b>Definition</b>	<p>Carmines and carminic acid are obtained from aqueous, aqueous alcoholic or alcoholic extracts from Cochineal, which consists of the dried bodies of the female insect <i>Dactylopius coccus</i> Costa.</p> <p>The colouring principle is carminic acid.</p> <p>Aluminium lakes of carminic acid (carmines) can be formed in which aluminium and carminic acid are thought to be present in the molar ratio 1:2.</p> <p>In commercial products the colouring principle is present in association with ammonium, calcium, potassium or sodium cations, singly or in combination, and these cations may also be present in excess.</p> <p>Commercial products may also contain proteinaceous material derived from the source insect, and may also contain free carminate or a small residue of unbound aluminium cations.</p>
Class	Anthraquinone
Colour Index No	75470
Einecs	Cochineal: 215-680-6; carminic acid: 215-023-3; carmines: 215-724-4

Chemical names	7-β-D-glucopyranosyl-3,5,6,8-tetrahydroxy-1-methyl-9,10-dioxoanthracene-2-carboxylic acid (carminic acid); carmine is the hydrated aluminium chelate of this acid
Chemical formula	C <sub>22</sub> H <sub>20</sub> O <sub>13</sub> (carminic acid)
Molecular weight	492,39 (carminic acid)
Assay	Content not less than 2,0 % carminic acid in the extracts containing carminic acid; not less than 50 % carminic acid in the chelates.
<b>Description</b>	Red to dark red, friable, solid or powder. Cochineal extract is generally a dark red liquid but can also be dried as a powder.
<b>Identification</b>	
Spectrometry	Maximum in aqueous ammonia solution at ca 518 nm Maximum in dilute hydrochloric solution at ca 494 nm for carminic acid
<b>Purity</b>	
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

## E 122 AZORUBINE, CARMOISINE

<b>Synonyms</b>	CI Food Red 3
<b>Definition</b>	Azorubine consists essentially of disodium 4-hydroxy-3-(4-sulfonato-1-naphthylazo) naphthalene-1-sulfonate and subsidiary colouring matters together with sodium chloride and/or sodium sulfate as the principal uncoloured components.  Azorubine is described as the sodium salt. The calcium and the potassium salt are also permitted.
Class	Monoazo
Colour Index No	14720
Einecs	222-657-4
Chemical name	Disodium 4-hydroxy-3-(4-sulfonato-1-naphthylazo) naphthalene-1-sulfonate
Chemical formula	C <sub>20</sub> H <sub>12</sub> N <sub>2</sub> Na <sub>2</sub> O <sub>7</sub> S <sub>2</sub>
Molecular weight	502,44
Assay	Content not less than 85 % total colouring matters, calculated as the sodium salt  E <sub>1 cm</sub> <sup>1 %</sup> 510 at ca 516 nm in aqueous solution
<b>Description</b>	Red to maroon powder or granules
<b>Identification</b>	
A. Spectrometry	Maximum in water at ca 516 nm
B. Red solution in water	
<b>Purity</b>	
Water insoluble matter	Not more than 0,2 %
Subsidiary colouring matters	Not more than 2,0 %
Organic compounds other than colouring matters:	
4-aminonaphthalene-1-sulfonic acid	} Total not more than 0,5 %
4-hydroxynaphthalene-1-sulfonic acid	



Unsulfonylated primary aromatic amines	Not more than 0,01 % (calculated as aniline)
Ether extractable matter	Not more than 0,2 % under neutral conditions
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

## E 123 AMARANTH

**Synonyms**

CI Food Red 9

**Definition**

Amaranth consists essentially of trisodium 2-hydroxy-1-(4-sulfonato-1-naphthylazo) naphthalene-3,6-disulfonate and subsidiary colouring matters together with sodium chloride and/or sodium sulfate as the principal uncoloured components.

Amaranth is described as the sodium salt. The calcium and the potassium salt are also permitted.

Class	Monoazo
Colour Index No	16185
Einecs	213-022-2
Chemical name	Trisodium 2-hydroxy-1-(4-sulfonato-1-naphthylazo) naphthalene-3,6-disulfonate
Chemical formula	$C_{20}H_{11}N_2Na_3O_{10}S_3$
Molecular weight	604,48
Assay	Content not less than 85 % total colouring matters, calculated as the sodium salt

$E_{1\text{ cm}}^{1\%}$  440 at ca 520 nm in aqueous solution

**Description**

Reddish-brown powder or granules

**Identification**

A. Spectrometry	Maximum in water at ca 520 nm
B. Red solution in water	

**Purity**

Water insoluble matter	Not more than 0,2 %
Subsidiary colouring matters	Not more than 3,0 %
Organic compounds other than colouring matters:	
4-aminonaphthalene-1-sulfonic acid	} Total not more than 0,5 %
3-hydroxynaphthalene-2,7-disulfonic acid	
6-hydroxynaphthalene-2-sulfonic acid	
7-hydroxynaphthalene-1,3-disulfonic acid	
7-hydroxynaphthalene-1,3,6-trisulfonic acid	
Unsulfonylated primary aromatic amines	Not more than 0,01 % (calculated as aniline)
Ether extractable matter	Not more than 0,2 % under neutral conditions
Arsenic	Not more than 3 mg/kg

Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

## E 124 PONCEAU 4R, COCHINEAL RED A

<b>Synonyms</b>	CI Food Red 7, New Coccine
<b>Definition</b>	Ponceau 4R consists essentially of trisodium 2-hydroxy-1-(4-sulfonato-1-naphthylazo) naphthalene-6,8-disulfonate and subsidiary colouring matters together with sodium chloride and/or sodium sulfate as the principal uncoloured components.  Ponceau 4R is described as the sodium salt. The calcium and the potassium salt are also permitted.
Class	Monoazo
Colour Index No	16255
Einecs	220-036-2
Chemical name	Trisodium 2-hydroxy-1-(4-sulfonato-1-naphthylazo) naphthalene-6,8-disulfonate
Chemical formula	$C_{20}H_{11}N_2Na_3O_{10}S_3$
Molecular weight	604,48
Assay	Content not less than 80 % total colouring matters, calculated as the sodium salt.  $E_{1\text{ cm}}^{1\%}$ 430 at ca 505 nm in aqueous solution
<b>Description</b>	Reddish powder or granules
<b>Identification</b>	
A. Spectrometry	Maximum in water at ca 505 nm
B. Red solution in water	
<b>Purity</b>	
Water insoluble matter	Not more than 0,2 %
Subsidiary colouring matters	Not more than 1,0 %
Organic compounds other than colouring matters:	
4-aminonaphthalene-1-sulfonic acid	} Total not more than 0,5 %
7-hydroxynaphthalene-1,3-disulfonic acid	
3-hydroxynaphthalene-2,7-disulfonic acid	
6-hydroxynaphthalene-2-sulfonic acid	
7-hydroxynaphthalene-1,3-6-trisulfonic acid	
Unulfonated primary aromatic amines	Not more than 0,01 % (calculated as aniline)
Ether extractable matter	Not more than 0,2 % under neutral conditions
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg

Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

## E 127 ERYTHROSINE

**Synonyms**

CI Food Red 14

**Definition**

Erythrosine consists essentially of disodium 2-(2,4,5,7-tetraiodo-3-oxido-6-oxoxanthen-9-yl) benzoate monohydrate and subsidiary colouring matters together with water, sodium chloride and/or sodium sulfate as the principal uncoloured components.

Erythrosine is described as the sodium salt. The calcium and the potassium salt are also permitted.

Class	Xanthen
Colour Index No	45430
Einecs	240-474-8
Chemical name	Disodium 2-(2,4,5,7-tetraiodo-3-oxido-6-oxoxanthen-9-yl)benzoate monohydrate
Chemical formula	$C_{20}H_6I_4Na_2O_5 \cdot H_2O$
Molecular weight	897,88
Assay	Content not less than 87 % total colouring matters, calculated as the anhydrous sodium salt
	$E_{1\text{ cm}}^{1\%} 1\ 100$ at ca 526 nm in aqueous solution at pH 7

**Description**

Red powder or granules.

**Identification**

A. Spectrometry	Maximum in water at ca 526 nm at pH 7
B. Red solution in water	

**Purity**

Inorganic iodides calculated as sodium iodide	Not more than 0,1 %
Water insoluble matter	Not more than 0,2 %
Subsidiary colouring matters (except fluorescein)	Not more than 4,0 %
Fluorescein	Not more than 20 mg/kg
Organic compounds other than colouring matters:	
Tri-iodoresorcinol	Not more than 0,2 %
2-(2,4-dihydroxy-3,5-diodo-benzoyl) benzoic acid	Not more than 0,2 %
Ether extractable matter	From a solution of pH from 7 through 8, not more than 0,2 %
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg
Aluminium Lakes	The hydrochloric acid insoluble matter method is not applicable. It is replaced by a sodium hydroxide insoluble matter, at not more than 0,5 %, for this colour only.

## E 128 RED 2G

**Synonyms**

CI Food Red 10, Azogeranine

**Definition**

Red 2G consists essentially of disodium 8-acetamido-1-hydroxy-2-phenylazo-naphthalene-3,6-disulfonate and subsidiary colouring matters together with sodium chloride and/or sodium sulfate as the principal uncoloured components.

Red 2G is described as the sodium salt. The calcium and the potassium salt are also permitted.

Class

Monoazo

Colour Index No

18050

Einescs

223-098-9

Chemical name

Disodium 8-acetamido-1-hydroxy-2-phenylazo-naphthalene-3,6-disulfonate

Chemical formula

 $C_{18}H_{13}N_3Na_2O_8S_2$ 

Molecular weight

509,43

Assay

Content not less than 80 % total colouring matters, calculated as the sodium salt

 $E_{1\text{ cm}}^{1\%}$  620 at ca 532 nm in aqueous solution**Description**

Red powder or granules

**Identification**

A. Spectrometry

Maximum in water at ca 532 nm

B. Red solution in water

**Purity**

Water insoluble matter

Not more than 0,2 %

Subsidiary colouring matters

Not more than 2,0 %

Organic compounds other than colouring matters:

5-acetamido-4-hydroxy-naphthalene-2,7-disulfonic acid

5-amino-4-hydroxy-naphthalene-2,7-disulfonic acid

Total not more than 0,5 %

Unulfonated primary aromatic amines

Not more than 0,01 % (calculated as aniline)

Ether extractable matter

Not more than 0,2 % under neutral conditions

Arsenic

Not more than 3 mg/kg

Lead

Not more than 10 mg/kg

Mercury

Not more than 1 mg/kg

Cadmium

Not more than 1 mg/kg

Heavy metals (as Pb)

Not more than 40 mg/kg

## E 129 ALLURA RED AC

**Synonyms**

CI Food Red 17

**Definition**

Allura Red AC consists essentially of disodium 2-hydroxy-1-(2-methoxy-5-methyl-4-sulfonato-phenylazo) naphthalene-6-sulfonate and subsidiary colouring matters together with sodium chloride and/or sodium sulfate as the principal uncoloured components.

Allura Red AC is described as the sodium salt. The calcium and the potassium salt are also permitted.

Class

Monoazo

Colour Index No

16035

Einecs	247-368-0
Chemical name	Disodium 2-hydroxy-1-(2-methoxy-5-methyl-4-sulfonatophenylazo)naphthalene-6-sulfonate
Chemical formula	$C_{18}H_{14}N_2Na_2O_8S_2$
Molecular weight	496,42
Assay	Content not less than 85 % total colouring matters, calculated as the sodium salt $E_{1\text{ cm}}^{1\%}$ 540 at ca 504 nm in aqueous solution at pH 7
<b>Description</b>	Dark red powder or granules
<b>Identification</b>	
A. Spectrometry	Maximum in water at ca 504 nm
B. Red solution in water	
<b>Purity</b>	
Water insoluble matter	Not more than 0,2 %
Subsidiary colouring matters	Not more than 3,0 %
Organic compounds other than colouring matters:	
6-hydroxy-2-naphthalene sulfonic acid, sodium salt	Not more than 0,3 %
4-amino-5-methoxy-2-methylbenzene sulfonic acid	Not more than 0,2 %
6,6-oxybis (2-naphthalene sulfonic acid) disodium salt	Not more than 1,0 %
Unulfonated primary aromatic amines	Not more than 0,01 % (calculated as aniline)
Ether extractable matter	From a solution of pH 7, not more than 0,2 %
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

## E 131 PATENT BLUE V

<b>Synonyms</b>	CI Food Blue 5
<b>Definition</b>	Patent Blue V consists essentially of the calcium or sodium compound of [4-( $\alpha$ -(4-diethylaminophenyl)-5-hydroxy-2,4-disulfophenyl-methylidene)2,5-cyclohexadien-1-ylidene] diethylammonium hydroxide inner salt and subsidiary colouring matters together with sodium chloride and/or sodium sulfate and/or calcium sulfate as the principal uncoloured components.  The potassium salt is also permitted.
Class	Triarylmethane
Colour Index No	42051
Einecs	222-573-8
Chemical names	The calcium or sodium compound of [4-( $\alpha$ -(4-diethylaminophenyl)-5-hydroxy-2,4-disulfophenyl-methylidene) 2,5-cyclohexadien-1-ylidene] diethyl-ammonium hydroxide inner salt
Chemical formula	Calcium compound: $C_{27}H_{31}N_2O_7S_2Ca_{1/2}$ Sodium compound: $C_{27}H_{31}N_2O_7S_2Na$

Molecular weight	Calcium compound: 579,72 Sodium compound: 582,67
Assay	Content not less than 85 % total colouring matters, calculated as the sodium salt $E_{1\text{ cm}}^{1\%}$ 2 000 at ca 638 nm in aqueous solution at pH 5
<b>Description</b>	Dark-blue powder or granules
<b>Identification</b>	
A. Spectrometry	Maximum in water at 638 nm at pH 5
B. Blue solution in water	
<b>Purity</b>	
Water insoluble matter	Not more than 0,2 %
Subsidiary colouring matters	Not more than 2,0 %
Organic compounds other than colouring matters:	
3-hydroxy benzaldehyde	} Total not more than 0,5 %
3-hydroxy benzoic acid	
3-hydroxy-4-sulfobenzoic acid	
N,N-diethylamino benzene sulfonic acid	
Leuco base	Not more than 4,0 %
Unsulfonylated primary aromatic amines	Not more than 0,01 % (calculated as aniline)
Ether extractable matter	From a solution of pH 5 not more than 0,2 %
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

## E 132 INDIGOTINE, INDIGO CARMINE

<b>Synonyms</b>	CI Food Blue 1
<b>Definition</b>	Indigotine consists essentially of a mixture of disodium 3,3'-dioxo-2,2'-bi-indolylidene-5,5'-disulfonate, and disodium 3,3'-dioxo-2,2'-bi-indolylidene-5,7'-disulfonate and subsidiary colouring matters together with sodium chloride and/or sodium sulfate as the principal uncoloured components.  Indigotine is described as the sodium salt. The calcium and the potassium salt are also permitted.
Class	Indigoid
Colour Index No	73015
Einecs	212-728-8
Chemical names	Disodium 3,3'-dioxo-2,2'-bi-indolylidene-5,5'-disulfonate
Chemical formula	$C_{16}H_8N_2Na_2O_8S_2$
Molecular weight	466,36
Assay	Content not less than 85 % total colouring matters, calculated as the sodium salt; disodium 3,3'-dioxo-2,2'-bi-indolylidene-5,7'-disulfonate: not more than 18 % $E_{1\text{ cm}}^{1\%}$ 480 at ca 610 nm in aqueous solution

<b>Description</b>	Dark-blue powder or granules
<b>Identification</b>	
A. Spectrometry	Maximum in water at ca 610 nm
B. Blue solution in water	
<b>Purity</b>	
Water insoluble matter	Not more than 0,2 %
Subsidiary colouring matters	Excluding disodium 3,3'-dioxo-2,2'-bi-indolydene-5,7'-disulfonate: not more than 1,0 %
Organic compounds other than colouring matters:	
Isatin-5-sulfonic acid	} Total not more than 0,5 %
5-sulfoanthranilic acid	
Anthranilic acid	
Unulfonated primary aromatic amines	Not more than 0,01 % (calculated as aniline)
Ether extractable matter	Not more than 0,2 % under neutral conditions
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

## E 133 BRILLIANT BLUE FCF

<b>Synonyms</b>	CI Food Blue 2
<b>Definition</b>	Brilliant Blue FCF consists essentially of disodium $\alpha$ -(4-(N-ethyl-3-sulfonatobenzylamino) phenyl)- $\alpha$ -(4-N-ethyl-3-sulfonatobenzylamino) cyclohexa-2,5-dienylidene) toluene-2-sulfonate and its isomers and subsidiary colouring matters together with sodium chloride and/or sodium sulfate as the principal uncoloured components.  Brilliant Blue FCF is described as the sodium salt. The calcium and the potassium salt are also permitted.
Class	Triarylmethane
Colour Index No	42090
Einecs	223-339-8
Chemical names	Disodium $\alpha$ -(4-(N-ethyl-3-sulfonatobenzylamino) phenyl)- $\alpha$ -(4-N-ethyl-3-sulfonatobenzylamino) cyclohexa-2,5-dienylidene) toluene-2-sulfonate
Chemical formula	$C_{37}H_{34}N_2Na_2O_9S_3$
Molecular weight	792,84
Assay	Content not less than 85 % total colouring matters, calculated as the sodium salt  $E_{1\text{ cm}}^{1\%}$ 1 630 at ca 630 nm in aqueous solution
<b>Description</b>	Reddish-blue powder or granules
<b>Identification</b>	
A. Spectrometry	Maximum in water at ca 630 nm
B. Blue solution in water	
<b>Purity</b>	
Water insoluble matter	Not more than 0,2 %
Subsidiary colouring matters	Not more than 6,0 %

Organic compounds other than colouring matters:	
Sum of 2-, 3- and 4-formyl benzene sulfonic acids	Not more than 1,5 %
3-((ethyl)(4-sulfophenyl) amino) methyl benzene sulfonic acid	Not more than 0,3 %
Leuco base	Not more than 5,0 %
Unulfonated primary aromatic amines	Not more than 0,01 % (calculated as aniline)
Ether extractable matter	Not more than 0,2 % at pH 7
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

## E 140 (i) CHLOROPHYLLS

**Synonyms**

CI Natural Green 3, Magnesium Chlorophyll, Magnesium Phaeophytin

**Definition**

Chlorophylls are obtained by solvent extraction of natural strains of edible plant material, grass, lucerne and nettle. During the subsequent removal of solvent, the naturally present co-ordinated magnesium may be wholly or partly removed from the chlorophylls to give the corresponding phaeophytins. The principal colouring matters are the phaeophytins and magnesium chlorophylls. The extracted product, from which the solvent has been removed, contains other pigments such as carotenoids as well as oils, fats and waxes derived from the source material. Only the following solvents may be used for the extraction: acetone, methyl ethyl ketone, dichloromethane, carbon dioxide, methanol, ethanol, propan-2-ol and hexane.

Class	Porphyrin
Colour Index No	75810
Einecs	Chlorophylls: 215-800-7, chlorophyll a: 207-536-6, Chlorophyll b: 208-272-4
Chemical names	The major colouring principles are:  Phytyl (13 <sup>2</sup> R,17S,18S)-3-(8-ethyl-13 <sup>2</sup> -methoxycarbonyl-2,7,12,18-tetramethyl-13'-oxo-3-vinyl-13 <sup>1</sup> -13 <sup>2</sup> -17,18-tetrahydrocyclopenta [at]-porphyrin-17-yl)propionate, (Pheophytin a), or as the magnesium complex (Chlorophyll a)  Phytyl (13 <sup>2</sup> R,17S,18S)-3-(8-ethyl-7-formyl-13 <sup>2</sup> -methoxycarbonyl-2,12,18-trimethyl-13'-oxo-3-vinyl-13 <sup>1</sup> -13 <sup>2</sup> -17,18-tetrahydrocyclopenta[at]-porphyrin-17-yl)propionate, (Pheophytin b), or as the magnesium complex (Chlorophyll b)
Chemical formula	Chlorophyll a (magnesium complex): C <sub>55</sub> H <sub>72</sub> MgN <sub>4</sub> O <sub>5</sub>  Chlorophyll a: C <sub>55</sub> H <sub>74</sub> N <sub>4</sub> O <sub>5</sub>  Chlorophyll b (magnesium complex): C <sub>55</sub> H <sub>70</sub> MgN <sub>4</sub> O <sub>6</sub>  Chlorophyll b: C <sub>55</sub> H <sub>72</sub> N <sub>4</sub> O <sub>6</sub>
Molecular weight	Chlorophyll a (magnesium complex): 893,51  Chlorophyll a: 871,22  Chlorophyll b (magnesium complex): 907,49  Chlorophyll b: 885,20
Assay	Content of total combined Chlorophylls and their magnesium complexes is not less than 10 %  E <sub>1 cm</sub> <sup>1 %</sup> 700 at ca 409 nm in chloroform



<b>Description</b>	Waxy solid ranging in colour from olive green to dark green depending on the content of co-ordinated magnesium										
<b>Identification</b>											
Spectrometry	Maximum in chloroform at ca 409 nm										
<b>Purity</b>											
Solvent residues	<table border="0"> <tr> <td>Acetone</td> <td rowspan="5">}</td> <td rowspan="5">Not more than 50 mg/kg, singly or in combination</td> </tr> <tr> <td>Methyl Ethyl ketone</td> </tr> <tr> <td>Methanol</td> </tr> <tr> <td>Ethanol</td> </tr> <tr> <td>Propan-2-ol</td> </tr> <tr> <td>Hexane</td> <td></td> <td></td> </tr> </table>	Acetone	}	Not more than 50 mg/kg, singly or in combination	Methyl Ethyl ketone	Methanol	Ethanol	Propan-2-ol	Hexane		
Acetone	}	Not more than 50 mg/kg, singly or in combination									
Methyl Ethyl ketone											
Methanol											
Ethanol											
Propan-2-ol											
Hexane											
	Dichloromethane: Not more than 10 mg/kg										
Arsenic	Not more than 3 mg/kg										
Lead	Not more than 10 mg/kg										
Mercury	Not more than 1 mg/kg										
Cadmium	Not more than 1 mg/kg										
Heavy metals (as Pb)	Not more than 40 mg/kg										

## E 140 (ii) CHLOROPHYLLINS

**Synonyms**

CI Natural Green 5, Sodium Chlorophyllin, Potassium Chlorophyllin

**Definition**

The alkali salts of chlorophyllins are obtained by the saponification of a solvent extract of natural strains of edible plant material, grass, lucerne and nettle. The saponification removes the methyl and phytol ester groups and may partially cleave the cyclopentenyl ring. The acid groups are neutralized to form the salts of potassium and/or sodium.

Only the following solvents may be used for the extraction: acetone, methyl ethyl ketone, dichloromethane, carbon dioxide, methanol, ethanol, propan-2-ol and hexane.

Class	Porphyrin
Colour Index No	75815
Einecs	287-483-3
Chemical names	<p>The major colouring principles in their acid forms are:</p> <p>— 3-(10-carboxylato-4-ethyl-1,3,5,8-tetramethyl-9-oxo-2-vinylporbin-7-yl)propionate (chlorophyllin a)</p> <p>and</p> <p>— 3-(10-carboxylato-4-ethyl-3-formyl-1,5,8-trimethyl-9-oxo-2-vinylporbin-7-yl)propionate (chlorophyllin b)</p> <p>Depending on the degree of hydrolysis the cyclopentenyl ring may be cleaved with the resultant production of a third carboxyl function.</p> <p>Magnesium complexes may also be present.</p>
Chemical formula	<p>Chlorophyllin a (acid form): <math>C_{34}H_{34}N_4O_5</math></p> <p>Chlorophyllin b (acid form): <math>C_{34}H_{32}N_4O_6</math></p>
Molecular weight	<p>Chlorophyllin a: 578,68</p> <p>Chlorophyllin b: 592,66</p> <p>Each may be increased by 18 daltons if the cyclopentenyl ring is cleaved.</p>

Assay	Content of total chlorophyllins is not less than 95 % of the sample dried at ca 100 °C for 1 hour.
	$E_{1\text{ cm}}^{1\%}$ 700 at ca 405 nm in aqueous solution at pH 9
	$E_{1\text{ cm}}^{1\%}$ 140 at ca 653 nm in aqueous solution at pH 9
<b>Description</b>	Dark green to blue/black powder
<b>Identification</b>	
Spectrometry	Maximum in aqueous phosphate buffer at pH 9 at ca 405 nm and at ca 653 nm
<b>Purity</b>	
Solvent residues	Acetone
	Methyl ethyl ketone
	Methanol
	Ethanol
	Propan-2-ol
	Hexane
	Dichloromethane: not more than 10 mg/kg
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

Not more than  
50 mg/kg, singly  
or in combination

## E 141 (i) COPPER COMPLEXES OF CHLOROPHYLLS

<b>Synonyms</b>	CI Natural Green 3, Copper Chlorophyll, Copper Phaeophytin
<b>Definition</b>	Copper chlorophylls are obtained by addition of a salt of copper to the substance obtained by solvent extraction of natural strains of edible plant material, grass, lucerne, and nettle. The product, from which the solvent has been removed, contains other pigments such as carotenoids as well as fats and waxes derived from the source material. The principal colouring matters are the copper phaeophytins. Only the following solvents may be used for the extraction: acetone, methyl ethyl ketone, dichloromethane, carbon dioxide, methanol, ethanol, propan-2-ol and hexane.
Class	Porphyrin
Colour Index No	75815
Einecs	Copper chlorophyll a: 239-830-5; copper chlorophyll b: 246-020-5
Chemical names	[Phytyl (13 <sup>2</sup> R,17S,18S)-3-(8-ethyl-13 <sup>2</sup> -methoxycarbonyl-2,7,12,18-tetramethyl-13'-oxo-3-vinyl-13 <sup>1</sup> -13 <sup>2</sup> -17,18-tetrahydrocyclopenta[at]-porphyrin-17-yl)propionate] copper (II) (Copper Chlorophyll a)
	[Phytyl (13 <sup>2</sup> R,17S,18S)-3-(8-ethyl-7-formyl-13 <sup>2</sup> -methoxycarbonyl-2,12,18-trimethyl-13'-oxo-3-vinyl-13 <sup>1</sup> -13 <sup>2</sup> -17,18-tetrahydrocyclopenta[at]-porphyrin-17-yl)propionate] copper (II) (Copper chlorophyll b)
Chemical formula	Copper chlorophyll a: C <sub>55</sub> H <sub>72</sub> Cu N <sub>4</sub> O <sub>5</sub>
	Copper chlorophyll b: C <sub>55</sub> H <sub>70</sub> Cu N <sub>4</sub> O <sub>6</sub>
Molecular weight	Copper chlorophyll a: 932,75
	Copper chlorophyll b: 946,73
Assay	Content of total copper chlorophylls is not less than 10 %.
	$E_{1\text{ cm}}^{1\%}$ 540 at ca 422 nm in chloroform
	$E_{1\text{ cm}}^{1\%}$ 300 at ca 652 nm in chloroform

<b>Description</b>	Waxy solid ranging in colour from blue green to dark green depending on the source material								
<b>Identification</b>									
Spectrometry	Maximum in chloroform at ca 422 nm and at ca 652 nm								
<b>Purity</b>									
Solvent residues	<table border="0"> <tr> <td>Acetone</td> <td rowspan="6">}</td> <td rowspan="6">Not more than 50 mg/kg, singly or in combination</td> </tr> <tr> <td>Methyl ethyl ketone</td> </tr> <tr> <td>Methanol</td> </tr> <tr> <td>Ethanol</td> </tr> <tr> <td>Propan-2-ol</td> </tr> <tr> <td>Hexane</td> </tr> </table>	Acetone	}	Not more than 50 mg/kg, singly or in combination	Methyl ethyl ketone	Methanol	Ethanol	Propan-2-ol	Hexane
Acetone	}	Not more than 50 mg/kg, singly or in combination							
Methyl ethyl ketone									
Methanol									
Ethanol									
Propan-2-ol									
Hexane									
	Dichloromethane: not more than 10 mg/kg								
Arsenic	Not more than 3 mg/kg								
Lead	Not more than 10 mg/kg								
Mercury	Not more than 1 mg/kg								
Cadmium	Not more than 1 mg/kg								
Copper ions	Not more than 200 mg/kg								
Total copper	Not more than 8,0 % of the total copper phaeophytins								

## E 141 (ii) COPPER COMPLEXES OF CHLOROPHYLLINS

<b>Synonyms</b>	Sodium Copper Chlorophyllin, Potassium Copper Chlorophyllin, CI Natural Green 5
<b>Definition</b>	<p>The alkali salts of copper chlorophyllins are obtained by the addition of copper to the product obtained by the saponification of a solvent extraction of natural strains of edible plant material, grass, lucerne, and nettle; the saponification removes the methyl and phytol ester groups and may partially cleave the cyclopentenyl ring. After addition of copper to the purified chlorophyllins, the acid groups are neutralized to form the salts of potassium and/or sodium.</p> <p>Only the following solvents may be used for the extraction: acetone, methyl ethyl ketone, dichloromethane, carbon dioxide methanol, ethanol, propan-2-ol and hexane.</p>
Class	Porphyrin
Colour Index No	75815
Einecs	
Chemical names	<p>The major colouring principles in their acid forms are:</p> <p>3-(10-Carboxylato-4-ethyl-1,3,5,8-tetramethyl-9-oxo-2-vinylporbin-7-yl)propionate, copper complex (Copper chlorophyllin a)</p> <p>and</p> <p>3-(10-Carboxylato-4-ethyl-3-formyl-1,5,8-trimethyl-9-oxo-2-vinylporbin-7-yl)propionate, copper complex (Copper chlorophyllin b)</p>
Chemical formula	<p>Copper chlorophyllin a (acid form): <math>C_{34}H_{32}Cu N_4O_5</math></p> <p>Copper chlorophyllin b (acid form): <math>C_{34}H_{30}Cu N_4O_6</math></p>
Molecular weight	<p>Copper chlorophyllin a: 640,20</p> <p>Copper chlorophyllin b: 654,18</p> <p>Each may be increased by 18 daltons if the cyclopentenyl ring is cleaved.</p>

Assay	Content of total copper chlorophyllins is not less than 95 % of the sample dried at 100 °C for 1 h. $E_{1\text{ cm}}^{1\%}$ 565 at ca 405 nm in aqueous phosphate buffer at pH 7,5 $E_{1\text{ cm}}^{1\%}$ 145 at ca 630 nm in aqueous phosphate buffer at pH 7,5
<b>Description</b>	Dark green to blue/black powder
<b>Identification</b>	
Spectrometry	Maximum in aqueous phosphate buffer at pH 7,5 at ca 405 nm and at ca 630 nm
<b>Purity</b>	
Solvent residues	Acetone Methyl ethyl ketone Methanol Ethanol Propan-2-ol Hexane Dichloromethane: not more than 10 mg/kg
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Copper ions	Not more than 200 mg/kg
Total copper	Not more than 8,0 % of the total copper chlorophyllins

Not more than  
50 mg/kg, singly  
or in combination

## E 142 GREEN S

**Synonyms**

CI Food Green 4, Brilliant Green BS

**Definition**

Green S consists essentially of sodium N-[4-(dimethylamino)phenyl] 2-hydroxy-3,6-disulfo-1-naphthalenyl)methylene]-2,5-cyclohexadien-1-ylidene]-N-methylmethanaminium and subsidiary colouring matters together with sodium chloride and/or sodium sulphate as the principal uncoloured compounds.

Green S is described as the sodium salt. The calcium and the potassium salt are also permitted.

Class  
Colour Index No  
Eines  
Chemical names  
Chemical formula  
Molecular Weight  
Assay

Triarylmethane

44090

221-409-2

Sodium N-[4-[[4-(dimethylamino)phenyl](2-hydroxy-3,6-disulfo-1-naphthalenyl)-methylene]2,5-cyclohexadien-1-ylidene]-N-methylmethanaminium;

Sodium 5-[4-dimethylamino- $\alpha$ -(4-dimethyliminocyclohexa-2,5-dienylidene)benzyl]-6-hydroxy-7-sulfonato-naphthalene-2-sulfonate (alternative chemical name).

 $C_{27}H_{25}N_2NaO_7S_2$ 

576,63

Content not less than 80 % total colouring matters calculated as the sodium salt

 $E_{1\text{ cm}}^{1\%}$  1 720 at ca 632 nm in aqueous solution**Description**

Dark blue or dark green powder or granules

**Identification**

A. Spectrometry

Maximum in water at ca 632 nm

B. Blue or green solution in water	
<b>Purity</b>	
Water insoluble matter	Not more than 0,2 %
Subsidiary colouring matters	Not more than 1,0 %
Organic compounds other than colouring matters:	
4,4'-bis(dimethylamino)-benzhydryl alcohol	Not more than 0,1 %
4,4'-bis(dimethylamino)-benzophenone	Not more than 0,1 %
3-hydroxynaphthalene-2,7-disulfonic acid	Not more than 0,2 %
Leuco base	Not more than 5,0 %
Unsulfonated primary aromatic amines	Not more than 0,01 % (calculated as aniline)
Ether extractable matter	Not more than 0,2 % under neutral conditions
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

## E 150a PLAIN CARAMEL

**Definition**

Plain caramel is prepared by the controlled heat treatment of carbohydrates (commercially available food grade nutritive sweeteners which are the monomers glucose and fructose and/or polymers thereof, e.g. glucose syrups, sucrose, and/or invert syrups, and dextrose). To promote caramelization, acids, alkalis and salts may be employed, with the exception of ammonium compounds and sulphites.

Einecs

232-435-9

**Description**

Dark brown to black liquids or solids

**Purity**

Colour bound by DEAE cellulose	Not more than 50 %
Colour bound by phosphoryl cellulose	Not more than 50 %
Colour intensity <sup>(1)</sup>	0,01-0,12
Total nitrogen	Not more than 0,1 %
Total sulphur	Not more than 0,2 %
Arsenic	Not more than 1 mg/kg
Lead	Not more than 2 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 25 mg/kg

<sup>(1)</sup> Colour intensity is defined as the absorbance of a 0,1 % (w/v) solution of caramel colour solids in water in a 1 cm cell at 610 nm.

## E 150b CAUSTIC SULPHITE CARAMEL

<b>Definition</b>	Caustic sulphite caramel is prepared by the controlled heat treatment of carbohydrates (commercially available food grade nutritive sweeteners which are the monomers glucose and fructose and/or polymers thereof, e.g. glucose syrups, sucrose, and/or invert syrups, and dextrose) with or without acids or alkalis, in the presence of sulphite compounds (sulphurous acid, potassium sulphite, potassium bisulphite, sodium sulphite and sodium bisulphite); no ammonium compounds are used.
Einecs	232-435-9
<b>Description</b>	Dark brown to black liquids or solids
<b>Purity</b>	
Colour bound by DEAE cellulose	More than 50 %
Colour intensity <sup>(1)</sup>	0,05-0,13
Total nitrogen	Not more than 0,3 % <sup>(2)</sup>
Sulphur dioxide	Not more than 0,2 % <sup>(2)</sup>
Total sulphur	0,3-3,5 % <sup>(2)</sup>
Sulphur bound by DEAE cellulose	More than 40 %
Absorbance ratio of colour bound by DEAE cellulose	19-34
Absorbance ratio (A 280/560)	Greater than 50
Arsenic	Not more than 1 mg/kg
Lead	Not more than 2 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 25 mg/kg

## E 150c AMMONIA CARAMEL

<b>Definition</b>	Ammonia caramel is prepared by the controlled heat treatment of carbohydrates (commercially available food grade nutritive sweeteners which are the monomers glucose and fructose and/or polymers thereof, e.g. glucose syrups, sucrose, and/or invert syrups, and dextrose) with or without acids or alkalis, in the presence of ammonium compounds (ammonium hydroxide, ammonium carbonate, ammonium hydrogen carbonate and ammonium phosphate); no sulphite compounds are used.
Einecs	232-435-9
<b>Description</b>	Dark brown to black liquids or solids
<b>Purity</b>	
Colour bound by DEAE cellulose	Not more than 50 %
Colour bound by phosphoryl cellulose	More than 50 %
Colour intensity <sup>(1)</sup>	0,08-0,36
Ammoniacal nitrogen	Not more than 0,3 % <sup>(2)</sup>
4-methylimidazole	Not more than 250 mg/kg <sup>(2)</sup>
2-acetyl-4-tetrahydroxy-butylimidazole	Not more than 10 mg/kg <sup>(2)</sup>

<sup>(1)</sup> Colour intensity is defined as the absorbance of a 0,1 % (w/v) solution of caramel colour solids in water in a 1 cm cell at 610 nm.

<sup>(2)</sup> Expressed on equivalent colour basis i.e. is expressed in terms of a product having a colour intensity of 0,1 absorbance units.

Total sulphur	Not more than 0,2 % <sup>(1)</sup>
Total nitrogen	0,7-3,3 % <sup>(1)</sup>
Absorbance ratio of colour bound by phosphoryl cellulose	13-35
Arsenic	Not more than 1 mg/kg
Lead	Not more than 2 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 25 mg/kg

## E 150d SULPHITE AMMONIA CARAMEL

**Definition**

Sulphite ammonia caramel is prepared by the controlled heat treatment of carbohydrates (commercially available food grade nutritive sweeteners which are the monomers glucose and fructose and/or polymers thereof (e.g. glucose syrups, sucrose, and/or invert syrups, and dextrose) with or without acids or alkalis in the presence of both sulphite and ammonium compounds (sulphurous acid, potassium sulphite, potassium bisulphite, sodium sulphite, sodium bisulphite, ammonium hydroxide, ammonium carbonate, ammonium hydrogen carbonate, ammonium phosphate, ammonium sulphate, ammonium sulphite and ammonium hydrogen sulphite).

Einecs 232-435-9

**Description**

Dark brown to black liquids or solids

**Purity**

Colour bound by DEAE cellulose	More than 50 %
Colour intensity <sup>(2)</sup>	0,10-0,60
Ammoniacal nitrogen	Not more than 0,6 % <sup>(1)</sup>
Sulphur dioxide	Not more than 0,2 % <sup>(1)</sup>
4-methylimidazole	Not more than 250 mg/kg <sup>(1)</sup>
Total nitrogen	0,3-1,7 % <sup>(1)</sup>
Total sulphur	0,8-2,5 % <sup>(1)</sup>
Nitrogen/sulphur ratio of alcohol precipitate	0,7-2,7
Absorbance ratio of alcohol precipitate <sup>(3)</sup>	8-14
Absorbance ratio ( $A_{280/560}$ )	Not more than 50
Arsenic	Not more than 1 mg/kg
Lead	Not more than 2 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 25 mg/kg

## E 151 BRILLIANT BLACK BN, BLACK PN

**Synonyms**

CI Food Black 1

<sup>(1)</sup> Expressed on equivalent colour basis i.e. is expressed in terms of a product having a colour intensity of 0,1 absorbance units.

<sup>(2)</sup> Colour intensity is defined as the absorbance of a 0,1 % (w/v) solution of caramel colour solids in water in a 1 cm cell at 610 nm.

<sup>(3)</sup> Absorbance ratio of alcohol precipitate is defined as the absorbance of the precipitate at 280 nm divided by the absorbance at 560 nm (1 cm cell).

<b>Definition</b>	Brilliant Black BN consists essentially of tetrasodium-4-acetamido-5-hydroxy-6-[7-sulfonato-4-(4-sulfonatophenylazo)-1-naphthylazo] naphthalene-1,7-disulfonate and subsidiary colouring matters together with sodium chloride and/or sodium sulfate as the principal uncoloured components.
	Brilliant Black BN is described as the sodium salt. The calcium and the potassium salt are also permitted.
Class	Bisazo
Colour Index No	28440
Einecs	219-746-5
Chemical names	Tetrasodium 4-acetamido-5-hydroxy-6-[7-sulfonato-4-(4-sulfonatophenylazo)-1-naphthylazo] naphthalene-1,7-disulfonate
Chemical formula	C <sub>28</sub> H <sub>17</sub> N <sub>5</sub> Na <sub>4</sub> O <sub>14</sub> S <sub>4</sub>
Molecular weight	867,69
Assay	Content not less than 80 % total colouring matters calculated as the sodium salt E <sub>1 cm</sub> <sup>1 %</sup> 530 at ca 570 nm in solution
<b>Description</b>	Black powder or granules
<b>Identification</b>	
A. Spectrometry	Maximum in water at ca 570 nm
B. Black-bluish solution in water	
<b>Purity</b>	
Water insoluble matter	Not more than 0,2 %
Subsidiary colouring matters	Not more than 10 % (expressed on the dye content)
Organic compounds other than colouring matters:	
4-acetamido-5-hydroxy-naphthalene-1,7-disulfonic acid	} Total not more than 0,8 %
4-amino-5-hydroxy-naphthalene-1,7-disulfonic acid	
8-aminonaphthalene-2-sulfonic acid	
4,4'-diazaminodi-(benzenesulfonic acid)	
Unulfonated primary aromatic amines	Not more than 0,01 % (calculated as aniline)
Ether extractable matter	Not more than 0,2 % under neutral conditions
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

## E 153 VEGETABLE CARBON

**Synonyms**

Vegetable black

**Definition**

Vegetable carbon is produced by the carbonization of vegetable material such as wood, cellulose residues, peat and coconut and other shells. The raw material is carbonised at high temperatures. It consists essentially of finely divided carbon. It may contain minor amounts of nitrogen, hydrogen and oxygen. Some moisture may be absorbed on the product after manufacture.



Colour Index No	77266
Einecs	215-609-9
Chemical names	Carbon
Chemical formula	C
Molecular weight	12,01
Assay	Content not less than 95 % of carbon calculated on an anhydrous and ash-free basis
<b>Description</b>	Black powder, odourless and tasteless
<b>Identification</b>	
A. Solubility	Insoluble in water and organic solvents
B. Burning	When heated to redness it burns slowly without a flame
<b>Purity</b>	
Ash (Total)	Not more than 4,0 % (ignition temperature: 625 °C)
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg
Polyaromatic hydrocarbons	The extract obtained by extraction of 1 g of the product with 10 g pure cyclohexane in a continuous extraction apparatus shall be colourless, and the fluorescence of the extract in ultraviolet light shall not be more intense than that of a solution of 0,100 mg of quinine sulfate in 1 000 ml of 0,01 M sulphuric acid.
Loss on drying	Not more than 12 % (120 °C, 4 hrs)
Alkali soluble matter	The filtrate obtained by boiling 2 g of the sample with 20 ml N sodium hydroxide and filtering shall be colourless
<b>E 154 BROWN FK</b>	
<b>Synonyms</b>	CI Food Brown 1
<b>Definition</b>	Brown FK consists essentially of a mixture of: <ul style="list-style-type: none"> <li>I sodium 4-(2,4-diaminophenylazo) benzenesulfonate</li> <li>II sodium 4-(4,6-diamino-m-tolylazo) benzenesulfonate</li> <li>III disodium 4,4'-(4,6-diamino-1,3-phenylenebisazo)di (benzenesulfonate)</li> <li>IV disodium 4,4'-(2,4-diamino-1,3-phenylenebisazo)di (benzenesulfonate)</li> <li>V disodium 4,4'-(2,4-diamino-5-methyl-1,3-phenylenebisazo)di (benzenesulfonate)</li> <li>VI trisodium 4,4',4''-(2,4-diaminobenzene-1,3,5-trisazo)tri-(benzenesulfonate)</li> </ul> and subsidiary colouring matters together with water, sodium chloride and/or sodium sulfate as the principal uncoloured components. Brown FK is described as the sodium salt. The calcium and the potassium salt are also permitted.
Class	Azo (a mixture of mono-, bis- and trisazo colours)
Einecs	

Chemical names	A mixture of: I sodium 4-(2,4-diaminophenylazo) benzenesulfonate II sodium 4-(4,6-diamino-m-tolylazo) benzenesulfonate III disodium 4,4'-(4,6-diamino-1,3-phenylenebisazo)di (benzenesulfonate) IV disodium 4,4'-(2,4-diamino-1,3-phenylenebisazo)di (benzenesulfonate) V disodium 4,4'-(2,4-diamino-5-methyl-1,3-phenylenebisazo)di (benzenesulfonate) VI trisodium 4,4',4''-(2,4-diaminobenzene-1,3,5-trisazo)tri-(benzenesulfonate)
Chemical formula	I $C_{12}H_{11}N_4NaO_3S$ II $C_{13}H_{13}N_4NaO_3S$ III $C_{18}H_{14}N_6Na_2O_6S_2$ IV $C_{18}H_{14}N_6Na_2O_6S_2$ V $C_{19}H_{16}N_6Na_2O_6S_2$ VI $C_{24}H_{17}N_8Na_3O_9S_3$
Molecular weight	I 314,30 II 328,33 III 520,46 IV 520,46 V 534,47 VI 726,59
Assay	Content not less than 70 % total colouring matters Of the total colouring matters present the proportions of the components shall not exceed: I 26 % II 17 % III 17 % IV 16 % V 20 % VI 16 %
<b>Description</b>	Red-brown powder or granules
<b>Identification</b>	
Orange to reddish solution	
<b>Purity</b>	
Water insoluble matter	Not more than 0,2 %
Subsidiary colouring matters	Not more than 3,5 %
Organic compounds other than colouring matters:	
4-aminobenzene-1-sulfonic acid	Not more than 0,7 %
m-phenylenediamine and 4-methyl-m-phenylenediamine	Not more than 0,35 %
Unsulfonylated primary aromatic amines other than m-phenylene diamine and 4-methyl-m-phenylene diamine	Not more than 0,007 % (calculated as aniline)

Ether extractable matter	From a solution of pH 7, not more than 0,2 %
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg
E 155 BROWN HT	
<b>Synonyms</b>	CI Food Brown 3
<b>Definition</b>	Brown HT consists essentially of disodium 4,4'-(2,4-dihydroxy-5-hydroxymethyl-1,3-phenylene bisazo) di (naphthalene-1-sulfonate) and subsidiary colouring matters together with sodium chloride and/or sulfate as the principal uncoloured components.  Brown HT is described as the sodium salt. The calcium and potassium salt are also permitted.
Class	Bisazo
Colour Index No	20285
Einecs	224-924-0
Chemical names	Disodium 4,4'-(2,4-dihydroxy-5-hydroxymethyl-1,3-phenylene bisazo)di (naphthalene-1-sulfonate)
Chemical formula	$C_{27}H_{18}N_4Na_2O_9S_2$
Molecular Weight	652,57
Assay	Content not less than 70 % total colouring matters calculated as the sodium salt.  $E_{1\text{ cm}}^{1\%}$ 403 at ca 460 nm in aqueous solution at pH 7
<b>Description</b>	Reddish-brown powder or granules
<b>Identification</b>	
A. Spectrometry	Maximum in water of pH 7 at ca 460 nm
B. Brown solution in water	
<b>Purity</b>	
Water insoluble matter	Not more than 0,2 %
Subsidiary colouring matters	Not more than 10 % (TLC method)
Organic compounds other than colouring matters:	
4-aminonaphthalene-1-sulfonic acid	Not more than 0,7 %
Unulfonated primary aromatic amines	Not more than 0,01 % (calculated as aniline)
Ether extractable matter	Not more than 0,2 % in a solution of pH 7
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg
E 160a (i) MIXED CAROTENES	
1. <i>Plant carotenes</i>	
<b>Synonyms</b>	CI Food Orange 5

<b>Definition</b>	<p>Mixed carotenes are obtained by solvent extraction of natural strains of edible plants, carrots, vegetable oils, grass, alfalfa (lucerne) and nettle.</p> <p>The main colouring principle consists of carotenoids of which beta-carotene accounts for the major part. Alpha, gamma-carotene and other pigments may be present. Besides the colour pigments, this substance may contain oils, fats and waxes naturally occurring in the source material.</p> <p>Only the following solvents may be used in the extraction: acetone, methyl ethyl ketone, methanol, ethanol, propan-2-ol, hexane <sup>(1)</sup>, dichloromethane and carbon dioxide.</p>								
Class	Carotenoid								
Colour Index No	75130								
Einesc	230-636-6								
Chemical formula	Beta-carotene: C <sub>40</sub> H <sub>56</sub>								
Molecular weight	Beta-carotene: 536,88								
Assay	Content of carotenes (calculated as beta-carotene) is not less than 5 %. For products obtained by extraction of vegetables oils: not less than 0,2 % in edible fats.								
	$E_{1\text{ cm}^{-1}\%} 2\ 500$ at approximately 440 nm to 457 nm in cyclohexane								
<b>Identification</b>									
Spectrometry	Maximum in cyclohexane at 440 nm to 457 nm and 470 nm to 486 nm								
<b>Purity</b>									
Solvent residues	<table border="0"> <tr> <td style="vertical-align: top;">Acetone</td> <td rowspan="6" style="font-size: 3em; vertical-align: middle;">}</td> <td rowspan="6" style="vertical-align: middle;">Not more than 50 mg/kg, singly or in combination</td> </tr> <tr> <td style="vertical-align: top;">Methyl ethyl ketone</td> </tr> <tr> <td style="vertical-align: top;">Methanol</td> </tr> <tr> <td style="vertical-align: top;">Propan-2-ol</td> </tr> <tr> <td style="vertical-align: top;">Hexane</td> </tr> <tr> <td style="vertical-align: top;">Ethanol</td> </tr> </table> <p>Dichloromethane: Not more than 10 mg/kg</p>	Acetone	}	Not more than 50 mg/kg, singly or in combination	Methyl ethyl ketone	Methanol	Propan-2-ol	Hexane	Ethanol
Acetone	}	Not more than 50 mg/kg, singly or in combination							
Methyl ethyl ketone									
Methanol									
Propan-2-ol									
Hexane									
Ethanol									
Lead	Not more than 5 mg/kg								
<b>2. Algal carotenes</b>									
<b>Synonyms</b>	CI Food Orange 5								
<b>Definition</b>	<p>Mixed carotenes may also be produced from natural strains of the algae <i>Dunaliella salina</i>, grown in large saline lakes located in Whyalla, South Australia. Beta-carotene is extracted using an essential oil. The preparation is a 20 to 30 % suspension in edible oil. The ratio of trans-cis isomers is in the range of 50/50 to 71/29.</p> <p>The main colouring principle consists of carotenoids of which beta-carotene accounts for the major part. Alpha-carotene, lutein, zeaxanthin and beta-cryptoxanthin may be present. Besides the colour pigments, this substance may contain oils, fats and waxes naturally occurring in the source material.</p>								
Class	Carotenoid								
Colour Index No	75130								
Chemical formula	Beta-Carotene: C <sub>40</sub> H <sub>56</sub>								
Molecular weight	Beta-Carotene: 536,88								
Assay	Content of carotenes (calculated as beta-carotene) is not less than 20 %								
	$E_{1\text{ cm}^{-1}\%} 2\ 500$ at approximately by 440 nm to 457 nm in cyclohexane								
<b>Identification</b>									
Spectrometry	Maximum in cyclohexane at 440 nm to 457 nm and 474 nm to 486 nm								

<sup>(1)</sup> Benzene not more than 0,05 % v/v.

<b>Purity</b>	
Natural tocopherols in edible oil	Not more than 0,3 %
Lead	Not more than 5 mg/kg
E 160a (ii) BETA-CAROTENE	
<b>1. <i>Beta-carotene</i></b>	
<b>Synonyms</b>	CI Food Orange 5
<b>Definition</b>	These specifications apply predominantly to all trans isomer of beta-carotene together with minor amounts of other carotenoids. Diluted and stabilised preparations may have different trans-cis isomer ratios.
Class	Carotenoid
Colour Index No	40800
Einecs	230-636-6
Chemical names	Beta-carotene, beta, beta-carotene
Chemical formula	C <sub>40</sub> H <sub>56</sub>
Molecular weight	536,88
Assay	Not less than 96 % total colouring matters (expressed as beta-carotene) E <sub>1 cm</sub> <sup>1%</sup> 2 500 at approximately by 440 nm to 457 nm in cyclohexane
<b>Description</b>	Red to brownish-red crystals or crystalline powder
<b>Identification</b>	
Spectrometry	Maximum in cyclohexane at 453 nm to 456 nm
<b>Purity</b>	
Sulfated ash	Not more than 0,2 %
Subsidiary colouring matters	Carotenoids other than beta-carotene: not more than 3,0 % of total colouring matters
Lead	Not more than 2 mg/kg
<b>2. <i>Beta-carotene from Blakeslea trispora</i></b>	
<b>Synonyms</b>	CI Food Orange 5
<b>Definition</b>	Obtained by a fermentation process using a mixed culture of the two sexual mating types (+) and (-) of natural strains of the fungus <i>Blakeslea trispora</i> . The beta-carotene is extracted from the biomass with ethyl acetate, or isobutyl acetate followed by isopropyl alcohol, and crystallised. The crystallised product consists mainly of trans beta-carotene. Because of the natural process approximately 3 % of the product consists of mixed carotenoids, which is specific for the product.
Class	Carotenoid
Colour Index No	40800
Einecs	230-636-6
Chemical names	Beta-carotene, beta,beta-carotene
Chemical formula	C <sub>40</sub> H <sub>56</sub>
Molecular weight	536,88
Assay	Not less than 96 % total colouring matters (expressed as beta-carotene) E <sub>1 cm</sub> <sup>1%</sup> 2 500 at approximately 440 nm to 457 nm in cyclohexane
<b>Description</b>	Red, brownish-red or purple-violet crystals or crystalline powder (colour varies according to extraction solvent used and conditions of crystallisation)
<b>Identification</b>	
Spectrometry	Maximum in cyclohexane at 453 nm to 456 nm

<b>Purity</b>	
Solvent residues	Ethyl acetate Ethanol Isobutyl acetate: Not more than 1,0 % Isopropyl alcohol: Not more than 0,1 %
	} Not more than 0,8 %, singly or in combination
Sulfated ash	Not more than 0,2 %
Subsidiary colouring matters	Carotenoids other than beta-carotene: not more than 3,0 % of total colouring matters
Lead	Not more than 2 mg/kg
<i>Mycotoxins:</i>	
Aflatoxin B1	Absent
Trichothecene (T2)	Absent
Ochratoxin	Absent
Zearalenone	Absent
<i>Microbiology:</i>	
Moulds	Not more than 100/g
Yeasts	Not more than 100/g
<i>Salmonella</i>	Absent in 25 g
<i>Escherichia coli</i>	Absent in 5 g

## E 160b ANNATTO, BIXIN, NORBIXIN

<b>Synonyms</b>	CI Natural Orange 4
<b>Definition</b>	
Class	Carotenoid
Colour Index No	75120
Einecs	Annatto: 215-735-4, annatto seed extract: 289-561-2; bixin: 230-248-7
Chemical names	Bixin: 6'-Methylhydrogen-9'-cis-6,6'-diapocarotene-6,6'-dioate 6'-Methylhydrogen-9'-trans-6,6'-diapocarotene-6,6'-dioate Norbixin: 9'Cis-6,6'-diapocarotene-6,6'-dioic acid 9'-Trans-6,6'-diapocarotene-6,6'-dioic acid
Chemical formula	Bixin: $C_{25}H_{30}O_4$ Norbixin: $C_{24}H_{28}O_4$
Molecular weight	Bixin: 394,51 Norbixin: 380,48
<b>Description</b>	Reddish-brown powder, suspension or solution
<b>Identification</b>	
Spectrometry	Bixin: maximum in chloroform at ca 502 nm Norbixin: maximum in dilute KOH solution at ca 482 nm

(i) <i>Solvent extracted bixin and norbixin</i>	
Definition	<p>Bixin is prepared by the extraction of the outer coating of the seeds of the annatto tree (<i>Bixa orellana</i> L.) with one or more of the following solvents: acetone, methanol, hexane or dichloromethane, carbon dioxide followed by the removal of the solvent.</p> <p>Norbixin is prepared by hydrolysis by aqueous alkali of the extracted bixin.</p> <p>Bixin and norbixin may contain other materials extracted from the annatto seed.</p> <p>The bixin powder contains several coloured components, the major single one being bixin, which may be present in both cis- and trans- forms. Thermal degradation products of bixin may also be present.</p> <p>The norbixin powder contains the hydrolysis product of bixin, in the form of the sodium or potassium salts as the major colouring principle. Both cis- and trans- forms may be present.</p>
Assay	<p>Content of bixin powders not less than 75 % total carotenoids calculated as bixin.</p> <p>Content of norbixin powders not less than 25 % total carotenoids calculated as norbixin</p> <p>Bixin: <math>E_{1\text{ cm}}^{1\%} 2\ 870</math> at ca 502 nm in chloroform</p> <p>Norbixin: <math>E_{1\text{ cm}}^{1\%} 2\ 870</math> at ca 482 nm in KOH solution</p>
Purity	
Solvent residues	<p>Acetone</p> <p>Methanol</p> <p>Hexane</p> <p>Dichloromethane: not more than 10 mg/kg</p>
	<p>} not more than 50 mg/kg, singly or in combination</p>
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg
(ii) <i>Alkali extracted annatto</i>	
Definition	<p>Water soluble annatto is prepared by extraction with aqueous alkali (sodium or potassium hydroxide) of the outer coating of the seeds of the annatto tree (<i>Bixa orellana</i> L.)</p> <p>Water soluble annatto contains norbixin, the hydrolysis product of bixin, in the form of the sodium or potassium salts, as the major colouring principle. Both cis- and trans- forms may be present.</p>
Assay	<p>Contains not less than 0,1 % of total carotenoids expressed as norbixin</p> <p>Norbixin: <math>E_{1\text{ cm}}^{1\%} 2\ 870</math> at ca 482 nm in KOH solution</p>
Purity	
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

## (iii) Oil extracted annatto

## Definition

Annatto extracts in oil, as solution or suspension, are prepared by extraction of the outer coating of the seeds of the annatto tree (*Bixa orellana* L.) with edible vegetable oil. Annatto extract in oil contains several coloured components, the major single one being bixin, which may be present in both cis- and trans-forms. Thermal degradation products of bixin may also be present.

## Assay

Contains not less than 0,1 % of total carotenoids expressed as bixin

Bixin:  $E_{1\text{ cm}}^{1\%} 2\ 870$  at ca 502 nm in chloroform

## Purity

## Arsenic

Not more than 3 mg/kg

## Lead

Not more than 10 mg/kg

## Mercury

Not more than 1 mg/kg

## Cadmium

Not more than 1 mg/kg

## Heavy metals (as Pb)

Not more than 40 mg/kg

## E 160c PAPRIKA EXTRACT, CAPSANTHIN, CAPSORUBIN

## Synonyms

Paprika Oleoresin

## Definition

Paprika extract is obtained by solvent extraction of the natural strains of paprika, which consists of the ground fruits pods, with or without seeds, of *Capsicum annum* L., and contains the major colouring principles of this spice. The major colouring principles are capsanthin and capsorubin. A wide variety of other coloured compounds is known to be present.

Only the following solvents may be used in the extraction: methanol, ethanol, acetone, hexane, dichloromethane, ethyl acetate and carbon dioxide.

## Class

Carotenoid

## Einesc

Capsanthin: 207-364-1, capsorubin: 207-425-2

## Chemical names

Capsanthin: (3R, 3'S, 5'R)-3,3'-dihydroxy- $\beta$ ,k-carotene-6-one

Capsorubin: (3S, 3'S, 5R, 5R')-3,3'-dihydroxy-k,k-carotene-6,6'-dione

## Chemical formula

Capsanthin:  $C_{40}H_{56}O_3$

Capsorubin:  $C_{40}H_{56}O_4$

## Molecular weight

Capsanthin: 584,85

Capsorubin: 600,85

## Assay

Paprika extract: content not less than 7,0 % carotenoids

Capsanthin/capsorubin: not less than 30 % of total carotenoids

$E_{1\text{ cm}}^{1\%} 2\ 100$  at ca 462 nm in acetone

## Description

Dark-red viscous liquid

## Identification

## A. Spectrometry

Maximum in acetone at ca 462 nm

## B. Colour reaction

A deep blue colour is produced by adding one drop of sulfuric acid to one drop of sample in 2-3 drops of chloroform

## Purity

## Solvent residues

Ethyl acetate

Methanol

Ethanol

Acetone

Hexane

Dichloromethane: not more than 10 mg/kg

} Not more than  
50 mg/kg, singly  
or in combination



Capsaicin	Not more than 250 mg/kg
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

## E 160d LYCOPENE

**Synonyms**

Natural Yellow 27

**Definition**

Lycopene is obtained by solvent extraction of the natural strains of red tomatoes (*Lycopersicon esculentum* L.) with subsequent removal of the solvent. Only the following solvents may be used: dichloromethane, carbon dioxide, ethyl acetate, acetone, propan-2-ol, methanol, ethanol, hexane. The major colouring principle of tomatoes is lycopene, minor amounts of other carotenoid pigments may be present. Beside the other colour pigments the product may contain oils, fats, waxes, and flavour components naturally occurring in tomatoes.

Class	Carotenoid
Colour Index No	75125
Chemical names	Lycopene, $\psi,\psi$ -carotene
Chemical formula	$C_{40}H_{56}$
Molecular weight	536,85
Assay	Content not less than 5 % total colouring matters $E_{1\text{ cm}}^{1\%}$ 3 450 at ca 472 nm in hexane

**Description**

Dark red viscous liquid

**Identification**

Spectrometry	Maximum in hexane at ca 472 nm
--------------	--------------------------------

**Purity**

Solvent residues	Ethyl acetate	} Not more than 50 mg/kg, singly or in combination
	Methanol	
	Ethanol	
	Acetone	
	Hexane	
	Propan-2-ol	
	Dichloromethane: not more than 10 mg/kg	
Sulfated ash	Not more than 0,1 %	
Arsenic	Not more than 3 mg/kg	
Lead	Not more than 10 mg/kg	
Mercury	Not more than 1 mg/kg	
Cadmium	Not more than 1 mg/kg	
Heavy metals (as Pb)	Not more than 40 mg/kg	

## E 160e BETA-APO-8'-CAROTENAL (C30)

**Synonyms**

CI Food Orange 6

<b>Definition</b>	These specifications apply to predominantly all trans isomer of $\beta$ -apo-8'-carotenal together with minor amounts of other carotenoids. Diluted and stabilized forms are prepared from $\beta$ -apo-8'-carotenal meeting these specifications and include solutions or suspensions of $\beta$ -apo-8'-carotenal in edible fats or oils, emulsions and water dispersible powders. These preparations may have different cis/trans isomer ratios.
Class	Carotenoid
Colour Index No	40820
Einecs	214-171-6
Chemical names	$\beta$ -apo-8'-carotenal, Trans- $\beta$ -apo-8'-carotene-aldehyde
Chemical formula	$C_{30}H_{40}O$
Molecular weight	416,65
Assay	Not less than 96 % of total colouring matters $E_{1\text{ cm}}^{1\%}$ 2 640 at ca 460-462 nm in cyclohexane
<b>Description</b>	Dark violet crystals with metallic lustre or crystalline powder
<b>Identification</b>	
Spectrometry	Maximum in cyclohexane at 460-462 nm
<b>Purity</b>	
Sulfated ash	Not more than 0,1 %
Subsidiary colouring matters	Carotenoids other than $\beta$ -apo-8'-carotenal: not more than 3,0 % of total colouring matters
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

## E 160f ETHYL ESTER OF BETA-APO-8'-CAROTENOIC ACID (C30)

<b>Synonyms</b>	CI Food Orange 7, $\beta$ -apo-8'-carotenoic ester
<b>Definition</b>	These specifications apply to predominantly all trans isomer of $\beta$ -apo-8'-carotenoic acid ethyl ester together with minor amounts of other carotenoids. Diluted and stabilized forms are prepared from $\beta$ -apo-8'-carotenoic acid ethyl ester meeting these specifications and include solutions or suspensions of $\beta$ -apo-8'-carotenoic acid ethyl ester in edible fats or oils, emulsions and water dispersible powders. These preparations may have different cis/trans isomer ratios.
Class	Carotenoid
Colour Index No	40825
Einecs	214-173-7
Chemical names	$\beta$ -apo-8'-carotenoic acid ethyl ester, ethyl 8'-apo- $\beta$ -caroten-8'-oate
Chemical formula	$C_{32}H_{44}O_2$
Molecular weight	460,70
Assay	Not less than 96 % of total colouring matters $E_{1\text{ cm}}^{1\%}$ 2 550 at ca 449 nm in cyclohexane
<b>Description</b>	Red to violet-red crystals or crystalline powder
<b>Identification</b>	
Spectrometry	Maximum in cyclohexane at ca 449 nm

<b>Purity</b>	
Sulfated ash	Not more than 0,1 %
Subsidiary colouring matters	Carotenoids other than $\beta$ -apo-8'-carotenoic acid ethyl ester: not more than 3,0 % of total colouring matters
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg
<b>E 161b LUTEIN</b>	
<b>Synonyms</b>	Mixed Carotenoids, Xanthophylls
<b>Definition</b>	Lutein is obtained by solvent extraction of the natural strains of edible fruits and plants, grass, lucerne (alfalfa) and <i>tagetes erecta</i> . The main colouring principle consists of carotenoids of which lutein and its fatty acid esters account for the major part. Variable amounts of carotenes will also be present. Lutein may contain fats, oils and waxes naturally occurring in the plant material.  Only the following solvents may be used for the extraction: methanol, ethanol, propan-2-ol, hexane, acetone, methyl ethyl ketone, dichloromethane and carbon dioxide
Class	Carotenoid
Einecs	204-840-0
Chemical names	3,3'-dihydroxy-d-carotene
Chemical formula	$C_{40}H_{56}O_2$
Molecular weight	568,88
Assay	Content of total colouring matter not less than 4 % calculated as lutein  $E_{1\text{ cm}}^{1\%}$ 2 550 at ca 445 nm in chloroform/ethanol (10 + 90) or in hexane/ethanol/acetone (80 + 10 + 10)
<b>Description</b>	Dark, yellowish brown liquid
<b>Identification</b>	
Spectrometry	Maximum in chloroform/ethanol (10 + 90) at ca 445 nm
<b>Purity</b>	
Solvent residues	Acetone Methyl ethyl ketone Methanol Ethanol Propan-2-ol Hexane
	Dichloromethane: not more than 10 mg/kg
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

Not more than  
50 mg/kg, singly  
or in combination

## E 161g CANTHAXANTHIN

**Synonyms**

CI Food Orange 8

**Definition**

These specifications apply to predominantly all trans isomers of canthaxanthin together with minor amounts of other carotenoids. Diluted and stabilized forms are prepared from canthaxanthin meeting these specifications and include solutions or suspensions of canthaxanthin in edible fats or oils, emulsions and water dispersible powders. These preparations may have different cis/trans isomer ratios.

Class

Carotinoid

Colour Index No

40850

Einesc

208-187-2

Chemical names

 $\beta$ -Carotene-4,4'-dione, canthaxanthin, 4,4'-dioxo- $\beta$ -carotene

Chemical formula

 $C_{40}H_{52}O_2$ 

Molecular weight

564,86

Assay

Not less than 96 % of total colouring matters (expressed as canthaxanthin)

 $E_{1\text{ cm}}^{1\%}$  2 200 at ca 485 nm in chloroform

at 468-472 nm in cyclohexane

at 464-467 nm in petroleum ether

**Description**

Deep violet crystals or crystalline powder

**Identification**

Spectrometry

Maximum in chloroform at ca 485 nm

Maximum in cyclohexane at 468-472 nm

Maximum in petroleum ether at 464-467 nm

**Purity**

Sulfated ash

Not more than 0,1 %

Subsidiary colouring matters

Carotenoids other than canthaxanthin: not more than 5,0 % of total colouring matters

Arsenic

Not more than 3 mg/kg

Lead

Not more than 10 mg/kg

Mercury

Not more than 1 mg/kg

Cadmium

Not more than 1 mg/kg

Heavy metals (as Pb)

Not more than 40 mg/kg

## E 162 BEETROOT RED, BETANIN

**Synonyms**

Beet Red

**Definition**

Beet red is obtained from the roots of natural strains of red beets (*Beta vulgaris* L. var. *rubra*) by pressing crushed beet as press juice or by aqueous extraction of shredded beet roots and subsequent enrichment in the active principle. The colour is composed of different pigments all belonging to the class betalaine. The main colouring principle consists of betacyanins (red) of which betanin accounts for 75-95 %. Minor amounts of betaxanthin (yellow) and degradation products of betalaines (light brown) may be present.

Besides the colour pigments the juice or extract consists of sugars, salts, and/or proteins naturally occurring in red beets. The solution may be concentrated and some products may be refined in order to remove most of the sugars, salts and proteins.

Class

Betalaine

Einecs	231-628-5
Chemical names	(S-(R',R')-4-(2-(2-Carboxy-5(β-D-glucopyranosyloxy)-2,3-dihydro-6-hydroxy-1H-indol-1-yl)ethenyl)-2,3-dihydro-2,6-pyridine-dicarboxylic acid; 1-(2-(2,6-dicarboxy-1,2,3,4-tetrahydro-4-pyridylidene)ethylidene)-5-β-D-glucopyranosyloxy)-6-hydroxyindolium-2-carboxylate
Chemical formula	Betanin: C <sub>24</sub> H <sub>26</sub> N <sub>2</sub> O <sub>13</sub>
Molecular weight	550,48
Assay	Content of red colour (expressed as betanine) is not less than 0,4 % E <sub>1 cm</sub> <sup>1 %</sup> 1 120 at ca 535 nm in aqueous solution at pH 5
<b>Description</b>	Red or dark red liquid, paste, powder or solid
<b>Identification</b>	
Spectrometry	Maximum in water of pH 5 at ca 535 nm
<b>Purity</b>	
Nitrate	Not more than 2 g nitrate anion/g of red colour (as calculated from assay).
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg

## E 163 ANTHOCYANINS

<b>Definition</b>	Anthocyanins are obtained by extraction with sulphited water, acidified water, carbon dioxide, methanol or ethanol from the natural strains of vegetables and edible fruits. Anthocyanins contain common components of the source material, namely anthocyanine, organic acids, tannins, sugars, minerals etc., but not necessarily in the same proportions as found in the source material.
Class	Anthocyanin
Einecs	208-438-6 (cyanidin); 205-125-6 (peonidin); 208-437-0 (delphinidin); 211-403-8 (malvidin); 205-127-7 (pelargonidin)
Chemical names	3,3',4',5,7-Pentahydroxy-flavylium chloride (cyanidin) 3,4',5,7-Tetrahydroxy-3'-methoxyflavylium chloride (peonidin) 3,4',5,7-Tetrahydroxy-3',5'-dimethoxyflavylium chloride (malvidin) 3,5,7-Trihydroxy-2-(3,4,5-trihydroxyphenyl)-1-benzopyrylium chloride (delphinidin) 3,3'4',5,7-Pentahydroxy-5'-methoxyflavylium chloride (petunidin) 3,5,7-Trihydroxy-2-(4-hydroxyphenyl)-1-benzopyrylium chloride (pelargonidin)
Chemical formula	Cyanidin: C <sub>15</sub> H <sub>11</sub> O <sub>6</sub> Cl Peonidin: C <sub>16</sub> H <sub>13</sub> O <sub>6</sub> Cl Malvidin: C <sub>17</sub> H <sub>15</sub> O <sub>7</sub> Cl Delphinidin: C <sub>15</sub> H <sub>11</sub> O <sub>7</sub> Cl Petunidin: C <sub>16</sub> H <sub>13</sub> O <sub>7</sub> Cl Pelargonidin: C <sub>15</sub> H <sub>11</sub> O <sub>5</sub> Cl

Molecular weight	Cyanidin: 322,6 Peonidin: 336,7 Malvidin: 366,7 Delphinidin: 340,6 Petunidin: 352,7 Pelargonidin: 306,7
Assay	$E_{1\text{ cm}}^{1\%}$ 300 for the pure pigment at 515-535 nm at pH 3,0
<b>Description</b>	Purplish-red liquid, powder or paste, having a slight characteristic odour
<b>Identification</b>	
Spectrometry	Maximum in methanol with 0,01 % conc. HCl Cyanidin: 535 nm Peonidin: 532 nm Malvidin: 542 nm Delphinidin: 546 nm Petunidin: 543 nm Pelargonidin: 530 nm
<b>Purity</b>	
Solvent residues	Methanol Ethanol
	} Not more than 50 mg/kg, singly or in combination
Sulfur dioxide	Not more than 1 000 mg/kg per percent pigment
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Mercury	Not more than 1 mg/kg
Cadmium	Not more than 1 mg/kg
Heavy metals (as Pb)	Not more than 40 mg/kg
<b>E 170 CALCIUM CARBONATE</b>	
<b>Synonyms</b>	CI Pigment White 18, Chalk
<b>Definition</b>	Calcium carbonate is the product obtained from ground limestone or by the precipitation of calcium ions with carbonate ions.
Class	Inorganic
Colour Index No	77220
Einecs	Calcium carbonate: 207-439-9 Limestone: 215-279-6
Chemical names	Calcium carbonate
Chemical formula	$\text{CaCO}_3$
Molecular weight	100,1
Assay	Content not less than 98 % on the anhydrous basis
<b>Description</b>	White crystalline or amorphous, odourless and tasteless powder
<b>Identification</b>	
Solubility	Practically insoluble in water and in alcohol. Dissolves with effervescence in diluted acetic acid, in diluted hydrochloric acid and in diluted nitric acid, and the resulting solutions, after boiling, give positive tests for calcium.

**Purity**

Loss on drying	Not more than 2,0 % (200 °C, 4 hours)
Acid-insoluble substances	Not more than 0,2 %
Magnesium and alkali salts	Not more than 1,5 %
Fluoride	Not more than 50 mg/kg
Antimony (as Sb)	} Not more than 100 mg/kg, singly or in combination
Copper (as Cu)	
Chromium (as Cr)	
Zinc (as Zn)	
Barium (as Ba)	
Arsenic	Not more than 3 mg/kg
Lead	Not more than 10 mg/kg
Cadmium	Not more than 1 mg/kg

## E 171 TITANIUM DIOXIDE

**Synonyms**

CI Pigment White 6

**Definition**

Titanium dioxide consists essentially of pure anatase and/or rutile titanium dioxide which may be coated with small amounts of alumina and/or silica to improve the technological properties of the product.

Class	Inorganic
Colour Index No	77891
Einecs	236-675-5
Chemical names	Titanium dioxide
Chemical formula	TiO <sub>2</sub>
Molecular weight	79,88
Assay	Content not less than 99 % on an alumina and silica-free basis

**Description**

White to slightly coloured powder

**Identification**

Solubility	Insoluble in water and organic solvents. Dissolves slowly in hydrofluoric acid and in hot concentrated sulfuric acid.
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**Purity**

Loss on drying	Not more than 0,5 % (105 °C, 3 hours)
Loss on ignition	Not more than 1,0 % on a volatile matter free basis (800 °C)
Aluminium oxide and/or silicon dioxide	Total not more than 2,0 %
Matter soluble in 0,5 N HCl	Not more than 0,5 % on an alumina and silica-free basis and, in addition, for products containing alumina and/or silica, not more than 1,5 % on the basis of the product as sold.
Water soluble matter	Not more than 0,5 %
Cadmium	Not more than 1 mg/kg
Antimony	Not more than 50 mg/kg by total dissolution
Arsenic	Not more than 3 mg/kg by total dissolution
Lead	Not more than 10 mg/kg by total dissolution
Mercury	Not more than 1 mg/kg by total dissolution
Zink	Not more than 50 mg/kg by total dissolution

## E 172 IRON OXIDES AND IRON HYDROXIDES

<b>Synonyms</b>	Iron Oxide Yellow: CI Pigment Yellow 42 and 43
	Iron Oxide Red: CI Pigment Red 101 and 102
	Iron Oxide Black: CI Pigment Black 11
<b>Definition</b>	Iron oxides and iron hydroxides are produced synthetically and consist essentially of anhydrous and/or hydrated iron oxides. The range of hues includes yellows, reds, browns and blacks. Food quality iron oxides are primarily distinguished from technical grades by the comparatively low levels of contamination by other metals. This is achieved by the selection and control of the source of the iron and/or by the extent of chemical purification during the manufacturing process.
Class	Inorganic
Colour Index No	Iron Oxide Yellow: 77492 Iron Oxide Red: 77491 Iron Oxide Black: 77499
Einecs	Iron Oxide Yellow: 257-098-5 Iron Oxide Red: 215-168-2 Iron Oxide Black: 235-442-5
Chemical names	Iron Oxide Yellow: hydrated ferric oxide, hydrated iron (III) oxide Iron Oxide Red: anhydrous ferric oxide, anhydrous iron (III) oxide Iron Oxide Black: ferroso ferric oxide, iron (II, III) oxide
Chemical formula	Iron Oxide Yellow: $\text{FeO}(\text{OH})\cdot\text{H}_2\text{O}$ Iron Oxide Red: $\text{Fe}_2\text{O}_3$ Iron Oxide Black: $\text{FeO}\cdot\text{Fe}_2\text{O}_3$
Molecular weight	88,85: $\text{FeO}(\text{OH})$ 159,70: $\text{Fe}_2\text{O}_3$ 231,55: $\text{FeO}\cdot\text{Fe}_2\text{O}_3$
Assay	Yellow not less than 60 %, red and black not less than 68 % total iron, expressed as iron
<b>Description</b>	Powder; yellow, red, brown or black in hue
<b>Identification</b>	
Solubility	Insoluble in water and in organic solvents Soluble in concentrated mineral acids
<b>Purity</b>	
Water soluble matter	Not more than 1,0 %
Arsenic	Not more than 5 mg/kg
Barium	Not more than 50 mg/kg
Cadmium	Not more than 5 mg/kg
Chromium	Not more than 100 mg/kg
Copper	Not more than 50 mg/kg
Lead	Not more than 20 mg/kg
Mercury	Not more than 1 mg/kg
Nickel	Not more than 200 mg/kg
Zinc	Not more than 100 mg/kg

} By total dissolution



## E 173 ALUMINIUM

**Synonyms**

CI Pigment Metal, Al

**Definition**

Aluminium powder is composed of finely divided particles of aluminium. The grinding may or may not be carried out in the presence of edible vegetable oils and/or food additive quality fatty acids. It is free from admixture with substances other than edible vegetable oils and/or food additive quality fatty acids.

Colour Index No

77000

Einecs

231-072-3

Chemical names

Aluminium

Chemical formula

Al

Atomic weight

26,98

Assay

Not less than 99 % calculated as Al on an oil-free basis

**Description**

A silvery-grey powder or tiny sheets

**Identification**

Solubility

Insoluble in water and in organic solvents. Soluble in dilute hydrochloric acid. The resulting solution gives positive tests for aluminium.

**Purity**

Loss on drying

Not more than 0,5 % (105 °C, to constant weight)

Arsenic

Not more than 3 mg/kg

Lead

Not more than 10 mg/kg

Mercury

Not more than 1 mg/kg

Cadmium

Not more than 1 mg/kg

Heavy metals (as Pb)

Not more than 40 mg/kg

## E 174 SILVER

**Synonyms**

Argentum, Ag

Class

Inorganic

Colour Index No

77820

Einecs

231-131-3

Chemical names

Silver

Chemical formula

Ag

Atomic weight

107,87

Assay

Content not less than 99,5 % Ag

**Description**

Silver-coloured powder or tiny sheets

## E 175 GOLD

**Synonyms**

Pigment Metal 3, Aurum, Au

Class

Inorganic

Colour Index No

77480

Einecs

231-165-9

Chemical names

Gold

Chemical formula

Au

Atomic weight

197,0

Assay

Content not less than 90 % Au

<b>Description</b>	Gold-coloured powder or tiny sheets	
<b>Purity</b>		
Silver	Not more than 7,0 %	} After complete dissolution
Copper	Not more than 4,0 %	
 E 180 LITHOLRUBINE BK		
<b>Synonyms</b>	CI Pigment Red 57, Rubinpigment, Carmine 6B	
<b>Definition</b>	Lithol Rubine BK consists essentially of calcium 3-hydroxy-4-(4-methyl-2-sulfonatophenylazo)-2-naphthalenecarboxylate and subsidiary colouring matters together with water, calcium chloride and/or calcium sulfate as the principal uncoloured components.	
Class	Monoazo	
Colour Index No	15850:1	
Einecs	226-109-5	
Chemical names	Calcium 3-hydroxy-4-(4-methyl-2-sulfonatophenylazo)-2-naphthalenecarboxylate	
Chemical formula	C <sub>18</sub> H <sub>12</sub> CaN <sub>2</sub> O <sub>6</sub> S	
Molecular weight	424,45	
Assay	Content not less than 90 % total colouring matters	
	E <sub>1 cm</sub> <sup>1 %</sup> 200 at ca 442 nm in dimethylformamide	
<b>Description</b>	Red powder	
<b>Identification</b>		
Spectrometry	Maximum in dimethylformamide at ca 442 nm	
<b>Purity</b>		
Subsidiary colouring matters	Not more than 0,5 %	
Organic compounds other than colouring matters:		
2-Amino-5-methylbenzenesulfonic acid, calcium salt	Not more than 0,2 %	
3-hydroxy-2-naphthalenecarboxylic acid, calcium salt	Not more than 0,4 %	
Unulfonated primary aromatic amines	Not more than 0,01 % (expressed as aniline)	
Ether extractable matter	From a solution of pH 7, not more than 0,2 %	
Arsenic	Not more than 3 mg/kg	
Lead	Not more than 10 mg/kg	
Mercury	Not more than 1 mg/kg	
Cadmium	Not more than 1 mg/kg	
Heavy metals (as Pb)	Not more than 40 mg/kg	

## ANNEX II

## PART A

**Repealed Directive with list of its successive amendments**

(referred to in Article 2)

Commission Directive 95/45/EC	(OJ L 226, 22.9.1995, p. 1)
Commission Directive 1999/75/EC	(OJ L 206, 5.8.1999, p. 19)
Commission Directive 2001/50/EC	(OJ L 190, 12.7.2001, p. 14)
Commission Directive 2004/47/EC	(OJ L 113, 20.4.2004, p. 24)
Commission Directive 2006/33/EC	(OJ L 82, 21.3.2006, p. 10)

## PART B

**List of time-limits for transposition into national law**

(referred to in Article 2)

Directive	Time-limit for transposition
95/45/EC	1 July 1996 <sup>(1)</sup>
1999/75/EC	1 July 2000
2001/50/EC	29 June 2002
2004/47/EC	1 April 2005 <sup>(2)</sup>
2006/33/EC	10 April 2007

<sup>(1)</sup> According to Article 2(2) of Directive 95/45/EC, products put on the market or labelled before 1 July 1996 which do not comply with that Directive may, however, be marketed until stocks are exhausted.

<sup>(2)</sup> According to Article 3 of Directive 2004/47/EC, products on the market or labelled before 1 April 2005 which do not comply with that Directive may be marketed until stocks are exhausted.

## ANNEX III

**Correlation table**

Directive 95/45/EC	This Directive
Article 1, first paragraph	Article 1
Article 1, second paragraph	—
Article 2	—
—	Article 2
Article 3	Article 3
Article 4	Article 4
Annex	Annex I
—	Annex II
—	Annex III