

Concept for a textile certification

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Introduction

In the following text a broad outline for a concept of a textile certification is given. It is the aim of DIN CERTCO, the certification organisation of DIN, the German Institute for Standardisation, to discuss this concept with experts and interested parties, like KITECH, to evaluate the merits and flaws of this concept.

General Principle

The textile certification shall differentiate between three levels of quality. The first level covers basic quality features and the legal requirements of the different countries. Therefore the maximum allowed concentration of certain harmful substances in textiles, and some other quality features like the colour fastness are controlled.

The second level of quality shall require additional proofs that no dangerous concentrations of a wider range of harmful substances and potentially harmful substances can be found in the textile products. Furthermore additional quality features may be tested, like dimensional changes during washing and drying, and light fastness.

The third level of quality shall cover requirements in the manufacturing process. The idea behind this is to minimise the overall ecological impact of textile production. Biodegradability, bioaccumulation and toxicity of chemicals such as detergents, complexing agents, auxiliaries and solvents, etc used in the manufacturing process shall also be considered. Pollution of the soil, water and air in the vicinity of a production site shall be minimized.

Table 1 Differentiation between DIN geprüft / DIN plus and the Certificate of Acceptability

Certificate	Certificate of Acceptability	DIN geprüft	DIN plus
Mark	No mark		
Requirements	<ul style="list-style-type: none"> • Legal Requirements (e.g. harmful substances) • Most important harmful 	<ul style="list-style-type: none"> • As for "Certificate of Acceptability" • Additional tests for more 	<ul style="list-style-type: none"> • as for "DIN geprüft" • Requirements for

	substances in the world-wide textile markets. <ul style="list-style-type: none"> • Basic quality features (Colour Fastness) 	potentially harmful substances) <ul style="list-style-type: none"> • Additional quality features (change of size due to washing and drying, light fastness) 	the manufacturing process
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Certificate of Acceptability

Laws of many countries make regulations concerning textiles. In Germany these are laid down in the "Lebensmittel und Verbrauchsgegenständegesetz (LMBG)" (Law on Food and Consumer Goods) in Japan they are described in "Law 112". There also exist international treaties that ban the use of certain harmful substances, like the Stockholm Convention on persistent organic pollutants. These legal requirements shall be recorded and it shall be checked in laboratory tests if the legal requirements are met. This shall be documented in a "Certificate of Acceptability". With it a textile producer can go to distributors to document legal compliance. As textile producers are required anyway to meet legal requirements, no quality mark is awarded.

A first draft of a list of required tests is given in Table 2 but it should be noted that not every possible legislation has been checked. Thus certain legal requirements may exist that are not covered yet. It should also be noted that the requirements for the certificate of acceptability will change over time as the legal framework does, e.g. the EU's white paper on chemicals legislation shows the possible development of the future European legislation in the chemical field, and changes in the EU's legislation are to be expected.

Table 2 Tests for "Certificate of Acceptability"

Criteria [unit]	Acceptable Limits			
	Baby	Direct contact with skin	No direct contact with skin	Decorative Material

<p>Azo dyes who could release one of the following substances (carcinogenic amines) [ppm]:</p> <ul style="list-style-type: none"> • 4-Aminobiphenyl • Benzidin • 4-Chlor-o-toluidin • 2-Naphthylamin • o-Aminoazotoluol • 2-Amino-4-nitrotoluol • p-Chloranilin • 2,4-Diaminoanisol • 4,4'-Diaminodiphenylmethan • 3,3'-Dichlorbenzidin • 3,3'-Dimethoxybenzidin • 3,3'-Dimethylbenzidin • 3,3'-Dimethyl-4,4'-diaminodiphenylmethan • p-Kresidin • 4,4'-Methylen-bis-(2-chloranilin) • 4,4'-Oxydianilin • 4,4'-Thiodianilin • o-Toluidin • 2,4-Diaminotoluol • 2,4,5-Trimethylanilin • 4-Aminoazobenzol • o-Anisidin • 2,4-Xylidine • 2,6-Xylidine 	30			
<p>Allergenic dyestuff (20 dyestuffs)</p> <ul style="list-style-type: none"> • C.I. Disperse Blue 1 • C.I. Disperse Blue 3 • C.I. Disperse Blue 7 • C.I. Disperse Blue 26 • C.I. Disperse Blue 35 • C.I. Disperse Blue 102 • C.I. Disperse Blue 106 • C.I. Disperse Blue 124 • C.I. Disperse Orange 1 • C.I. Disperse Orange 3 • C.I. Disperse Orange 37 • C.I. Disperse Orange 76 • C.I. Disperse Red 1 • C.I. Disperse Red 11 • C.I. Disperse Red 17 • C.I. Disperse Yellow 1 • C.I. Disperse Yellow 3 • C.I. Disperse Yellow 9 • C.I. Disperse Yellow 39 • C.I. Disperse Yellow 49 	not detectable			
<p>Formaldehyde Free [ppm] Emission [ppm]</p>	20 0,1	75	300	300 0,1

Heavy metals [ppm]				
<ul style="list-style-type: none"> • Antimony (Sb) • Arsenic (As) • Lead (Pb) • Cadmium (Cd) • Chromium, total (Cr) • Chromium VI (Cr(VI)) • Cobalt (Co) • Copper (Cu) • Nickel (Ni) • Mercury (Hg) 	5.0 0,2 0,2 0,1 1,0 not detectable 1,0 25,0 1,0 0,02	10.0 1,0 1,0 0,1 2,0 not detectable 4,0 50,0 4,0 0,02		
Ni Release [ug/cm ² /week]	0.5			
Pentachlorophenol (PCP) [ppm]	0,05	0,5	0,5	0,5
Tetrachlorophenol (TeCP) [ppm]	0.05	0.5	0.5	0.5
Pesticides [ppm]				
<ul style="list-style-type: none"> • α-, β-, δ-, ϵ- Hexachlorcyclohexane • Lindan (γ-HCH) • 2,4,5-T • 2,4-D • Aldrin • Chlordan • DDD • DDE • DDT • Dieldrin • Endrin • Heptachlor • Heptachlorepoxyd • Hexachlorbenzol • Mirex • Methoxychlor • Toxaphen 	0,5	1,0	1,0	1,0
Total concentration of pesticides				
pH	4,0 – 7,5	4,0 – 7,5	4,0 – 9,0	4,0 - 9,0

Besides the legal requirements for harmful substances, certain quality criteria have to be met. These are listed in Table 1 and include the colour fastness.

Table 3 Basic Quality Criteria

Criteria [unit]	Acceptable Limits			
	Baby	Direct contact with skin	No direct contact with skin	Decorative Material

Colour fastness		
<ul style="list-style-type: none"> • Water • acidic perspiration • alkaline perspiration • rubbing, dry • rubbing, wet • saliva & perspiration 	<ul style="list-style-type: none"> - - - 3-4 2-3 resistant 	<ul style="list-style-type: none"> 3 3-4 3-4 3-4 2-3 resistant

DIN geprüft

Products that may bear the DIN geprüft mark have to meet more than just the legal requirements. Criteria for harmful substances in textile products, i.e. the maximum allowed concentration, shall be stricter than the legal requirements. Furthermore also potentially harmful substances shall not be used for the products.

Table 4 Criteria for harmful substances

Criteria [unit]	Acceptable Limits			
	Baby	Direct contact with skin	No direct contact with skin	Decorative Material
Acrylnitril [ppm]	1.5			
Allergenic dyestuff (20 dyestuffs) <ul style="list-style-type: none"> • C.I. Disperse Blue 1 • C.I. Disperse Blue 3 • C.I. Disperse Blue 7 • C.I. Disperse Blue 26 • C.I. Disperse Blue 35 • C.I. Disperse Blue 102 • C.I. Disperse Blue 106 • C.I. Disperse Blue 124 • C.I. Disperse Orange 1 • C.I. Disperse Orange 3 • C.I. Disperse Orange 37 • C.I. Disperse Orange 76 • C.I. Disperse Red 1 • C.I. Disperse Red 11 • C.I. Disperse Red 17 • C.I. Disperse Yellow 1 • C.I. Disperse Yellow 3 • C.I. Disperse Yellow 9 • C.I. Disperse Yellow 39 • C.I. Disperse Yellow 49 	Not detectable			
AOX [ppm]	(250)			
Arylamines				

<p>Azo dyes who could release one of the following substances (carcinogenic amines) [ppm]:</p> <ul style="list-style-type: none"> • 4-Aminobiphenyl • Benzidin • 4-Chlor-o-toluidin • 2-Naphthylamin • o-Aminoazotoluol • 2-Amino-4-nitrotoluol • p-Chloranilin • 2,4-Diaminoanisol • 4,4'-Diaminodiphenylmethan • 3,3'-Dichlorbenzidin • 3,3'-Dimethoxybenzidin • 3,3'-Dimethylbenzidin • 3,3'-Dimethyl-4,4'-diaminodiphenylmethan • p-Kresidin • 4,4'-Methylen-bis-(2-chloranilin) • 4,4'-Oxydianilin • 4,4'-Thiodianilin • o-Toluidin • 2,4-Diaminotoluol • 2,4,5-Trimethylanilin • 4-Aminoazobenzol • o-Anisidin • 2,4-Xylidine • 2,6-Xylidine 	<p>Not detectable (30 ppm)</p>			
<p>Biocides</p> <p>Insecticide</p> <ul style="list-style-type: none"> • Carbaryl (Sevin) <p>Herbicide</p> <ul style="list-style-type: none"> • 2,4-D • Cyhalothrin • Cypermethrin • Deltamethrin • Permethrin • Fenvalerat 				
<p>Carcinogenic dyes</p> <ul style="list-style-type: none"> ● Acid Red 26 ● Basic Red 9 ● Direct Black 38 ● Direct Blue 6 ● Direct Red 28 ● Disperse Blue 1 ● Disperse Yellow 3 	<p>(not detectable)</p>			
<p>Chlorinated phenols [ppm]</p>	<p>0,05</p>			
<p>Chlororganic Carriers [ppm]</p>	<p>not detectable (1,0)</p>			

Emissions of volatile organic carbons [mg/m ³]			
• Toluol	0,1		
• Styrol	0,005		
• Vinylcyclohexen	0,002		
• 4-Phenylcyclohexen	0,03		
• Butadien	0,002		
• Vinylchlorid	0,002		
• AromaticHydrocarbons	0,3		
• Total VOC	0,5		
Flame retardants	(not detectable)		
Formaldehyde [ppm]	20 (30)	75 (75)	300 (300)
Glyoxal	(not detectable)		
Heavy metals [ppm]			
• Antimony (Sb)	5,0	10,0	
• Arsenic (As)	0,2	1,0	
• Lead (Pb)	0,2	1,0	
• Cadmium (Cd)	0,1	0,1	
• Chromium, total (Cr)	1,0	2,0	
• Chromium VI (Cr(VI))	not detectable	not detectable	
• Cobalt (Co)	1,0	4,0	
• Copper (Cu)	25,0	50,0	
• Nickel (Ni)	1,0	4,0	
• Mercury (Hg)	0,02	0,02	
• Zinc (Zn)	(1 000-1500)	(1 000-1500)	
• Cer	(not detectable)	(not detectable)	
• Tin (Sn)	(250)	(250)	
• Selen (Se)	(0,2 mg / kg)	(0,2 mg / kg)	
PCDD/PCDF			
Pentachlorphenol (PCP) [ppm]	(0,05)		

Pesticides [ppm]	0,5 (0,05-0,5)	1,0 (0,05-0,5)		
<ul style="list-style-type: none"> • α-, β-, δ-, ϵ- Hexachlorcyclohexane • Lindan (γ-HCH) • 2,4,5-T • Aldrin • Azinphosmethyl • Bromophosethyl • Captafol • Chlorbenzilat • Chlordan • Chlordimeform • Chlorfenvinphos • Coumaphos • Cyfluthrin • Cyhalothrin • Cypermethrin • DDD • DDE • DDT • DEF • Deltamethrin • Diazinon • Dichlofenthion • Dicrotophos • Dieldrin • Dimethoat • Dinoseb • Endosulfan • Endrin • Fenchlorphos • Fenvalerat • Heptachlor • Heptachlorepoxyd • Hexachlorbenzol (HCB) • Malathion • Methamidophos • Methoxychlor • Mirex • Monocrotophos • Parathionethyl • Parathionmethyl • Phoxim • Profenophos • Propetamphos • Quinalphos • TDE • Toxaphen 				
Total concentration of pesticides				
pH	4,0 – 7,5 (4,5 – 8)	4,0 – 7,5 (4,5 – 8)	4,0 – 9,0 (4,5 – 8)	4,0 – 9,0 (4,5 – 8)
Phenol				
Polychlorinated biphenyles				

PVC additives (Phthalate) [ppm]	0,1	
<ul style="list-style-type: none"> • DINP • DNOP • DEHP • DIDP • BBP • DBP 		
Tetrachlorphenol (TCP) [ppm]	(0,05)	
Tin organic substances [ppm]	0,5 (1,0)	1,0
<ul style="list-style-type: none"> • TBT • DBT 		

Of course textiles that will bear the DIN geprüft quality mark have also to fulfil additional quality features as they are given in Table 5.

Table 5 Additional quality features

Criteria [unit]	Acceptable Limits			
	Baby	Direct contact with skin	No direct contact with skin	Decorative Material
Accelerated ageing				
<ul style="list-style-type: none"> • Accelerating ageing of sulphur dyed fabric • Accelerated Heat Ageing Test 				
Change of size due to washing and drying	Maximum: 4 – 8 %			
Colour fastness				
<ul style="list-style-type: none"> • Water • Acidic perspiration • Alkaline perspiration • Rubbing, dry • Rubbing, wet • Saliva & perspiration • Light (decorative textiles only) 	- - - 4 (2-3) 2-3 resistant 4-5	3 (3-4) 3-4 3-4 4 (2-3) 2-3 - 4-5	3 (3-4) 3-4 3-4 4 (2-3) 2-3 - 4-5	3 (3-4) 3-4 3-4 4 (2-3) 2-3 - 4-5
Odour	No abnormal odour			
Self-Smoothing Behaviour				

DIN plus

Requirements for the manufacturing process could follow detailed demands as they are laid down in the program for the "EU-flower" label or the requirements could be coupled with an environmental management system (EMS). These requirements have still to be developed.

Testing

Testing shall be done according to well established standards. Some applicable standards are given in Table 6. Testing laboratories shall demonstrate their competence by for example fulfilling the requirements of ISO/IEC 17025.

It has to be noted further that not all of the above mentioned tests have to be performed in all cases. There is no need to check the pesticide concentrations of a textile fabric that is made up of chemical fibres, or to check for potentially harmful dyes if the textile fabric was not coloured.

In addition to test reports also appropriate data and the declaration of a company's responsible person will be needed together with the test report to prove that products meet the requirements for certification.

Table 6 Standards for textile testing

Criteria	Testing Standard
Accelerated ageing	
<ul style="list-style-type: none"> Accelerating ageing of sulphur dyed fabric Accelerated Heat Ageing Test 	AATCC 26
Acrylnitril	
Additives	
AOX	ISO 9562
Arylamines	German Methods §35 LMBG B-82.02-2, B-82.02-3, B-82.02-4
Azo dyes who could release carcinogenic amines	German Methods §35 LMBG B-82.02-2
Biocides	
Burning Behaviour	E DIN EN 13772
Carcinogenic dyes	
Change of size due to washing and drying	ISO 5077
Chlorinated organic carbons	DIN 38407-2
Chlorinated phenols	DIN 38407-2
Chlororganic Carriers	DIN 38407-2
Colour fastness	
<ul style="list-style-type: none"> Water acidic perspiration alkaline perspiration rubbing, dry rubbing, wet saliva & perspiration Light (decorative textiles only) 	ISO 105-E01 ISO 105-E04 ISO 105-E04 ISO 105-X12 ISO 105-X12 German Methods §35 LMBG B-82.10-1 (or ISO 105) ISO 105-B02
Emissions of volatile organic carbons	
Flame retardants	
Formaldehyde	Japanese Law 112 ISO/DIS 14184-1 German Methods §35 LMBG B-82.02-1
Glyoxal	
Heavy metals	Extraction: ISO 105-E04 ISO 8288 (Co, Ni, Cu, Zn, Cd, Pb) ISO 9174 (Cr)

Herbicide	
Insecticide	
Odour	Panel test
Self-Smoothing Behaviour	DIN 53895
PCDD/PCDF	
Pentachlorophenol (PCP)	DIN 53133 DIN 38407-2
Pesticides	DIN 38407-2 (Preparation of samples)
pH	DIN EN 1413 DIN 54275 ISO 3071
Phenol	
Polychlorinated biphenyles	DIN 38407-2
Potentially allergenic dyes	
PVC additives (Phthalate)	
Tetrachlorophenol (TCP)	
Tin organic substances	

Outlook

If a consensus on the requirements for a textile certification can be reached, textile producers will benefit from a clear regulatory framework for textile production. Furthermore third-party assessment as conducted by DIN CERTCO and it's network of partners can help to improve the competitiveness of consumer products by raising consumer confidence in tested and certified products.