

# **Metallic Materials in Contact with Drinking Water – International and National Standardisation and Regulation – An International Harmonisation Process**

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## **ABSTRACT**

**Introduction and Background** [Source: 4MS-Group Procedure for the acceptance of metallic materials used for products in contact with drinking water Version: 21. Nov. 2008]  
Council Directive 98/83/EC *on the Quality of Water Intended for Human Consumption (DWD)* establishes a high level of protection for the consumer and requires Member States to ensure that substances and materials used in preparation and distribution of drinking water do not reduce that level of protection.

Article 10 of this directive obligates the national legislators to regulate the requirement for products in contact with drinking water (PDW). This has to be done in a focus of an international harmonization process.

### **Article 10:**

*"Quality assurance of treatment, equipment and materials Member States shall take all measures necessary to ensure that no substances or materials for new installations used in the preparation or distribution of water intended for human consumption or impurities associated with such substances or materials for new installations remain in water intended for human consumption in concentrations higher than is necessary for the purpose of their use and do not, either directly or indirectly, reduce the protection of human health provided for in this Directive; the interpretative document and technical specifications pursuant to Article 3 and Article 4 (1) of Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products ... shall respect the requirements of this Directive."*

The Directive's point of compliance is at consumers' taps. This implies a need for control of all products in contact with drinking water (PDW), including pipes and fittings within consumers' premises.

The first approach provided a harmonization of the requirements of PDW under the Directive 89/106/EEC *on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products*. But this approach to implement a European Acceptance Scheme (EAS) failed and alternative had to be worked out. To act from necessity the Four Member States Group (4MS-Group: France, Germany, The Netherlands and UK) was founded.

### **4MS-Group**

The work of the 4MS-Group bases on voluntariness. This group works and is still working out requirements for all materials like metals, cement-bound materials and organic materials used for products in contact with drinking water. The aim is only to have a circulation of

products in market which are able to fulfill the conditions given in article 10 of Council Directive 98/83/EC *on the Quality of Water Intended for Human Consumption (DWD)*.

The following described procedure is an agreed proposal of the 4MS-Group based on the report of the Sub-Group for Metallic Materials for DG Enterprise's Expert Group for Construction Products in contact with Drinking Water. These requirements are addressed to:

- the European Commission as a proposal for regulating metallic materials in contact with drinking water and to
- Member States as a proposal for regulating metallic materials in contact with drinking water in their national acceptance schemes to satisfy Article 10 of the Council Directive 98/83/EC on the Quality of Water Intended for Human Consumption (DWD).

As long as no European Acceptance Scheme for PDW exists, Member States are obliged to regulate PDW and their hygienic safety individually. This proposal aims to harmonize the acceptance of metallic materials for PDW in the EU (see document of 4MS-Group *Procedure for the acceptance of metallic materials used for products in contact with drinking water Version: 21. Nov. 2008*).

## RESUMÉ

L'objectif principal est d'harmoniser les spécifications techniques et hygiéniques afin d'obtenir une acceptation internationale réciproque des matériaux et notamment des produits en contact avec l'eau potable (PDW).

Suite à l'échec de l'EAS (« European Acceptance Scheme ») sur les produits en contact avec l'eau potable (PDW) ainsi qu'à l'obligation des législateurs nationaux de réglementer les exigences relatives à de tels produits, quatre régulateurs nationaux (France, Pays-Bas, Allemagne, Royaume-Uni) ont initié un processus d'harmonisation volontaire pour formuler des exigences à propos des matériaux utilisés pour des produits en contact avec l'eau potable. Ce groupe, appelé « Four Member-State Group » (4MS-Group), a presque terminé son travail à ce sujet. Les résultats seront publiés prochainement.

Les matériaux métalliques ne sont autorisés pour une utilisation en tant que produit en contact avec l'eau potable que s'ils ont réussi les essais de l'EN 15664-1, s'ils respectent les critères donnés dans cette norme et si leur composition est au moins acceptée sur la base de sa liste.

La mise en œuvre au niveau national ne dépend désormais plus que des régulateurs nationaux et organismes de normalisation nationaux.

L'exigence de vérification de conformité ou de certification respectivement sera réglementée en tant que *Déclaration du Système 1+* dans le cadre du document 10753/3/3/10 du Conseil de l'Union européenne.

## ZUSAMMENFASSUNG

Hauptziel ist, die technischen und hygienischen Spezifikationen zu harmonisieren, um zu einer gegenseitigen internationalen Akzeptanz von Werkstoffen zu kommen, zumindest von Produkten in Kontakt mit Trinkwasser (PTW).

Aufgrund des Scheiterns des European Acceptance Scheme (EAS) für Produkte in Kontakt mit Trinkwasser (PTW) und der Verpflichtung nationaler Gesetzgeber, die Anforderungen an

solche Produkte zu regeln, haben vier nationale Regulatoren (Frankreich, Niederlande, Deutschland, Großbritannien) einen freiwilligen Harmonisierungsprozess angeregt, um Anforderungen an Werkstoffe zu formulieren, die für PTW verwendet werden. Diese sogenannte Vier-Mitgliedstaaten-Gruppe (4MS-Gruppe) hat ihre Arbeit an diesem Thema beinahe abgeschlossen. Das Ergebnis wird in Kürze veröffentlicht.

Metallene Werkstoffe sind nur zur Verwendung für PTW zugelassen, wenn sie entsprechend EN 15664-1 erfolgreich getestet wurden, die Kriterien erfüllen, die in diesem Dokument vorgegeben sind, und zumindest für die Legierungsliste akzeptiert wurden.

Jetzt liegt es an den nationalen Regulatoren und Standardisierungsorganisationen, dies auf nationaler Ebene umzusetzen.

Die Anforderung der Konformitätsprüfung bzw. der Zertifizierung wird vom Rat der Europäischen Union 10753/3/3/10 als „System 1+“-Erklärung geregelt.

### **Metallic materials in contact with drinking water**

Most of the metals used in metallic PDW are controlled as parameters by the DWD. Monitoring carried out by Member States provides evidence that metallic pipes and fittings can increase concentrations of metals in drinking water. Metal release into drinking water is caused by corrosion. This is a long term process and leads to the build-up of corrosion product layers which influence further metal release. Two different periods of metal release from a PDW can be distinguished. The initial period about three months (short term behaviour) is mainly influenced by the surface characteristics of the product (e.g. lead film on the surface), whereas the long term behaviour is characterized by the bulk metallic material. As it is the bulk metallic material that defines the long term behavior of products, it is possible to accept metallic materials for use with drinking water. For the acceptance of metallic materials other factors affecting the interaction between metals and water have to be taken into account, such as:

- chemical and physical characteristics of water
- design and construction of the distribution system (e.g. density of use of fittings, design of products)
- flow regime, as determined by the water consumption habits of consumers
- contact time of the metallic material with water

The procedure for accepting metallic materials takes reasonable worst case situations of the above mentioned factors into account.

As the interpretation of test results is very complex a “Committee of Experts” is required to decide about the acceptance of materials based on these results and other significant data. The acceptance will lead to a listing on a Composition List (Material List). The acceptance of materials and their listing in the Composition List requires a clear definition of the material's composition and test methods to identify the complete composition. The Composition List reflects currently available information on the performance of metallic materials.

Test methods like EN 15664 *Influence of metallic materials on water intended for human consumption* for evaluation the long term behaviour were already worked out by CEN TC 164 WG 3 *Effects of materials in contact with drinking water*.

- EN 15664-1 *Influence of metallic materials on water intended for human consumption*  
- *Dynamic rig test for assessment of metal release - Part 1: Design and operation*
- EN 15664-2 *Influence of metallic materials on water intended for human consumption*  
- *Dynamic rig test for assessment of metal release - Part 2: Test waters*

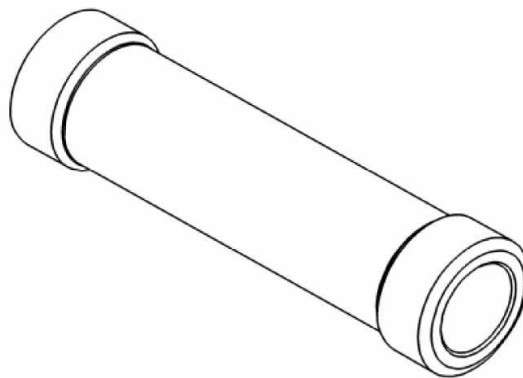
In the beginning these standards and the described evaluation of the 4MS-Group base on the German experience, standards DIN 50931-1 *Corrosion of metals - Corrosion tests of drinking water - Part 1: Testing of change of the composition of drinking water* and DIN 50930-6 *Corrosion of metals - Corrosion of metallic materials under corrosion load by water inside of tubes, tanks and apparatus - Part 6: Influence of the composition of drinking water* worked out in DIN and DVGW *German Technical and Scientific Association for Gas and Water* (Technical Committee *Internal Corrosion*).

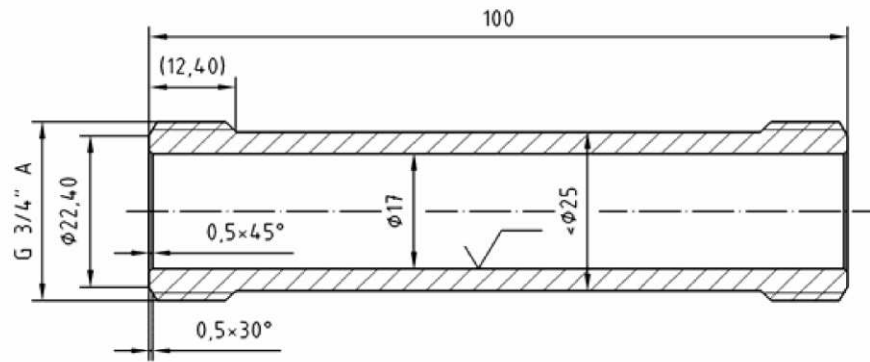
## **EN 15664-1 and EN 15664-2**

Acceptance of metallic materials is based on results of long term tests on a rig test according to EN 15664-1. The minimum test period is six months and which can be extended. Acceptance of a reference material for a category requires acceptance of results from the EN 15664-1 test carried out with different waters (see EN 15664-2) representing the range of compositions of drinking waters in the EU. To accept a new material, a comparative test against the reference material is required using EN 15664-1. For comparative testing it is sufficient to use a local drinking water, provided that the water is suitably corrosive (see EN 15664-2). Additionally the following information shall be provided to the Committee of Experts:

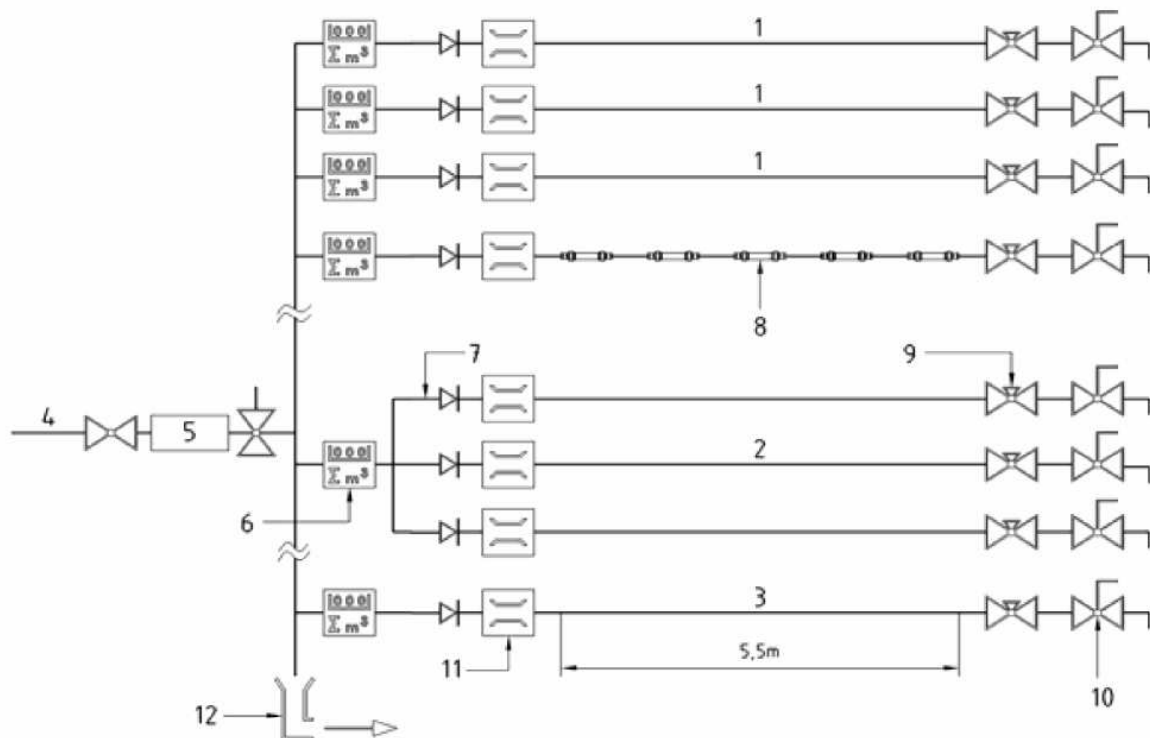
- For each composition, information on the boundaries for major alloying constituent elements and maximum values for impurities. Such boundaries will be tighter for Reference Materials than for commercial alloys
- Existing applicable European standard(s) for the material
- The material characteristics
- Products to be manufactured from the material
- The production process

Other information considered appropriate in support of the assessment. The following figures show the geometry of a test piece according to EN 15664-1, the components and assembly of the test rig and a typical migration curve for copper of the tested metallic material.





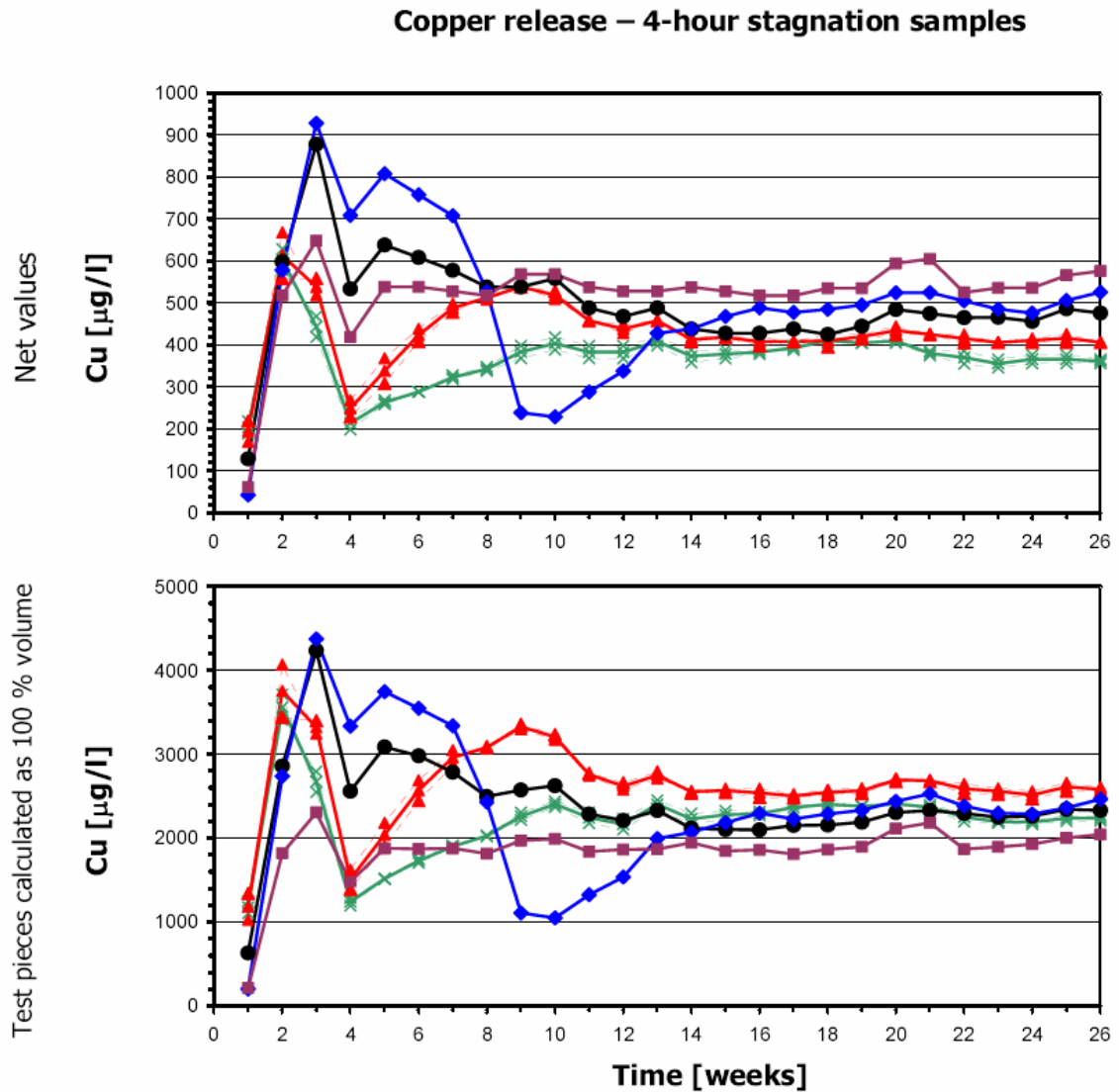
**Figure 1 – Test Piece EN 15664-1**



**Key**

- |                                     |                             |                               |
|-------------------------------------|-----------------------------|-------------------------------|
| 1 test piece test line              | 2 pipe test line            | 3 control line                |
| 4 inlet                             | 5 filter                    | 6 water meter                 |
| 7 distributing pipe and check valve | 8 test piece and connectors | 9 flow regulator              |
| 10 outlet valve                     | 11 optional flow meter      | 12 inlet water sampling point |

**Figure 2 - Test Rig EN 15664-1**



**Figure 3 - Example for a tested reference material copper release according to EN 15664-1**

Further on it is important for the tested new material, that worst case conditions even for the composition itself are covered. This fact is mirrored in the following chapter explaining the requirements of the tested materials.

#### **Composition of the tested material**

All elements exceeding 0.02% could be of relevance and have to be declared for the composition. For impurities below 0.02% it is the responsibility of the producer of the alloys/materials to guarantee that no release occurs with the potential to cause negative health impacts.

- All elements exceeding 0,02% to be declared.
- Impurities below 0,02% not declared (Responsibility of the producer: no negative health impacts)

The composition of a **test specimen** shall be as follows:

For reference materials:

- Constituents have to be in the range as declared.
- Impurities to be analysed in the contact water (see below) shall be greater than 60% of the declared range.

For non-reference materials:

- With the exceptions of Cu, Zn, As, Al, Si and P all constituents shall be greater than 80% of the declared range\*.
- As as a constituent shall be within the declared range and greater than 66%
- Al, Si and P shall be less than 50% of the declared range
- Impurities to be analysed in the contact water shall be greater than 60% of the declared range

\*e.g. if the declared range is 1,6 to 2,2% then 80% of the range (0,6%) is 0,48%; therefore, element content should be greater than 2.08%.

For elements to be analysed in the **contact water**:

- Elements to be analysed in the contact water are those declared in the alloy with the exceptions of:
  - Sn, Si and P if present as constituents
  - Fe, Sn, Mn, Al, Si and P if present as impurities in the alloy

After a successful testing, next step for the acceptance is fulfilling the criteria respectively the thresholds of the DWD and national laws. For evaluation and drawing conclusions for putting the data in coherence to the thresholds the following criteria were developed.

### **Acceptance criteria**

The acceptable contributions from metallic PDW to the overall concentrations of metals at consumers' taps is based on the acceptance values for chemical and indicator parametric values in the DWD. The acceptable contributions (RC) were derived using the following principles:

- 90 % for elements for which metallic PDW constitute the only major source of contamination;
- 50 % for elements for which other sources of contamination are possible and the metal is essential to the production of a product.

In the case of other parameters not listed in the DWD, the following criteria have been used:

- Zinc: this element is not toxic at the concentrations encountered in water supply systems where galvanised steel pipes have been used. However, zinc can give rise to complaints about the taste and appearance of water. The proposed reference value has been set to ensure that zinc does not reduce the aesthetic acceptability of water (WHO, 2004).
- Tin, bismuth, molybdenum, titanium: these reference values are based on provisional values recommended by a toxicology expert (Fawell, 2003).
- Other metals: Advice will be sought from toxicology experts on an appropriate reference value as necessary

In order to allow time for the development of natural protective layers, it is proposed that the test procedure simulates a conditioning period of three months, in which a slight noncompliance with the reference concentration is tolerated.

### Acceptance of a Reference Material

For the assessment of the test rig results (according to EN 15664-1) the arithmetic mean of the equivalent pipe concentrations  $MEP_n(T)$  shall be considered. For all periods of operation (T) an average of the  $MEP_n(T)$  of the three test lines in one rig is calculated:  $MEP_a(T)$ .

The material can be accepted for a product group with the assumed contact surface (a) if:

- (I)  $MEP_a(T) * a \leq RC$  for  $T = 16, 21$  and  $26$  weeks
- (II)  $MEP_a(T_b) \geq MEP_a(T)$  for  $\{T_b, T\} = \{12, 16\}, \{16, 21\}$  and  $\{21, 26\}$  weeks

are met for all tested drinking waters.

The test may be extended up to 1 year, if criterion II is not met. In this case the material is acceptable, if

- (III)  $MEP_a(T_b) \geq MEP_a(T)$  for  $\{T_b, T\} = \{26, 39\}$  and  $\{39, 52\}$  weeks

is met for the tested drinking waters, where criterion II was not fulfilled.

The Committee of Experts shall consider the complete set of available data. For the test rig according to EN 15664-1 these are:

- Results of individual test lines,
- 4h stagnation results and
- Parameters of water composition.

If stagnation samples were analysed in addition to the requirements in EN 15664-1 this data shall also be considered for the assessment. The Committee of Expert shall decide whether the data available is of sufficient quality (e.g. no major difference of the three test lines, interpretation of outliers) for an assessment to be carried out and if so decide whether to accept the material based on the above mentioned criteria. Accepted materials will be added to the Composition List together with the Category as the Reference Material.

Product Group	Examples of products or parts of products	Assumed contact surface "a"
A	Pipes in buildings installation Uncoated pipelines in water supply systems	100%
B	Fittings Ancillaries Parts of pumps in buildings installations Parts of valves in buildings installations	10%
B	Moving parts in water meter Parts of pumps in water supply systems Parts of valves in water supply systems	1%

**Table 1 – Contact surface (a) for different product groups**

- **Product Group A: up to 100% contact surface**  
For pipes in a buildings installation the same material can be used for all diameters. A single material can contribute to nearly 100 % of the surface in contact with water e.g.



copper, galvanised steel or stainless steel. The evaluation of the conditions for safe use must assume the maximum possible percentage. The acceptance of a composition for the use as pipes includes the acceptance for all uses (e.g. fittings, components, etc.). This group also includes uncoated metallic pipelines in water supply systems and water treatment processes.

- **Product Group B: up to 10% contact surface**

Fittings or ancillaries can be produced from one material or from slightly different materials throughout the buildings installation. The most common are made from copper alloys that contain lead. Due to their potential to release lead to water there is a need to restrict the total surface contact of products made from these alloys. For assessments of materials for these products a contribution of 10% water contact surface area is assumed. This group also includes metallic parts of pumps and valves used in buildings installations.

- **Product Group C: less than 1% contact surface**

For technical reasons, there might be a need to produce small parts from compositions not accepted for the Product Group B, fittings and ancillaries. Other compositions with higher release rates may be accepted in these devices as long as their use will not significantly increase the total contamination of drinking water. The use of such compositions should be restricted to parts that do not exceed 1% of the total surface in contact with drinking water; for example, the body of a water meter would need to be produced from an accepted composition for Product Group B but a moving part may be produced from a material listed for Product Group C. This group also includes metallic parts of pumps and valves used in water supply systems and water treatment processes.

**Acceptance of a material by comparative testing**

For the assessment of the test rig results (according to EN 15664-1) the arithmetic mean of the equivalent pipe concentrations  $MEP_n(T)$  shall be considered. For all periods of operation (T) an average of the  $MEP_n(T)$  of the three test lines in the rig is calculated:  $MEP_a(T)$ . For the Reference Material  $MEP_a$ ,  $RM(T)$  of the three reference lines shall be considered. The material can be accepted for a product group with the assumed contact surface (a) of the Reference Material, if:

- (I)  $MEP_a(T) \leq MEP_a, RM(T)$  for  $T = 16, 21$  and  $26$  weeks
- (II)  $MEP_a(T_b) \geq MEP_a(T)$  for  $\{T_b, T\} = \{12, 16\}, \{16, 21\}$  and  $\{21, 26\}$  weeks

are met for the tested drinking water.

The test may be extended up to 1 year, if criterion II is not met. In this case the material is acceptable, if

- (III)  $MEP_a(T_b) \geq MEP_a(T)$  for  $\{T_b, T\} = \{26, 39\}$  and  $\{39, 52\}$  weeks

is met.

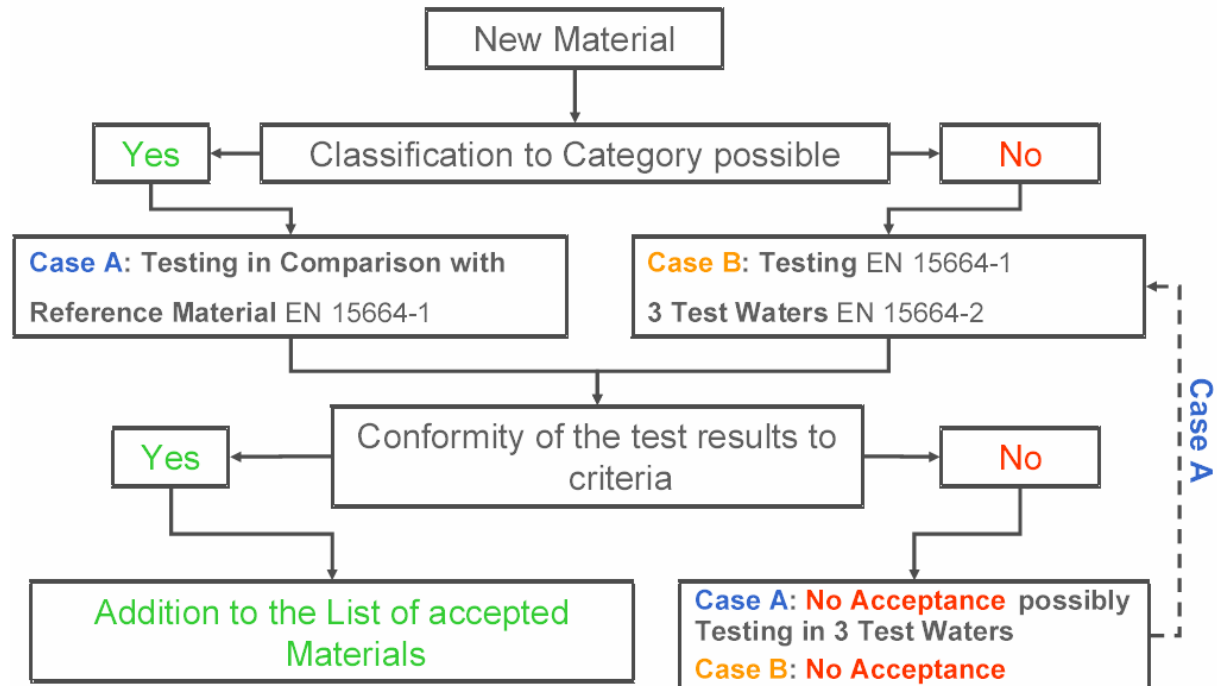
The Committee of Experts shall consider the complete set of available data. For the test rig according to EN 15664-1 these are:

- Results of individual test lines,
- 4h stagnation results and
- Parameters of water composition.

If stagnation samples were analysed in addition to the requirements in EN 15664-1 this data shall also be considered for the assessment.

The Committee of Expert shall decide whether the data available is of sufficient quality (e.g. no major difference of the three test lines, interpretation of outliers) for an assessment to be carried out, and if so decide whether to accept the materials based on the above mentioned criteria. Accepted materials will be added to the Composition List for the Category of the Reference Material used for comparative testing.

For an overview the scheme for the evaluation respectively the accepting process of new materials is given below.



**Figure 4 – Scheme Procedure of Acceptance of new materials**

An already tested and accepted composition has not to be tested furthermore. So it is listed and can be used for PDW to fulfill the requirement respectively the thresholds of DWD. The only thing than to do is to prove the conformity to the actual Composition List described below.

### The Composition List

The Composition List was compiled by the Sub-Group Metallic Materials based on existing evidence and Regulators' experience. The list contains for each Category of materials a Reference Material composition and accepted material compositions together with any restriction with regard to water quality and/or surface contribution or other relevant information. Metallic materials, which have been deliberately coated, are listed as a specific category in the Composition List. This list deals with composition of materials. It does not deal with products made from those materials.

- The conformity of a metallic material used in a product will be a prerequisite for the products to be considered fit for use:
- Any material not on the Composition List will be unable to get accepted for PDW until it fulfils the requirements for addition to the List.

In the next chapter a selection of already accepted commercial alloys is given.

## Accepted commercial alloys and alloys proposed for acceptance

### Copper-zinc alloys:

CW510L **proposed** for acceptance

- Product group B
- Product group C

Constituent	Content (%)	Impurity	Maximum (%)
Copper	57,0 – 59,0	Antimony	0,02
Zinc	Remainder	Arsenic	0,02
Lead	≤ 0,2	Bismuth	0,02
		Cadmium	0,02
		Nickel	0,3
		Aluminum	0,05
		Iron	0,3
		Silicon	0,02
		Tin	0,3

**Table 2 – CW510L composition of the material proposed for acceptance**

### Copper-zinc-arsenic alloys:

CW511L **proposed** for acceptance

- Product group B
- Product group C

Constituent	Content (%)	Impurity	Maximum (%)
Copper	61,5 – 63,5	Antimony	0,02
Zinc	Remainder	Arsenic	0,02
Lead	≤ 0,2	Bismuth	0,02
		Cadmium	0,02
		Nickel	0,3
		Aluminium	0,1
		Iron	0,1
		Silicon	0,02
		Tin	0,1
		Manganese	0,1

**Table 3 – CW511L composition of the material proposed for acceptance**

### Copper-zinc-lead alloys based on CW617N CW612N:

- Product group B
- Product group C

Constituent	Content (%)	Impurity	Maximum (%)
Copper	57,0 – 60,0	Antimony	0,02
Zinc	Remainder	Arsenic	0,02
Lead	1,6 – 2,2	Bismuth	0,02
		Cadmium	0,02
		Chromium	0,02
		Nickel	0,1
		Aluminium	0,05
		Iron	0,3
		Silicon	0,03
		Tin	0,3

**Table 4 – Copper-zinc-lead alloys composition of the accepted material**

Copper-zinc-lead alloys based on CW614N, CW603N:

- Product group C

Constituent	Content (%)	Impurity	Maximum (%)
Copper	57,0 – 62,0	Antimony	0,02
Zinc	Remainder	Arsenic	0,02
Lead	2,5 – 3,5	Bismuth	0,02
		Cadmium	0,02
		Chromium	0,02
		Nickel	0,2
		Aluminium	0,05
		Iron	0,3
		Silicon	0,03
		Tin	0,3

**Table 5 – Copper-zinc-lead alloys composition of the accepted material**

Copper-zinc-lead-arsenic alloys:

CC752S **proposed** for acceptance

- Product Group B
- Product Group C

Constituent	Content (%)	Impurity	Maximum (%)
Copper	61,0 – 63,0	Antimony	0,02
Zinc	Remainder	Bismuth	0,02
Lead	1,4 – 1,6	Cadmium	0,02
Arsenic	0,09 – 0,13	Nickel	0,2
Aluminium	0,5 – 0,7	Iron	0,3
		Silicon	0,02
		Tin	0,3
		Manganese	0,1

**Table 6 – CC752S composition of the material proposed for acceptance**

CuZn33Pb1.5AlAs (DZR 7.1) **proposed** for acceptance

- Product Group B
- Product Group C

Constituent	Content (%)	Impurity	Maximum (%)
Copper	63,0 – 66,0	Antimony	0,02
Zinc	Remainder	Bismuth	0,02
Lead	1,4 – 1,7	Cadmium	0,02
Arsenic	0,09 – 0,15	Nickel	0,2
Aluminium	0,8 – 1,0	Iron	0,3
		Silicon	0,02
		Tin	0,3
		Manganese	0,1

**Table 7 – CuZn33Pb1.5AlAs composition of the material proposed for acceptance**

CuZn33Pb1.5AlSiAs **proposed** for acceptance

- Product Group B
- Product Group C

Constituent	Content (%)	Impurity	Maximum (%)
Copper	63,0 – 66,0	Antimony	0,02
Zinc	Remainder	Bismuth	0,02
Lead	1,4 – 1,7	Cadmium	0,02
Arsenic	0,02 – 0,08	Nickel	0,2
Aluminium	0,1 – 0,4	Iron	0,3
Silicon	0,1 – 0,3	Silicon	0,02
		Tin	0,3
		Manganese	0,1

**Table 8 – CuZn33Pb1.5AlSiAs composition of the material proposed for acceptance**

Copper-tin-zinc-lead alloys based on CC499K:

- Product Group B
- Product Group C

Constituent	Content (%)	Impurity	Maximum (%)
Copper	84,0 – 88,0	Aluminium	0,01
Zinc	4,0 – 6,0	Antimony	0,1
Tin	4,0 – 6,0	Arsenic	0,03
Lead	2,5-3,0	Bismuth	0,02
Nickel	0,1-0,6	Cadmium	0,02
		Chromium	0,02
		Iron	0,3
		Silicon	0,01

**Table 9 – Copper-tin-zinc-lead alloys composition of the accepted material**

Silicon containing copper alloys high Zn:

CW724R **proposed** for acceptance

- Product Group B
- Product Group C

Constituent	Content (%)	Impurity	Maximum (%)
Copper	75,0 – 77,0	Antimony	0,02
Zinc	Remainder	Arsenic	0,02
Phosphorus	0,02 – 0,10	Bismuth	0,02
Silicon	2,7 – 3,5	Cadmium	0,02
		Nickel	0,2
		Aluminium	0,05
		Iron	0,3
		Lead	0,1
		Tin	0,3
		Manganese	0,05

**Table 10 – Silicon containing copper alloys high Zn composition of the material proposed for acceptance**

Silicon containing copper alloys high Cu:

CuZn10Si4MnP **proposed** for acceptance

- Product Group B
- Product Group C

Constituent	Content (%)	Impurity	Maximum (%)
Copper	84 – 96	Antimony	0,02
Zinc	≤ 11	Arsenic	0,02
Silicon	2,5 – 4,5	Bismuth	0,02
Phosphorus	0,01 – 0,1	Cadmium	0,02
Tin	0,01 – 0,3	Nickel	0,3
Manganese	0,01 – 0,1	Aluminum	0,3
		Iron	0,3
		Lead	0,1

**Table 11 – Silicon containing copper alloys high Cu composition of the material proposed for acceptance**

Copper (Cu-DHP/CW 024A):

- Product group A
- Product group B
- Product group C

Constituent	Content (%)	Impurity	Maximum (%)
Copper	≥ 99,9	Others total	≤ 0,1
Phosphorus	≤ 0,04		

**Table 12 – Copper composition of the accepted material**

#### Tinned Copper Tubes and tinned Copper Fittings:

Cu-DHP/CW 024A with a tin layer thickness 1 µm with the following composition:

- Product group A
- Product group B
- Product group C

Constituent	Content (%)	Impurity of	Maximum (%)
Tin	> 90	Antimony	0,01
Copper	< 10	Arsenic	0,01
		Bismuth	0,01
		Cadmium	0,01
		Chromium	0,01
		Lead	0,01
		Nickel	0,01

**Table 13 – Tinned Copper Tubes and tinned Copper Fittings composition of the accepted material**

#### Galvanised steel

The zinc coating resulting from used in the galvanising process shall comply with the following requirements.

- Product group A
- Product group B
- Product group C

Constituent	Content (%)	Impurity	Maximum (%)
Zinc		Antimony	0,01
		Arsenic	0,02
		Cadmium	0,01
		Chromium	0,02
		Lead	0,05
		Bismuth	0,01

**Table 14 – Galvanised steel composition of the accepted material**

#### Carbon steel:

Carbon steel without permanent protective layers is not suitable for use in contact with drinking water. Unprotected carbon steel can be used for specific applications (e.g. pumps, valves) and only for small surface in contact with water. The constituents and impurities should not exceed the maximum limits stated below:

- Group C

Constituent	Content (%)	Impurity	Maximum (%)
Iron		Antimony	0,02
Carbon	≤ 2,11	Arsenic	0,02
Chromium	≤1,0	Cadmium	0,02
Molybdenum	≤1,0	Lead	0,02
Nickel	≤0,5		

**Table 15 – Carbon steel composition of the accepted material**

Cast iron:

Cast iron without permanent protective layers is not suitable for pipes and fittings in contact with drinking water. Unprotected cast iron can be used for specific applications (e.g. pumps, valves) and only for very small surface in contact with water. Their composition needs to be regulated. The constituents and impurities should not exceed the maximum limits stated below:

- Group C

Constituent	Content (%)	Impurity	Maximum (%)
		Antimony	0.02
Iron		Arsenic	0.02
Carbon		Cadmium	0.02
Chromium	≤1.0	Lead	0.02
Molybdenum	≤1.0		
Nickel	≤6.0		

**Table 16 – Cast iron composition of the accepted material**

Stainless Steel:

Due to its passivity relating to hygienic aspects Stainless Steel is suitable for pipes and fittings in contact with drinking water, but it is necessary to regard EN 12502-4 especially high chloride concentrations more than 200 mg/l (cold water) or more than 50 mg/l (warm water):

- Product group A
- Product group B
- Product group C

**Certification and Declaration of PDW**

At the end of the process for accepting metallic materials und in consequence also PDW it is necessary to show conformity to the harmonised requirements. A suitable method to do this is the Certification and Declaration of these products. The frame is given in the Council Directive 89/106/EEC. This directive will be replaced by the Council of the European Union 10753/3/3/10. The Council of the European Union 10753/3/3/10 Rev 3 Position of the Council at first reading with a view to the adoption of a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC. This Regulation lays down conditions for the placing or making available on the market of construction products by establishing harmonised rules on how to express the performance of construction



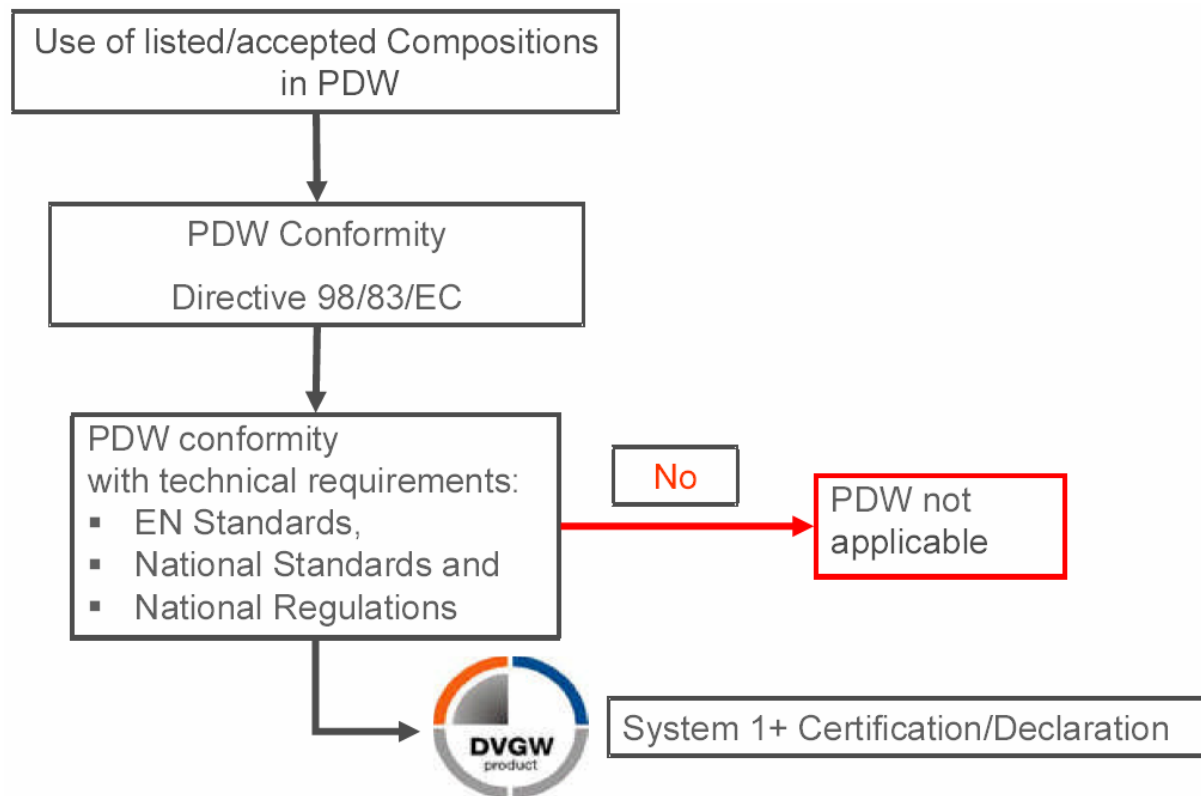
products in relation to their essential characteristics and on the use of CE marking on those products.

- framework for the marketing of products in the internal market
- removal of technical barriers in the field of construction
- establishment of harmonised technical specifications
- Declaration of performance

For the drinking water section respectively for products in contact with drinking water annex V of the Council of the European Union 10753/3/3/10 will be relevant as a system of assessment and verification of constancy of performance. It describes a *System 1+ - Declaration* of the performance of the essential characteristics of the construction product by the manufacturer. It is the most stringent System for certification on the basis of the following items:

- a) the manufacturer shall carry out:
  - i. factory production control;
  - ii. further testing of samples taken at the factory in accordance with the prescribed test plan;
- b) the notified product certification body shall issue the certificate of constancy of performance of the product on the basis of:
  - i. determination of the product-type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product;
  - ii. initial inspection of the manufacturing plant and of factory production control;
  - iii. continuous surveillance, assessment and evaluation of factory production control;
  - iv. audit-testing of samples taken before placing the product on the market.

The following scheme shows the relevance and necessity of the *System 1+ - Declaration* in the whole verification process for the acceptance of PDW to fulfill requirements of national and international regulations.



**Figure 5 – System 1+ - Declaration in the whole verification process for the acceptance of PDW**

### Summary

The main aim is to harmonize the technical and hygienic specifications in order to have an international reciprocal acceptance for materials and at least products in contact with drinking water (PDW).

Due to failure of the European Acceptance Scheme (EAS) for products in contact with drinking water (PDW) and the obligation of the national legislators to regulate the requirement for such products, four national regulators (France, The Netherlands, Germany, UK) initiated a volunteer harmonization process to formulate requirements for materials used for PDW. This so called Four-Member-States-Group (4MS-Group) has nearly finished its work on this topic. The result will be published soon.

Metallic materials are only allowed to use for PDW if they were successfully tested in accordance to EN 15664-1 and fulfilling the criteria given in this document and at least accepted for the composition list.

Now it is up to the national regulators and national standardization organizations to implement this on a national level.

The requirement for verification of conformity respectively certification will be regulated under the Council of the European Union 10753/3/3/10 as a *System 1+ - Declaration*.

### Literature

1. 4MS-Group *Procedure for the acceptance of metallic materials used for products in contact with drinking water* Version: 21. Nov. 2008
2. Council Directive 98/83/EC on the Quality of Water Intended for Human Consumption (DWD)

3. Directive 89/106/EEC on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products
4. Council of the European Union 10753/3/3/10 Position of the Council at first reading with a view to the adoption of a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC
5. EN 15664-1 Influence of metallic materials on water intended for human consumption - Dynamic rig test for assessment of metal release - Part 1: Design and operation
6. EN 15664-2 Influence of metallic materials on water intended for human consumption - Dynamic rig test for assessment of metal release - Part 2: Test waters
7. DIN 50931-1 Corrosion of metals - Corrosion tests of drinking water - Part 1: Testing of change of the composition of drinking water
8. DIN 50930-6 Corrosion of metals - Corrosion of metallic materials under corrosion load by water inside of tubes, tanks and apparatus - Part 6: Influence of the composition of drinking water

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