

BRASS ALLOYS SPECIALLY DESIGNED FOR THE REQUIREMENTS OF DRINKING WATER APPLICATIONS

Drinking water is our most important resource – it is essential to life and therefore fundamental to our health.

For this reason, ever stricter requirements are being imposed worldwide on materials that come into contact with drinking water.

Selecting the right materials for drinking water installations is therefore extremely important.

Technical, economic and, in particular, hygiene and health aspects play a major role here.

DIEHL BRASS SOLUTIONS TOMORROW. TODAY. SINCE 1902.



CuZn21Si3P



Stand: January 2024

1. Designation

Werkstoffbezeichnung	
Diehl Metall	434 (CUPHIN)
DIN EN Symbol	CuZn21Si3P
DIN EN	CW724R
UNS	C69300

2. Composition

Composition (mass percentage, reference values)	
Cu	75.0 – 77.0
Si	2.7 – 3.5
Р	0.02 - 0.10
Sn	0.2
Al	0.04
Zn	Remainder

3. Products and suitable standards

Products and suitable standards	
Rods (for general use)	EN 12163
Rods, drawn (for machining)	EN 12164
Rods (pre-material for forgings)	EN 12165
Hollow Rods (for machining)	EN 12168
Profile (for general use)	EN 12167

4. Mechanical properties and hardnes

*Values on request

Rod. drawn (reference values)		
Tensile strength Rm [in MPa]	550	
Yield strength R _{p0.2} [in MPa]	370	
Elongation A5 [in %]	35	

CuZn21Si3P

5. Processing properties

Forming	
Machinability (CuZn39Pb3 = 100%)	very good
Hot working property	very good
Cold working property	moderate
Surface treatment	
Polishing	good
Electroplating	good
Joining	
Gas-shield welding / resistance welding	good
Soft soldering	very good
Hard soldering	very good

434 (CUPHIN)

6. Thermal treatment

Wärmebehandlung	
Soft annealing	550 – 700 °C
Stress relieving	200 – 300 °C
Hot forming	700 – 750 °C

7. Corrosion resistance

In general good resistance to organic substances and neutral or alkaline compounds.

8. Dezincification resistance according to ISO 6509

This alloy meets the requirements of the relevant standards.



9. Use

Particularly suitable for use in drinking water applications due to its high corrosion resistance. Lead-free machining alloy with very good hot forming properties. High-strength construction material. The dezincification resistance of the material is impaired during processing operations exceeding a temperature of 580 °C. Optimum dezincification resistance needs to be restored by heat treatment at 550 °C - 580 °C over a period of 2 - 3 hours. For further information, please contact the manufacturer.

CuZn21Si3P



Stand: January 2024

1. Designation

Designation	
Diehl Metall	432 PbF (CUPHIN)
DIN EN Symbol	CuZn21Si3P
DIN EN	CW724R
UNS	C69300 (C87850)

2. Composition

Composition (mass percentage, reference values)	
Cu	75.0 – 77.0
Si	2.7 – 3.5
Р	0.02 – 0.10
Zn	Remainder

3. Products and Corresponding Standards

Rods (for general machining) EN 12163

4. Mechanical properties and hardness

Mechanical properties (Reference values (die casting))	
Tensile strength Rm	500 N/mm ²
Yield strength R _{p0.2}	200 N/mm ²
Elongation A5	22 %
Brinell-hardness	135 HB

CuZn21Si3P

5. Physical properties

Physical properties		
Density	g/cm ³	8.3
Coeffi cient of thermal expansion 20-200°C	10- ⁶ /K	19.6
Electrical conductivity	m/(Ω·mm²)	5.3
Modulus of elasticity	GPa	106

432 Pbf (CUPHIN)

6. Processing properties

Processing properties	
Machinability (CuZn39Pb3 = 100%)	very good
Castability	good

7. Thermal treatment

Thermal treatment	
Soft annealing	550 – 700 °C
Stress relieving	200 – 300 °C

8. Corrosion resistance

In general good resistance to organic substances and neutral or alkaline compounds.

9. Dezincification resistance according to ISO 6509

This alloy meets the requirements of the relevant standards.



10. Use

Lead-free material for the production of fine-grained, high-strength, and corrosion-resistant castings.

The dezincification resistance of the material is impaired during processing operations exceeding a temperature of 580 °C. Optimum dezincification resistance needs to be restored by heat treatment at 550 °C – 580 °C over a period of 2-3 hours. For further information, please contact the manufacturer.





1. Designation

Designation	
Diehl Metall	412 (AQCUARIN. alloy for forging)
DIN EN Symbol	CuZn33Pb1AlSiAs
DIN EN	CW725R
UNS	-

2. Composition

Composition (mass percentage	. reference values)		
Cu	64.0 – 67.0	Al	0.1 – 0.4
Pb	0.5 – 0.8	Si	0.1 – 0.3
Zn	Remainder	As	0.04 - 0.08

3. Approval according to DIN 50930 - 6

The alloy can be used in the drinking water sector for fittings, including faucet extensions (lead \leq 3.5%) product group B and C.

Hygienic list: Accepted.

4. Approval according to US Legislation

S3874 Reduction of Lead in Drinking Water Act. The alloy can be used in drinking water applications to a limited extent.

5. Products and suitable standards

Produkte und entsprechende Normen	1
Rods (pre-material for forgings)	EN 12165
Hollow Rods (for machining)	EN 12168
Profile (for general use)	EN 12167

6. Mechanical Properties and Hardness

The strength properties and hardness values are specified in the relevant product standards. The properties depend on the product and dimensions.

CuZn33Pb1AlSiAs

7. Physical properties

Physical properties		
Dichte	g/cm ³	8.47
Coefficient of thermal expansion of 20 – 200 $^{\circ}\text{C}$	10- ⁶ /K	20
Electrical conductivity	m/(Ω·mm²)	12.8

8. Processing properties

Formgebung	
Machinability (CuZn39Pb3 = 100%)	good
Hot workability	good
Cold workability	moderate

9. Thermal treatment

Thermal treatment	
Soft annealing	450 − 550 °C
Stress relieving	200 − 250 °C

10. Corrosion resistance

In general good resistance to organic substances and neutral or alkaline compounds.

11. Dezincification resistance according to ISO 6509

This alloy meets the requirements of the relevant standards.



12. Use

Alloy 412 is a construction material with medium strength and good toughness properties. It is particularly suitable for use in aggressive tap water. Alloy 412 is included in the positive list of the German Environment Agency (UBA). Rods and profiles as a pre-material for forgings are not dezincification-resistant in the as-delivered state. To achieve dezincification resistance, heat treatment at 500 – 550 °C for a duration of 2 hours is required after forging.



1. Designation

Designation	
Diehl Metall	413 (AQCUARIN. alloy for machining)
DIN EN Symbol	CuZn33Pb1AlSiAs
DIN EN	CW725R
UNS	-

2. Composition

Composition (mass percentage. re	ference values)		
Cu	64.0 – 67.0	Al	0.1 – 0.4
Pb	0.5 – 0.8	Si	0.1 – 0.3
Zn	Remainder	As	0.04 - 0.08

3. Products and suitable standards

(conditions correspond to the alloy CuZn36Pb2As; composition is not standardized)

Products and suitable standards	
Rods (pre-material for forgings)	EN 12164
Hollow Rods (for machining)	EN 12168
Profile (for general use)	EN 12167

4. Mechanical Properties and Hardness

The strength properties and hardness values are specified in the relevant product standards. The properties depend on the product and dimensions.

CuZn33Pb1AlSiAs

5. Physical properties

Physical properties		
Density	g/cm ³	8.47
Coefficient of thermal expansion of 20 – 200 $^{\circ}\text{C}$	10- ⁶ /K	20
Electrical conductivity	m/(Ω·mm²)	12.8

6. Processing properties

Processing properties	
Machinability (CuZn39Pb3 = 100%)	good
Hot workability	good
Cold workability	moderate

7. Thermal treatment

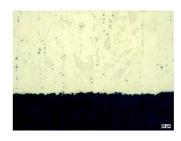
Thermal treatment	
Soft annealing	450 – 550 °C
Stress relieving	200 − 250 °C

8. Corrosion resistance

In general good resistance to organic substances and neutral or alkaline compounds.

9. Dezincification resistance according to ISO 6509

This alloy meets the requirements of the relevant standards.



10. Use

Alloy 413 is a construction material with medium strength and good toughness properties. It is particularly suitable for use in aggressive tap water. Alloy 413 is ideal for automated machining processes and can be cold formed.

Following cold forming, it is advisable to carry out stress-relief annealing at $< 300 \, ^{\circ}\text{C}$ with a dwell time of 1-2 hours. If processing operations are carried out at temperatures above 600 °C, the dezincification resistance is impaired. It needs to be restored by means of a suitable heat treatment. The annealing temperature for this is 500 – 550 °C over a period of 2 hours.

Any further information should be obtained from the manufacturer.

CuZn38As



Stand: January 2024

1. Designation

Designation	
Diehl Metall	062 (ECOMERICA)
DIN EN Symbol	CuZn38As
DIN EN	CW511L
UNS	C24453

2. Composition

Composition (mass percentage. reference values)	
Cu	61.5 – 63.5
As	0.02 – 0.15
Zn	Remainder
Pb	< 0.2

3. Products and suitable standards

Products and suitable standards	
Rods (for machining)	EN 12164
Rods (pre-material for forgings)	EN 12165
Hollow Rods (for machining)	EN 12168
Profile (for general use)	EN 12167

4. Mechanical Properties and Hardness

The strength properties and hardness values are specified in the relevant product standards. The properties depend on the product and dimensions.

CuZn38As

5. Physical properties

Physical properties		
Density	g/cm ³	8.4
Electrical conductivity	$m/(\Omega \cdot mm^2)$	16.2
Heat conductivity	W/mK	123
Modulus of elasticity	GPa	97

062 (ECOMERICA)

6. Processing properties

Formgebung	
Machinability (CuZn39Pb3 = 100%)	moderate
Hot workability	moderate
Cold workability	good

7. Thermal treatment

Thermal treatment	
Soft annealing	450 – 550 °C
Stress relieving	250 – 300 °C

8. Corrosion resistance

In general good resistance to organic substances and neutral or alkaline compounds.

9. Dezincification resistance according to ISO 6509

This alloy meets the requirements of the relevant standards.



10. Use

Dezincification-resistant alloy with good cold formability, solderability, and weldability. The alloy can be used in the drinking water sector. If processing operations are carried out at temperatures above 600 °C, the dezincification resistance is impaired. It therefore needs to be restored by means of a suitable heat treatment. The annealing temperature for this is 500 - 550 °C. Any further information should be obtained from the manufacturer.

1. Designation

Designation	
Diehl Metall	415
DIN EN Symbol	CuZn35Pb1,5AlAs
DIN EN	CW625N
UNS	-

2. Composition

Composition (mass percentage. reference values)	
Cu	63.0
Al	0.5
Pb	1.5
As	0.1
Zn	Remainder

3. Products and suitable standards

Products and suitable standards	
Rods (for general use)	EN 12168
Rods (machining)	EN 12164
Rods (pre-material for forgings)	EN 12165
Profile (for general use)	EN 12167
Nahtlose Rundrohre (for general use)	EN 12449

4. Mechanical Properties and Hardness

The mechanical properties are specified in the relevant product standards. The properties depend on the product and dimensions.

CuZn35Pb1,5AlAs

5. Physical properties

Physical properties		
Density	g/cm ³	8.4
Coefficient of thermal expansion of 20 – 200 °C	10- ⁶ /K	21.2

6. Processing properties

Processing properties	
Machinability (CuZn39Pb3 = 100%)	good
Hot workability	good
Cold workability	moderate

7. Thermal treatment

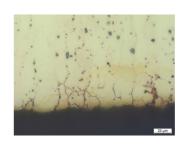
Thermal treatment	
Soft annealing	450 – 600 °C
Stress relieving	200 – 400 °C
Hot forming	650 – 800 °C

8. Corrosion resistance

In general good resistance to organic substances and neutral or alkaline compounds.

9. Dezincification resistance according to ISO 6509

This alloy meets the requirements of the relevant standards.



10. Use

Well-formable stamping and embossing brass. Suitable for bending, riveting, upsetting, and flanging. Applications include warm-pressed parts, fittings, and lock components.

Stand: January 2024



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CuZn42

1. Designation

Designation	
Diehl Metall	057 (ECOMERICA)
DIN EN Symbol	CuZn42
DIN EN	CW510L
UNS	-

2. Composition

Composition (mass percentage. reference values)	
Cu	57.0 – 59.0
Zn	Remainder
Pb	< 0.2

3. Products and suitable standards

Products and suitable standards	
Rods (for general use)	EN 12163
Rods (for machining)	EN 12164
Rods (pre-material for forgings)	EN 12165
Profile (for general use)	EN 12167
Nahtlose Rundrohre (for general use)	EN 12449

4. Mechanical Properties and Hardness

The strength properties and hardness values are specified in the relevant product standards. The properties depend on the product and dimensions.

5. Physical properties

Physical properties		
Density	g/cm ³	8.5
Coefficient of thermal expansion of 20 – 200 °C	10- ⁶ /K	21.4

057 (ECOMERICA)

6. Processing properties

Processing properties	
Machinability (CuZn39Pb3 = 100%)	moderate
Hot workability	good
Cold workability	poor

7. Thermal treatment

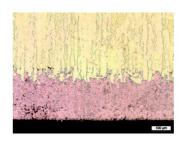
Thermal treatment	
Soft annealing	450 – 550 °C
Stress relieving	280 − 330 °C

8. Corrosion resistance

In general good resistance to organic substances and neutral or alkaline compounds.

9. Dezincification resistance according to ISO 6509

This alloy does not meet the requirements of the relevant standards.



10. Use

Low-lead material for automated machining. Suitable for all types of profile turned parts. Very suitable for forgings. The alloy can only be cold formed to a limited extent. The alloy can be used in drinking water applications.

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CuZn39Pb3 Diehl Metall 002

1. Designation

Designation	
Diehl Metall	002
DIN EN Symbol	CuZn39Pb3
DIN EN	CW614N
UNS	C38500

2. Composition

Composition (mass percentage. reference values)	
Cu	57.0 – 62.0
Pb	2.5 – 3.5
Zn	Remainder

3. Products and suitable standards

Products and suitable standards	
Rods	EN 12164
Rods (pre-material for forgings)	EN 12165
Hollow Rods (for machining)	EN 12168
Profile (for general use)	EN 12167

4. Mechanical Properties and Hardness

The strength properties and hardness values are specified in the relevant product standards. The properties depend on the product and dimensions.

5. Physical properties

Physical properties		
Density	g/cm ³	8.5
Coefficient of thermal expansion of 20 – 200 °C	10- ⁶ /K	19.97

6. Processing properties

Processing properties	
Machinability (CuZn39Pb3 = 100%)	excellent
Hot workability	excellent (650 – 760 °C)
Cold workability	poor

7. Thermal treatment

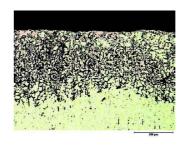
Thermal treatment	
Soft annealing	450 – 550 °C / 1 - 2h
Stress relieving	280 – 330 °C / 1 - 2h

8. Corrosion resistance

In general good resistance to organic substances and neutral or alkaline compounds.

9. Dezincification resistance according to ISO 6509

This alloy does not meet the requirements of the relevant standards.



10. Use

Standard material for automated machining. Suitable for all profile turned parts. The alloy can only be cold formed to a limited extent. The alloy can be used in drinking water applications.

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Stand: January 2024

CuZn39Pb3

Stand: January 2024

1. Designation

Designation	
Diehl Metall	006
DIN EN Symbol	CuZn39Pb3
DIN EN	CW614N
UNS	C38500

2. Composition

Composition (mass percentage, reference values)	
Cu	57.0 – 62.0
Pb	2.5 – 3.5
Zn	Remainder

3. Products and suitable standards

Products and suitable standards	
Rods (for machining)	EN 12164
Rods (pre-material for forgings)	EN 12165
Hollow Rods (for machining)	EN 12168
Profile (for general use)	EN 12167

4. Mechanical Properties and Hardness

The strength properties and hardness values are specified in the relevant product standards. The properties depend on the product and dimensions.

CuZn39Pb3

5. Physical properties

Physical properties		
Density	g/cm ³	8.5
Coefficient of thermal expansion of 20 – 200 °C	10- ⁶ /K	21.4

Diehl Metall 006

6. Processing properties

Processing properties	
Machinability (CuZn39Pb3 = 100%)	very good
Hot workability	very good (650 – 760 °C)
Cold workability	poor

7. Thermal treatment

Thermal treatment	
Soft annealing	450 – 550 °C / 1 - 2h
Stress relieving	280 – 330 °C / 1 - 2h

8. Corrosion resistance

In general good resistance to organic substances and neutral or alkaline compounds.

9. Dezincification resistance according to ISO 6509

This alloy does not meet the requirements of the relevant standards.

10. Use

Special alloy from the CuZn39Pb3 group with improved cold formability. Standard material for automated machining. Suitable for all profile turned parts that undergo further processing involving limited cold forming, e.g. thread rolling, flanging. The alloy can only be cold formed to a limited extent. The alloy can be used in drinking water applications.

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CuZn39Pb2

Stand: January 2024

1. Designation

Designation	
Diehl Metall	008
DIN EN Symbol	CuZn39Pb2
DIN EN	CW612N
UNS	C37700

2. Composition

Composition (mass percentage. reference values)	
Cu	57.0 – 60.0
Pb	1.6 – 2.2
Zn	Remainder

3. Products and suitable standards

Products and suitable standards	
Rods (for machining)	EN 12164
Rods (pre-material for forgings)	EN 12165
Hollow Rods (for machining)	EN 12168
Profile (for general use)	EN 12167

4. Mechanical Properties and Hardness

The strength properties and hardness values are specified in the relevant product standards. The properties depend on the product and dimensions.

CuZn39Pb3

5. Physical properties

Physical properties		
Density	g/cm ³	8.4
Coefficient of thermal expansion of 20 – 200 °C	10- ⁶ /K	21.1

Diehl Metall 008

6. Processing properties

Processing properties	
Machinability (CuZn39Pb3 = 100%)	very good
Hot workability	good (650 – 760 °C)
Cold workability	poor

7. Thermal treatment

Thermal treatment	
Soft annealing	450 – 550 °C / 1 - 2h
Stress relieving	280 – 330 °C / 1 - 2h

8. Corrosion resistance

In general good resistance to organic substances and neutral or alkaline compounds.

9. Dezincification resistance according to ISO 6509

This alloy does not meet the requirements of the relevant standards.

10. Use

The alloy has excellent machinability and hot formability; only limited cold formability. CuZn39Pb2 is used for parts in precision mechanics as well as in mechanical and apparatus engineering. The alloy can be used in drinking water applications.

CuZn39Pb3

1. Designation

Designation	
Diehl Metall	205
DIN EN Symbol	CuZn36Pb3
DIN EN	CW603N
UNS	C35600 / C36000

2. Composition

Composition (mass percentage. reference values)	
Cu	57.0 – 62.0
Pb	2.5 – 3.5
Zn	Remainder

3. Products and suitable standards

Products and suitable standards	
Rods (for machining)	EN 12164
Hollow Rods (for machining)	EN 12168
Profile (for general use)	EN 12167

4. Mechanical Properties and Hardness

The strength properties and hardness values are specified in the relevant product standards. The properties depend on the product and dimensions.

5. Physical properties

Physical properties		
Density	g/cm ³	8.5
Coefficient of thermal expansion of 20 – 200 °C	10- ⁶ /K	20.6

6. Processing properties

Processing properties		
Machinability (CuZn39Pb3 = 100%)	very good	
Hot workability	good	
Cold workability	good	

7. Thermal treatment

Thermal treatment	
Soft annealing	450 – 550 °C
Stress relieving	250 − 350 °C

8. Corrosion resistance

In general good resistance to organic substances and neutral or alkaline compounds.

9. Dezincification resistance according to ISO 6509

This alloy does not meet the requirements of the relevant standards.

10. Use

The alloy has good machinability and cold formability. It is suitable for automated machining, e.g. flanging and thread rolling operations. In the USA, it is the main alloy used for automated machining.



isk Disclosure

The tests took place under the test conditions mentioned here. In these tests, selected properties of the alloy can be investigated. The test results are based on the test setup shown, which has specific laboratory conditions. Deviating conditions in the field may have significant effects. Aspects which play a decisive role include, in particular, but not exhaustively, the design of the components, the further processing of the alloy, the processing of the finished parts made with the alloy, transport and storage, the manner and location of use, the installation and the installation situation.

When it comes to properties, the corrosion resistance of the material is a key factor. The DIN standard DIN EN ISO 8044 (formerly DIN 50900) defines corrosion as a reaction of a metallic material with its environment that causes a measurable change in the material and can impair the function of a metal component or an entire system. From a technical point of view, corrosion is a reaction of a material corrosion can impair the function of a component or system. Corrosion, as a complex system of interactions, depends on a large number of factors which, in their multiformity, cannot be fully reproduced under test conditions. The type of corrosion known as dezincfication, which occurs with zinc-containing copper alloys that are in contact with drinking water is familiar to the broad expert public.

The purchaser of the alloy is responsible for determining and testing the design, further processing, application areas of products made from the alloy, and any other relevant factors. This is also applicable when determining the dezincification depth that is considered reasonable for the selected area of application. Diehl cannot accept any liability for this, but solely for the information contained in the enclosed product data sheet.

You can also find the information $\underline{\text{\bf here}}$ on our website.

Stand: January 2024

Diehl Metall Stiftung & Co. KG Diehl Metall Messing Heinrich-Diehl-Straße 9 D - 90552 Röthenbach/Pegnitz Phone +4 0911/5704-0

Declaration of Conformity

Quality Assurance

Material code:	Material number:
(700 1100 1)	(=), (4,0)
(ISO 1190-1)	(EN 1412)
CuZn39Pb3	CW 614 N
CuZn40Pb2	CW 617 N
CuZn40Pb2	CW 617 N
CuZn40Pb2	CW 617 N
CuZn39Pb3	CW 614 N
CuZn39Pb3	CW 614 N
CuZn39Pb2	CW 612 N
CuZn40	CW 509 L
CuZn37	CW 508 L
CuZn36	CW 507 L
CuZn42	CW 510 L
CuZn42	CW 510 L
CuZn38As	CW 511 L
CuZn36	CW 507 L
CuZn36Pb3	CW 603 N
CuZn40	CW 509 L
CuZn21Si3P	CW 724 R
CuZn33Pb1AlSiAs	CW 725 R
CuZn33Pb1AlSiAs	CW 725 R
CuZn35Pb1,5AlAs	CW 625 N
CuZn21Si3P	CW 724 R
CuZn21Si3P	CW 724 R
CuZn21Si3P	CW 724 R
	(ISO 1190-1) CuZn39Pb3 CuZn40Pb2 CuZn40Pb2 CuZn40Pb3 CuZn39Pb3 CuZn39Pb3 CuZn39Pb2 CuZn40 CuZn37 CuZn36 CuZn42 CuZn42 CuZn42 CuZn42 CuZn36 CuZn37 CuZn37 CuZn33 CuZn33 CuZn33 CuZn33 CuZn35 CuZn35 CuZn35 CuZn21Si3 CuZn21Si3 CuZn21Si3

Herewith we are confirming the conformity of our material in compliance with the "Positivliste der trinkwasserhygienisch geeigneten metallenen Werkstoffe" (UBA-List: Revision May 2020) and the "4MS Common Composition List" (Revision August 2020).

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Signature: i.A. Potthof

