



## 1. Introduction, scope

The subject of the factory technical specification are horizontal continuous cast copper alloy tubes and rods.

The specification applies to products manufactured for the manufacturer's stock and to customer orders, unless other requirements are specified by the customer.

## 2. Definition of the requirements in the contract

Example of markings:

- alloy feature, e.g.: B101, RG5,
- nominal outside diameter,
- for tubes, nominal inside diameter,
- nominal length

## 3. Markings

Direct marking at the end of products or using labels (tags) is allowed. The marking should contain at least the following information:

- a) the maker's mark,
- b) alloy name, e.g.: B101, RG5,
- c) batch number (melt number),
- d) dimension (outer diameter, and in the case of tubes also inner diameter),

Products with outside diameter is below 30 mm are marked only with labels (tags).

## 4. Quality requirements

### 4.1 Surface

The surfaces of the rods and tubes shall correspond to the manufacturing technology.

On the surfaces of tubes and rods, the following are permitted:

- a) annular casting marks, minor scratches, indentations, overcasts,
- b) oxide coloring of the surface resulting from the hot casting coming into contact with air after leaving the crystallizer and traces of graphite and irregularities resulting from physical wear of the crystallizer,

Overcasts or indentations shall not result in failure to meet the requirements included in the dimensional tolerances of the outside diameter and inside diameter of the casting.

### 4.2 Dimensions and shape

#### 4.2.1 Tubes and rods diameters - according to Table 1.

#### 4.2.2 Hole offset, wall thickness difference

Permissible wall thickness difference = 8% of nominal wall thickness.

Nominal wall thickness calculated using the formula (nominal external diameter - nominal internal diameter)/2

The difference in wall thickness is the difference in wall thickness measured in two opposite locations.


#### 4.2.3 Straightness - according to Table 1

#### 4.2.4 Length

B101 rods and tubes are cast in factory-made lengths of 2000mm with a permissible deviation of +50mm / -0mm.

Tubes and rods of other alloys are cast in 3000 mm factory lengths with a permissible deviation of +100mm / -0mm.

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 SZOPIENICE	Rods and tubes cast by horizontal continuous casting	Revision 2.0
		Page 2 z 3
		Date: 24.05.2021

Other lengths are permitted upon agreement between the customer and the manufacturer.

**Table 1: Dimensional and straightness tolerances of tubes and rods**

Nominal outer diameter	External diameter tolerance	Internal diameter tolerance	Max straightness deviation
below 100mm	+0,6mm -0,0mm	+0,0mm -1,0mm	2mm/m
from 100mm	+1,0mm -0,0mm	+0,0mm -1,0mm	3mm/m

#### 4.3 Chemical composition and HBW hardness- according to Table 2

In the case of B101 production, the HB hardness test is not performed.

For grades not mentioned in this specification, the chemical composition shall be agreed between the manufacturer and the customer

**Table 2: Chemical composition and HBW hardness.**

Alloy		Sn [%]	Pb [%]	Zn [%]	Fe [%]	Al [%]	Si [%]	P [%]	Sb [%]	Bi [%]	As [%]	Ni [%]	S [%]	Cu [%]	Cd [%]	Cr [%]	HBW
RG5 CC499K	min	4,0	0,2	4,0	--	--	--	--	--	--	--	0,1	--	84,0	--	--	--
	max	6,0	3,0	6,0	0,30	0,01	0,01	0,04	0,10	0,02	0,02	0,60	0,04	88,0	0,02	0,02	65
B555 CC491K	min	4,0	4,0	4,0	--	--	--	--	--	--	--	--	--	83,0*	--	--	--
	max	6,0	6,0	6,0	0,3	0,01	0,01	0,10	0,25	--	--	2,0*	0,10	87,0*	--	--	65
RG7 CC493K	min	5,2	5,0	2,0	--	--	--	--	--	--	--	--	--	81,0*	--	--	--
	max	8,0	8,0	5,0	0,2	0,01	0,01	0,10	0,3	--	--	2,0*	0,10	86,0*	--	--	70
CuSn12 CC483K	min	10,5	--	--	--	--	--	--	--	--	--	--	--	85,0	--	--	--
	max	13,0	0,7	0,5	0,2	0,01	0,01	0,60	0,15	--	--	2,0	0,5	89,0	--	--	90
B101	min	9,0	--	--	--	--	--	0,5	--	--	--	*	--	--	--	--	--
	max	11,0	1,0	0,8	0,3	--	--	1,0	0,3	--	--	*	0,05	--	--	--	--

\* Ni content up to 2.0% shall be added to the Cu content

#### 4.4 Cross-section, structure

The cross-section of rods and tubes shall be free from non-metallic inclusions, delamination and pores.

### 5. Packaging, storage and transport

#### 5.1 Packing

The method of packaging shall be agreed with the purchaser and shall be suitable for the agreed conditions of transport.

#### 5.2 Storage

The products should be stored in dry and clean areas, free from harmful toxins and gases.



## 6. Testing and inspection

### 6.1 Product batch

A batch (melt) consists of max 1100kg of tubes or rods of the same nominal size and the same metal grade.

### 6.2 Description of inspection, evaluation of results

Tubes and rods are subject to surface quality control, dimensional and shape inspections. The chemical composition is tested by analyzing the chemical composition of a piece of a casting taken from a given batch of products

The detailed course of control and testing is described in the internal procedures and instructions of the Quality Management System.

### 6.3 Certifications

At the customer's request, an Inspection certificate 3.1 containing the results of chemical composition tests and, where applicable, the results of HBW hardness measurements is enclosed with the order.

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