Valjaonica bakra Sevojno a.d.

Product catalog

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VBS product portfolio

PRODUCT CATEGORIES

The core activity of Valjaonica bakra Sevojno is processing of copper and copper alloys by rolling, extruding and drawing into typical semi-finished products, such as sheets, strips, foils, lamellas, discs, tubes, rods, bars, profiles and wires.

In our plants we are casting and processing various types of pure, phosphorus-deoxidized copper, broad range of copper-zinc alloys – brasses of two or three components (leaded brasses, special brasses containing tin, aluminum or nickel), or multi-component brasses with Si, Al, Fe, Mn added, and other copper-nickel alloys as well.

1. FLAT ROLLED PRODUCTS

Our flat rolled products assortment is designed for use in numerous applications, from sheets for façade cladding and roofing up to strips and foils for manufacture of electric and electronic components. They are produced in compliance with EN and other world standards, or as per specific requirements of customers, respectively.

Flat rolled products are manufactured according to EN, DIN, GOST, BS and other world standards, but also adhering to customers' specific requirements. Specific requirements may relate to tighter tolerances, consideration of special engineering features, narrower field of mechanical properties, specific requirements for surface finish and other characteristics that should meet targeted application.

1.1. Copper flat rolled products

The flat rolled products from copper are widely used in electrical engineering, as well as in construction industry – especially for external purposes. They are also suitable for manufacture of pressure vessels and many other industrial applications.

COPPER TYPES USED FOR MANUFACTURE OF OUR FLAT ROLLED PRODUCTS					
EN		DIN	ASTM	Conductivity (MS/m)*	Density (g/cm^3)
Alphabetic code	Numeric code				
Cu-HCP	CW021A	SE-Cu57	C10300	≥54	8,94
Cu-ETP	CW004A	E-Cu58	C11000	≥55	8,94
Cu-DLP	CW023A	SW-Cu	C12000	≥52	8,94
Cu-DHP	CW024A	SF-Cu	C12200	≥46	8,94
Cu-Zn0,5	CW119C	CuZn0,5	–	≥48	8,90
*in hard temper					

Assortment of copper flat rolled products:

1.1.1. COPPER STRIPS AND FOILS

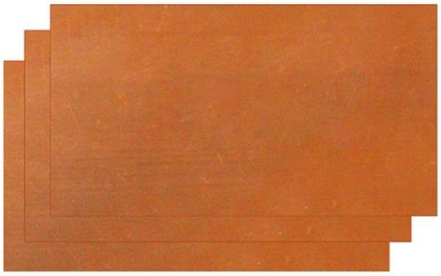
Copper strips and foils for use in electrical engineering are produced according to EN 13599, for general use according to EN 1652, and for use in construction sector according to EN 1172.

Assortment		
PRODUCTS	SIZES, mm	
STRIP	Thickness[2)]	0,1-4,0
	Width[2)]	6,0-1000
	Coilweight in kgs per mm of width[3)]	up to 3,0
	Coil internal diameter[4)]	75, 100, 150, 200, 300, 400, 500 or as requested
FOIL	Thickness	0,07-0,05 for copper
	Width	6,0-600
	Coil internal diameter	75, 80, 100 or as requested
[1)]Fabricating alloy, [2)]Width as per ordered thickness, [3)]Depending on alloy type, strip thickness and width, [4)]Delivered on reel if so ordered by customer (steel, cardboard or plastic core).		

Copper strips and foils are manufactured according to EN, DIN, GOST, BS and other world standards, but also adhering to customers' specific requirements. Specific requirements may relate to tighter tolerances, consideration of special engineering features, narrower range of mechanical properties and other characteristics specified to meet targeted application.

1.1.2. COPPER SHEETS AND PLATES

Copper sheets and plates for use in electrical engineering are produced according to EN 13599, for general use according to EN 1652, for pressure vessels according to EN 1653 and for use in construction area according to EN 1172.



Assortment		
PRODUCTS	SIZES, mm	
SHEET	Thickness	0,3-10
	Width	500-1000
	Length	500-4000
PLATE	Thickness	>10 (max. 150)
	Width	500-1100
	Length	as requested
SECTION, LAMELLA	Thickness	0,3-10
	Width	50-500
	Length	500-3000

Copper sheets and plates are manufactured according to EN, DIN, GOST, BS and other world standards, but also adhering to customers' specific requirements. Specific requirements may relate to tighter tolerances, consideration of special engineering features, narrower range of mechanical properties and other characteristics that should meet targeted application.

1.1.3. COPPER DISCS, ROUNDELS AND MULTIANGLES

Copper discs, roundels and multiangles for general use are made according to EN 1652, for pressure vessels according to EN 1653 as well as according to specific needs of our customers.

Specific requirements may relate to tighter tolerances, consideration of special engineering features, narrower range of mechanical properties and other characteristics that should meet targeted application.

Assortment		
PRODUCTS	SIZES, mm	
DISC (punched/cut)	Thickness	0,25-3,0
	Diameter	40-1000
ROUNDEL	Thickness	2,5-25
	Diameter	12-300
MULTIANGLE	Thickness	>3,0 (max. 30)
	Circle dia / No. of angles	as requested

1.2. Brass flat rolled products

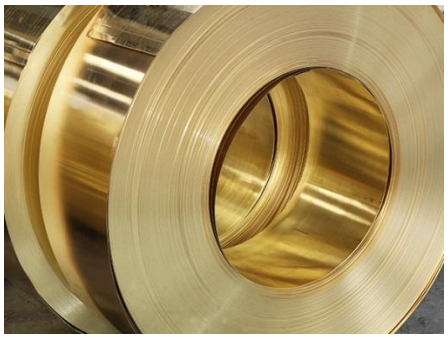
Flat rolled products from brass are used for a variety of applications, both in industrial and construction sector.

BRASS TYPES USED FOR MANUFACTURE OF OUR FLAT ROLLED PRODUCTS					
EN		DIN	ASTM	Conductivity (MS/m)*	Density (g/cm^3)
Alphabetic code	Numeric code				
CuZn5	CW500L	CuZn5	C21000	>33	8,86
CuZn10	CW501L	CuZn10	C22000	≥22	8,80
CuZn15	CW502L	CuZn15	C23000	≥18	8,75
CuZn20	CW503L	CuZn20	C24000	≥16	8,67
CuZn28	CW504L	CuZn28	C25600	≥16,5	8,55
CuZn30	CW505L	CuZn30	C26000	>13	8,55
CuZn33	CW506L	CuZn33	C26800	≥12	8,50
CuZn36	CW507L	CuZn36	C27000	>12	8,44
CuZn37	CW508L	CuZn37	C27200	≥12	8,44
CuZn40	CW509L	CuZn40	C28000	≥12	8,44
* in hard temper					

Assortment of brass flat rolled products:

1.2.1. BRASS STRIPS AND FOILS

Brass strips and foils for general use are produced according to EN 1652, and strips for use in construction area are produced according to EN 1172.



PRODUCTS	SIZES, mm	
STRIP	Thickness[2)]	0,1-4,0
	Width[2)]	6,0-1000
	Coilweight in kgs per mm of width[3)]	up to 3,0
	Coil internal diameter[4)]	75, 100, 150, 200, 300, 400, 500 or as requested
FOIL	Thickness	0,07-0,1
	Width	6,0-600
	Coil internal diameter	75, 80, 100 or as requested

[1)]Fabricating alloy, [2)]Width as per ordered thickness, [3)]Depending on alloy type, strip thickness and width, [4)]Delivered on reel if so ordered by customer (steel, cardboard or plastic core).

Brass strips and foils are manufactured according to EN, DIN, GOST, BS and other world standards, as well as according to specific needs of customers. Specific requirements usually relate to tighter tolerances, consideration of special engineering features, narrower field of mechanical properties and other characteristics that should meet targeted application.

1.2.2. BRASS SHEETS AND PLATES

Brass sheets and plates for general use are produced according to EN 1652, for pressure vessels according to EN 1653, and for use in construction sector according to EN 1172.

Assortment		
PRODUCTS	SIZES, mm	
SHEET	Thickness	0,3-10
	Width	500-1000
	Length	500-4000
PLATE	Thickness	>10 (max. 150)
	Width	500-1100
	Length	as requested
SECTION, LAMELLA	Thickness	0,3-10
	Width	50-500
	Length	500-3000

Brass sheets and plates are manufactured according to EN, DIN, GOST, BS and other world standards, as well as according to specific needs of the customers. Specific requirements usually relate to tighter tolerances, consideration of special engineering features, narrower field of mechanical properties and other characteristics specified to meet targeted application.

1.2.3. BRASS DISCS, ROUNDELS AND MULTIANGLES

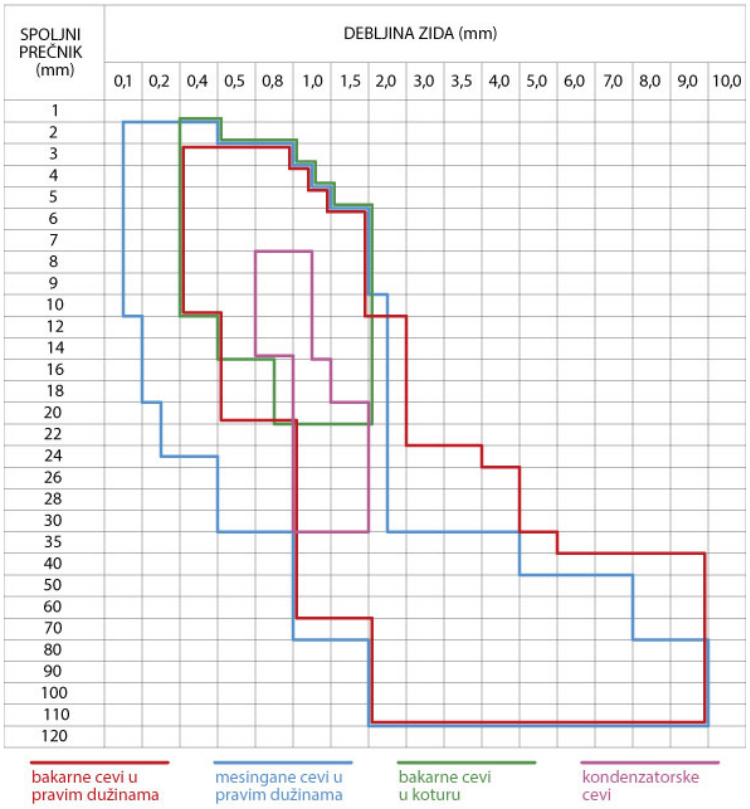
Brass discs, roundels and multiangles for general use are produced according to EN 1652, for pressure vessels according to EN 1653, but also according to specific requirements of our customers.
Such specific requirements usually relate to tighter tolerances, consideration of special engineering features, narrower field of mechanical properties and other characteristics specified to meet targeted application.

Brass roundels are only offered in hard condition.

Assortment		
PRODUCTS	SIZES, mm	
DISC (punched/cut)	Thickness	0,25-3,0
	Diameter	40-1000
ROUNDEL	Thickness	2,5-25
	Diameter	12-300
MULTIANGLE	Thickness	>3,0 (max. 30)
	Circle dia / no. of angles	as requested

2. TUBES

Valjaonica bakra Sevojno produces high quality tubes from copper and copper alloys. Wide range of copper types and alloys, diversified product mix* and excellent performance make our products suitable for various industrial applications, as well as for the use in construction sector, e.g. for installations and interior and exterior purposes.



Tubes are manufactured in compliance with EN, DIN, GOST, BS and other world standards, but also in accordance with specific requirements of customers. Such requirements may relate to tighter tolerances, consideration of special engineering features, narrower field of mechanical properties and other characteristics specified to meet targeted application.

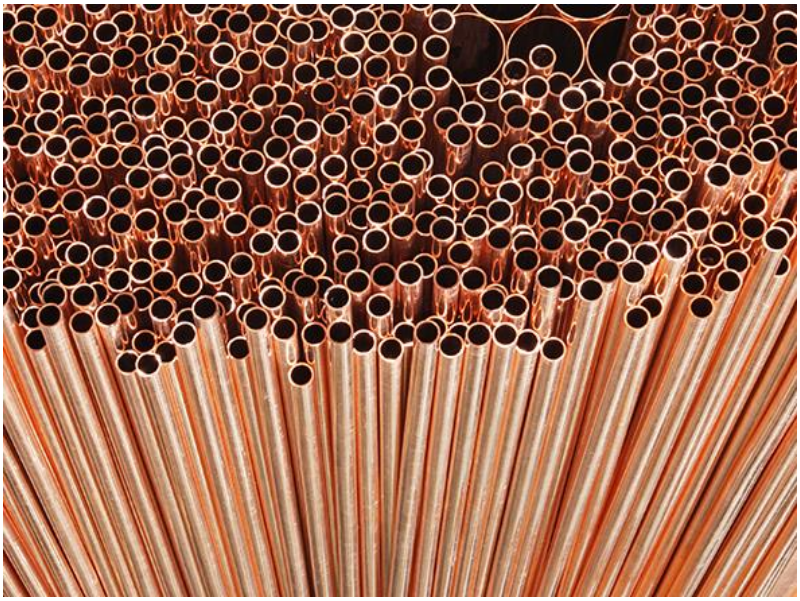
2.1. Copper tubes

Thanks to their outstanding durability, excellent thermal and electric conductivity and ease of shaping, copper tubes are good choice for various purposes in industry, construction, and generally household appliances. Manufacture of air conditioners and refrigerators, heating, plumbing and sanitary pipelines, as well as of installations for medical gases, manufacture of condensers and components for electric industry are just some of their numerous applications.

Assortment of copper tubes:

2.1.1. INSTALLATION TUBES

Installations made from copper tubes are very efficient and cost-effective, maintaining properties over a long period which guaranties a longer lifetime.



COPPER DESIGNATION AND standardS ACCORDING TO WHICH COPPER INSTALLATION TUBES ARE MANUFACTURED					
EN designation		EN defining the products	Designations as per other standards		
			DIN		ASTM
alphabetic	numeric		alphabetic	numeric	
Cu-DHP	CW024A	EN 1057 EN 12735-1 EN 13348	SF-Cu	2.0090	C 122 00

Assortment of copper installation tubes:

2.1.1.1. TUBES FOR HEATING AND SANITARY FACILITIES

We produce tubes for heating and sanitaria's completely in accordance with the standard EN 1057. Copper tubes made as per this standard are designed for manufacture of distributive networks for cold and hot water supply, for hot water heating systems and wall and floor heating panels. They are also ideal for pipelines for liquid fuel and household gas distribution and waste water systems (drains and alike).

AsSortMENT OF TUBES FOR HEATING AND SANITARY FACILITIES ACCORDING TO EN 1057			
COPPER TYPE	SIZES, mm		DELIVERY FORM
	Outer diameter	Wall thickness	
Cu-DHP	6,0-22,0	0,5-2,0	coil, level wound (soft temper)
	6,0-120,0	0,5-3,0*	fabricating lengths (2-6 m), fixed lengths (1-6 m)
* depending on the outer diameter			

Tubes are manufactured in compliance with EN, DIN, GOST, BS and other world standards, but also in accordance with specific requirements of customers. Such requirements may relate to tighter tolerances, consideration of special engineering features, narrower field of mechanical properties and other characteristics specified to meet targeted application.

2.1.1.2. TUBES FOR AIR-CONDITIONERS AND REFRIGERATORS

Tubes for air-conditioners and refrigerators are completely produced in accordance with the standard EN 12735-1. Copper tubes made on the basis of this standard are designed for manufacture of pipelines for air-conditioning and cooling of spaces where low temperatures are required.

AsSortmENT OF TUBES FOR AIR-CONDITIONERS AND REFRIGERATORS ACCORDING TO EN 12735-1			
COPPER TYPE	SIZES, mm		DELIVERY FORM
	Outer diameter	Wall thickness	
Cu-DHP	6,0-22,0	0,5-2,0	coil, level wound (soft temper)
	6,0-108,0	0,5-2,5*	fabricating lengths (2-6 m), fixed lengths (1-6 m)
* depending on the outer diameter			

Tubes are manufactured in compliance with EN, DIN, GOST, BS and other world standards, but also in accordance with specific requirements of customers. Such requirements may relate to tighter tolerances, consideration of special engineering features, narrower field of mechanical properties and other characteristics specified to meet targeted application.

2.1.1.3. TUBES FOR MEDICAL GASES AND VACUUM SYSTEMS

Tubes for medical gases and vacuum systems are completely produced according to standard EN 13348. Copper tubes made on the basis of this standard are designed for manufacture of pipelines for distribution of gases in healthcare institutions and laboratories, for working pressures of up to 2000 kPa, as well as for vacuum-systems.

Assortment of tubes for medical gases and vacuum according to EN 13348			
COPPER TYPE	SIZES, mm		DELIVERY FORM
	Outer diameter	Wall thickness	
Cu-DHP	8,0-22,0	0,5-2,0	coil, level wound
	8,0-54,0	0,5-2,0*	fabricating lengths (2-6 m), fixed lengths (1-6 m)
* depending on the outer diameter			

Tubes are manufactured in compliance with EN, DIN, GOST, BS and other world standards, but also in accordance with specific requirements of customers. Such requirements may relate to tighter tolerances, consideration of special engineering features, narrower field of mechanical properties and other characteristics specified to meet targeted application.

2.1.2. INDUSTRIAL TUBES

Copper tubes with amazing characteristics and very good conversion capability are readily used in electrical engineering, heat exchangers industry and many other industrial branches meeting the needs of various applications.

Assortment of copper industrial tubes:

2.1.2.1. TUBES FOR ELECTRICAL ENGINEERING

Tubes designed for use in electrical engineering are manufactured in compliance with EN 13600 standard.

ASSORTMENT OF TUBES FOR ELECTRICAL ENGINEERING ACCORDING TO EN 13600			
COPPER TYPE	SIZES, mm		DELIVERY FORM
	Outer diameter	Wall thickness	
Cu-ETP	6,0-22,0	0,5-2,0	coil, level wound (soft temper)
Cu-HCP	6,0-120,0	0,5-10,0*	fabricating lengths (2-6 m), fixed lengths (1-6 m)
* depending on the outer diameter.			

Tubes are manufactured in compliance with EN, DIN, GOST, BS and other world standards, as well as in accordance with specific requirements of customers. Specific requirements may relate to tighter tolerances, consideration of special engineering features, narrower field of mechanical properties and other characteristics specified to meet targeted application.

COPPER DESIGNATION AND STANDARDS ACCORDING TO WHICH COPPER INSTALLATION TUBES ARE MANUFACTURED					
EN designation		Applicable EN	Designation as per other standards		
alphabetic	numeric		DIN		ASTM
			alphabetic	numeric	
Cu-HCP	CW021A	EN 13600	SE-Cu	2.0700	C 103 00
Cu-ETP	CW004A	EN 13600	E-Cu58	2.0065	C 110 00

2.1.2.2. COPPER TUBES FOR HEAT EXCHANGERS

Copper tubes for heat exchangers, condensers, evaporators and desalination equipment are manufactured complying to EN 12451 standard.

ASSORTMENT OF TUBES FOR HEAT EXCHANGERS according to EN 12451			
COPPER TYPE	SIZES, mm		DELIVERY FORM
	Outer diameter	Wall thickness	
Cu-DHP	6,0-22,0	0,5-2,0	coil, level wound (soft temper)
	6,0-76,0	0,5-3,0*	fabricating lengths (2-6 m), fixed lengths (1-6 m)
* depending on the outer diameter.			

We produce heat exchangers in accordance with EN 12735-2. Copper tubes for climatization and cooling devices made on the basis of this standard are designed for manufacture of heat exchanging tube bundles to be installed into air-conditioning and refrigerating units.

ASSORTMENT OF TUBES according to EN 12735-2			
COPPER TYPE	SIZES, mm		DELIVERY FORM
	Outer diameter	Wall thickness	
Cu-DHP	6,0-22,0	0,5-2,0	coil*, level wound (soft temper)
	6,0-76,0	0,5-3,0	fabricating lengths (2-6 m), fixed lengths (1-6 m)
* for OD-s up to 18 mm and wall thicknesses up to 1,5 mm we can supply the LWC coil			

We produce tubes in compliance with EN, DIN, GOST, BS and other world standards.

2.1.2.3. COPPER TUBES FOR GENERAL INDUSTRIAL APPLICATION

Copper tubes can satisfy requests from many industrial sectors. Copper tubes for general industrial purpose are manufactured in accordance with EN 12449.

ASSORTMENT OF COPPER TUBES FOR GENERAL INDUSTRIAL APPLICATION ACCORDING TO EN 12449			
COPPER TYPE	SIZES, mm		DELIVERY FORM
	Outer diameter	Wall thickness	
Cu-DHP	6,0-22,0	0,5-2,0	coil, level wound (soft temper)
	6,0-120,0	0,5-10,0*	fabricating lengths (2-6 m), fixed lengths (1-6 m)
* depending on the outer diameter.			

Tubes are manufactured in compliance with EN, DIN, GOST, BS and other world standards, but also in accordance with specific requirements of customers. Specific requirements may relate

to tighter tolerances, consideration of special engineering features, narrower field of mechanical properties and other characteristics specified to meet targeted application.

We produce copper tubes suitable for bending which can be ordered adhering to factory's technical terms and conditions.

2.1.3. THIN-WALL TUBES FROM COPPER

The thin-wall tubes from copper are mainly used in the refrigeration unit's industry, heat exchangers industry (coolers and air conditioners), for distribution of liquids (free or under pressure), in solar energy systems, for heaters, copper fittings and rivets, etc.

BASIC aSsortmENT OF THIN-WALL TUBES			
COPPER TYPE	SIZES, mm		DELIVERY FORM
	Outer diameter	Wall thickness	
COPPER Cu-DHP TUBES	1,5-12	0,35-0,5	free coil* (O.D. < 5 mm) level wound coil** (O.D. 3-12 mm)
	3-12	0,35-0,5	straight lengths ***
* Coil OD 500-800 mm ** Level wound coil OD 400-800 mm *** Fabricating (2000 – 6000 mm) & fixed (20-6000 mm) lengths. For soft temper max.length is 2200mm.			

Copper thin-wall tubes are manufactured according to standards EN 1057, EN 12735-1, EN 12735-2, EN 12449, DIN, GOST, BS or other world standards and customers' requests, depending on their application. Special requests may be related to tighter tolerances, fulfillment of specific engineering characteristics, narrower range of mechanical properties, particular surface finish and other characteristics specified to satisfy a targeted application.

2.2. Brass tubes

Due to their ideal property profile, very good formability and attractive appearance, brass tubes are broadly used, both as parts of installations systems, condensers and other industrial components, and as components for furniture industry and interior design, for manufacture of decorative articles, lighting elements and other countless purposes.

Assortment of brass tubes:

2.2.1. BRASS TUBES FOR BENDING

Our brass tubes suitable for bending can be ordered on the basis of VBS' Technical terms and conditions. The warranty for this product covers its ability to be processed by bending and its application. The product is used for making installations, sanitary devices and fittings, in furniture industry, for manufacture of metal fixtures and various decoration articles, for development of lighting components and a number of other purposes. It can be delivered in fabricating (2-6 m) or fixed (1-6 m) lengths.

BASIC ALLOY FOR TUBES FOR BENDING *				
EN		Designation as per other standards		
		DIN		ASTM
alphabetic	numeric	alphabetic	numeric	
CuZn37	CW508L	CuZn37	2.0321	C 27 200

2.2.2. BRASS PROFILE TUBES

This sort of tubes is widely applied in architecture, for manufacture of interior decorating elements (chandeliers, lamps, diverse structures and similar decorative and functional objects). Standard alloy used is CuZn37, and tubes are offered in hard, half hard and soft annealed condition, both in fabricating lengths up to 6 meters or in fixed lengths as per buyers' requests, respectively.

BASIC ALLOY FOR PROFILE TUBES *				
EN		Designation as per other standards		
		DIN		ASTM
alphabetic	numeric	alphabetic	numeric	
CuZn37	CW508L	CuZn37	2.0321	C 272 00

Tubes are manufactured according to standards EN, DIN, GOST, BS or other world standards and special customers' requests as well. Such requests may be related to tighter tolerances, fulfillment of specific engineering characteristics, narrower range of mechanical properties, particular surface finish and other characteristics specified to satisfy a targeted application.

Sizes and shapes can be selected from the CATALOG or tailored to customer's requirement.

2.2.3. THIN-WALL TUBES FROM BRASS

Thin-wall tubes from brass find use for sanitary fittings, heat exchangers, interior furnishing, manufacture of decorative articles, rivets production etc.

BASIC ASSORTMENT OF BRASS THIN-WALL TUBES			
PRODUCT	SIZES, mm		DELIVERY FORM
	Outer diameter	Wall thickness	
BRASS TUBES	2-25	0,15-0,50	Fabricating (2000-6000 mm) and fixed (20-8000 mm) lengths.
	1,5-6	0,51-1,50****	
*** Fabricating (2000 – 6000 mm)&fixed (20-6000 mm) lengths.For soft temper the max.length is 2200mm. **** Depending on outer dia.			

Based on their application, brass thin-wall tubes are produced in compliance with EN 1057, EN 12735-1, EN 12735-2, EN 12449, DIN, GOST, BS and other world standards, but also per special customers' requests. Such requests may be related to tighter tolerances, fulfillment of specific engineering characteristics, narrower range of mechanical properties, particular surface finish and other characteristics specified to satisfy a targeted application.

COPPER AND BRASS DESIGNATION AND STANDARDS ACCORDING TO WHICH BRASS THIN-WALL TUBES ARE PRODUCED					
EN		Applicable EN	Designations as per other standards		
alphabetic	numeric		DIN		ASTM
			alphabetic	numeric	
CuZn30	CW505L	EN 12449	CuZn30	2.0265	C 260 00
–	–	–	CuZn33	2.0280	C 268 00
CuZn37	CW508L	EN 12449	CuZn37	2.0321	C 272 00

2.2.4. CONDENSER TUBES

Tubes produced at Valjaonica bakra Sevojno under the label CONDENSER TUBES have the widest application in shipbuilding, energetics and chemical industry. They are used as components of condensers, evaporators, heat exchangers/ radiators, distillation units and many other purposes.

Brass tubes for condensers are manufactured according to EN 12451 and other world standards.

COPPER AND COPPER ALLOYS DESIGNATION AND STANDARDS ACCORDING TO WHICH CONDENSER TUBES ARE PRODUCED				
EN 12451	**DIN 1785**	**ASTM B111**	**GOST 21646**	**GOST 17217**
Cu-DHP CW024A	SF-Cu 2.0090	C 122 00	-	-
-	-	C 230 00	-	-
-	-	C 260 00	Л70	-
CuZn28Sn1 CW706R	CuZn28Sn1 2.0470	C 443 00	Л070-1	-
CuZn20Al2 CW702R	CuZn20Al2 2.0460	C 687 00	ЛАМш70-2-0,05	-
-	-	-	-	МНЖ5-1 (CuNi5Fe1Mn)

Control of tubes quality

Permanent control of all relevant features done throughout the entire production process provides high quality and reliable finished product. Attributable to this, our tubes have an enviable reputation both at home and abroad.

In addition to dimensional and internal and external control, our tubes undergo the EDDY CURRENT or hydraulic pressure testing.

Tubes are supplied in fixed lengths, as per customer's request. The maximum length we are offering amounts to 11,5 meters.

2.2.5. BRASS TUBES FOR GENERAL INDUSTRIAL APPLICATION

Our brass tubes portfolio includes a large number of alloys and wide range of sizes. Tubes are characterized by a perfect surface and quality in general. Brass tubes for general industrial application are produced in accordance with EN 12449.

SIZE RANGE OF TUBES FOR GENERAL INDUSTRIAL APPLICATION ACCORDING TO EN 12449		
SIZES, mm		DELIVERY FORM
Outer diameter	Wall thickness	
6-35	0,5-2,0(2,5)	Fabricating (2 to 6 m) and fixed (1 to 6 m) lengths
35-50	1,0-5,0	
50-80	1,0-8,0(10,0)	
80-120	2,0-10,0	

Tubes are manufactured according to EN, DIN, GOST, BS or other world standards and special customers' requests as well. Such requests may be related to tighter tolerances, fulfillment of specific engineering characteristics, narrower range of mechanical properties, particular surface finish and other characteristics specified to satisfy a targeted application.

BRASS DESIGNATION AND STANDARDS ACCORDING TO WHICH BRASS TUBES FOR GENERAL INDUSTRIAL APPLICATION ARE PRODUCED							
	EN		Applicable EN	Designations as per other standards			
	alphabetic	numeric		DIN		ASTM	
				alphabetic	numeric		
	CuZn5	CW500L	EN 12449	CuZn5	2.0220	C 210 00	
	CuZn10	CW501L	EN 12449	CuZn10	2.0230	C 220 00	
	CuZn15	CW502L	EN 12449	CuZn15	2.0240	C 230 00	
	CuZn20	CW503L	EN 12449	CuZn20	2.0250	C 240 00	
	CuZn30	CW505L	EN 12449	CuZn30	2.0265	C 260 00	
	–	–	–	CuZn33	2.0280	C 268 00	
	CuZn36	CW507L	EN 12449	CuZn36	2.0335	C 270 00	
	CuZn37	CW508L	EN 12449	CuZn37	2.0321	C 272 00	
	CuZn40	CW509L	EN 12449	CuZn40	2.0360	C 280 00	

3. EXTRUDED AND DRAWN PROFILES

We manufacture copper and brass extruded and drawn profiles. They are many-purpose products which can be ordered according to a respective standard, VBS specification or tailored as to suit specific needs of customers.

3.1. Copper extruded and drawn profiles

Extruded and drawn profiles from copper are produced in form of rods, bars, shapes and wires. They can be used for numerous purposes, but prevalently in electrical industry.

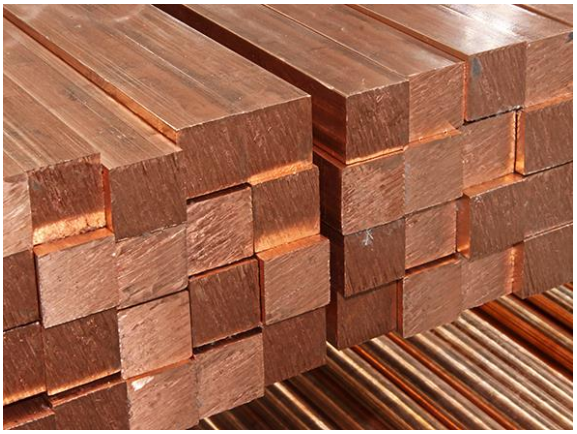
Assortment of copper extruded and drawn profiles:

3.1.1. COPPER BARS AND RODS

Copper bars and rods are widely used for electrical purposes due to their high conductivity and shaping ability. They are manufactured on the basis of EN 13601 provisions. Rods intended for treatment by forging are manufactured as per EN 12165 standard.

Copper bars and rods are designed for a variety of industrial applications and for different installations and structure elements in construction sector.

Rods from copper and low-alloyed copper alloys for general purpose are manufactured according to EN 12163, and for deformation by forging according to EN 12165. Bars from the same alloys, intended also for general purposes, are made according to EN 12167.



Assortment				
Material	SEMI-PRODUCT	SIZES mm	DELIVERY FORM	
Copper: Cu-ETP Cu-HCP Cu-DHP	Bars	Thickness: 2 – 25 Width: 5 – 120*	Round rods of up to 18 mm dias and hexagons of up to 16 mm width across flats can be delivered in coils or straight lengths, (max. coilweight 100 kgs). Lengths: fabricating (2-4 m) & fixed (1-4 m).	
	Round rods	3,0 – 80		
	Square rods	4,0 – 50		
	Hexagonal rods	4,0 – 65		
LOW-ALLOYED COPPER	Round rods	9 – 60	fabricating (2-4 m) & fixed (1-4 m) lengths	
CuNi1,5Si CuNi2Si	Hexagonal rods	20 – 40	fabricating (2-4 m) & fixed (1-4 m) lengths	
*depending on thickness				

Copper bars and rods are manufactured according to EN, DIN, GOST, BS or other world standards and special customers' requests as well. Such requests may be related to tighter tolerances, fulfillment of specific engineering characteristics, narrower range of mechanical properties, particular surface finish and other characteristics specified to satisfy a targeted application.

COPPER AND ALLOYS DESIGNATION AND STANDARDS ACCORDING TO WHICH RODS AND BARS ARE PRODUCED					
EN		Applicable EN	Designation as per other standards		
			DIN		ASTM
alphabetic	numeric		alphabetic	numeric	
Cu-HCP	CW021A	EN 13601 EN 12165	SE-Cu	2.070	C 10 300
Cu-ETP	CW004A	EN 13601 EN 12165	E-Cu58	2.0065	C 11 000
Cu-DHP	CW024A	EN 12163 EN 12165 EN 12167	SF-Cu	2.0090	C 12 200
CuNi1Si	CW109C	EN 12163 EN 12165	CuNi1,5Si	2.0853	–
CuNi2Si	CW111C	EN 12163 EN 12165	CuNi2Si	2.0855	–

3.1.2. COPPER PROFILES

Copper profiles are manufactured in shapes and tempers indicated in company's CATALOGUE or adhering to specific needs of customers.

This product mix includes diverse extruded and drawn profiles for electrical contacts, hollow copper induction profiles for coils of induction furnaces ("inductor tubes" of the cross-section to 1500 mm2) and collector profiles (CuAg).

BASIC ASSORTMENT OF COPPER PROFILES*		
TYPE OF COPPER OR LOW-ALLOYED COPPER*	CROSS SECTION, mm^2	DELIVERY FORM
Cu-HCP, Cu-ETP	from 30 to 3000	coils of 40 – 60 kgs and straight lengths up to 4 m.
CuAg0,1; CuAg0,1P; CuAg0,03	from 20 to 1200	
* for comutators		

DESIGNATION OF COPPER AND ALLOYS FOR PROFILES PRODUCTION				
EN		Designation as per other standards		
alphabetic	numeric	DIN		ASTM
		alphabetic	numeric	
Cu-HCP	CW021A	SE-Cu	2.0070	C 103 00
Cu-ETP	CW004A	E-Cu58	2.0065	C 110 00
CuAg0,1				
CuAg0,1P				
CuAg0,03				

3.1.3. COPPER WIRE

Valjaonica bakra Sevojno serves the market very flexibly, offering numerous options in terms of the type of material, size and quality of processing. Our capacities are available for high level of processing and drawing wire into finest dimensions, with minimum diameter of Φ0,1mm. Wire for electrical engineering is made as per EN 13601, and for general purpose per EN 12166.

Copper wire is manufactured according to EN, DIN, GOST, BS or other world standards and special customers' requests as well. Such requests may be related to tighter tolerances, fulfillment of specific engineering characteristics, narrower range of mechanical properties, particular surface finish and other characteristics specified to satisfy a targeted application.

ASSORTMENT OF COPPER WIRES*		
MATERIAL	DIAMETER (mm)	DELIVERY FORM
Cu-HCP Cu-ETP Cu-DHP Cu-DLP Cu-OF	0,10 – 1,0	reel, coil
	1,0 – 8,0	coil

COPPER DESIGNATION AND STANDARDS ACCORDING TO WHICH WIRE IS PRODUCED					
EN		Available EN	Designation as per other standards		
alphabetic	numeric		DIN		ASTM
			alphabetic	numeric	
Cu-HCP	CW021A	EN 13601	SE-Cu	2.070	C 10 300
Cu-ETP	CW004A	EN 13601	E-Cu58	2.0065	C 11 000
Cu-OF	CW008A	EN 13601	OF-Cu	2.0040	C 10 200
Cu-DHP	CW024A	EN 12166	SF-Cu	2.0090	C 12 200
Cu-DLP	CW023A	–	SW-Cu	2.0076	C 12 000

Welding electrodes / rods

Our product portfolio further comprises bare electrodes used for welding of copper and copper alloys by subsequent gas welding procedure, welding by tungsten electrodes under the inert gas atmosphere (TIG procedure) and metal welding under the inert gas atmosphere (MIG procedure).

ASSORTMENT, melting temperature range and application*			
ALLOY		MELTING TEMPERATURE RANGE	APPLICATION FOR BASIC MATERIALS (processed or cast)
DIN 1733			
S-CuAg	2.1211	1070 to 1080	Copper
S-CuSi3	2.1461	910 to 1025	Copper, Cu-Si and CuMn alloys
S-CuZn40Si	2.0366	890 to 910	Copper – zinc alloys

3.2. Brass extruded and drawn profiles

Extruded and drawn profiles from brass are shaped as rods, bars, profiles and wire. They are used for different purposes in numerous industrial fields and for home applications as well.

Assortment of brass extruded and drawn profiles:

3.2.1. BRASS BARS AND RODS

Brass bars and rods are extremely processable and formable and therefore widely used for various industrial applications. Brass rods designed for machining on rotary devices are manufactured on the basis of the EN 12164, for forging on the basis of EN 12165, and for general purpose on the basis of EN 12163.

Brass bars for general application from identical materials are produced as per EN 12167.

Assortment*				
ALLOY		SEMI-PRODUCT	SIZES mm	DELIVERY FORM
LEAD-FREE BRASSES	CuZn37 CuZn40	Bars	Thickness: 2 – 15 Width: 5 – 60*	Fabricating (2-4 m) and fixed (1-4 m) lengths.
	CuZn10 CuZn20 CuZn28 CuZn30 CuZn33 CuZn37 CuZn40	Round rods	3,0 – 80	
		Square rods	4,0 – 50	
		Hexagonal rods	4,0 – 60	
BRASSES CONTAINING LEAD	CuZn36Pb1,5 CuZn36Pb3 CuZn38Pb2 CuZn39Pb2 CuZn39Pb3 CuZn40Pb2	Bars	Thickness: 2 – 15 Width: 5 – 60*	Round rods of 18 mm dia and hexagons up to 16 mm width across flats can be supplied in coils or straight lengths, (max.coilweight 100 kgs). Lengths: fabricating (2-4 m) & fixed (1-4 m).
		Round rods	3,0 – 80	
		Square rods	4,0 – 40	
		Hexagonal rods	4,0 – 65	
		Hollow rods (round and hexagonal)	as per customer's request	
*depending on thickness				

BRASS DESIGNATION AND STANDARDS ACCORDING TO WHICH RODS AND BARS ARE PRODUCED					
EN		Applicable EN	Designation as per other standards		
			DIN		ASTM
alphabetic	numeric		alphabetic	numeric	
CuZn10	CW501L	EN 12163	CuZn10	2.0230	C 220 00
CuZn20	CW503L	EN 12163	CuZn20	2.0250	C 240 00
CuZn28	CW504L	EN 12163	CuZn28	2.0261	–
CuZn30	CW505L	EN 12163	CuZn30	2.0265	C 260 00
CuZn33	CW506L	EN 12163	CuZn33	2.080	C 268 00
CuZn36	CW507L	EN 12163 EN 12167	CuZn36	2.0335	C 270 00
CuZn37	CW508L	EN 12163 EN 12165 EN 12167	CuZn37	2.0321	C 272 00
CuZn40	CW509L	EN 12163 EN 12165 EN 12167	CuZn40	2.0360	C 280 00
–	–	–	CuZn36Pb1,5	2.0331	C 350 00
CuZn36Pb3	CW603N	EN 12164 EN 12167	CuZn36Pb3	2.0375	C 360 00

CuZn38Pb2	CW608N	EN 12163 EN 12164 EN 12165 EN 12167	CuZn38Pb1,5	2.0371	–
CuZn39Pb2	CW612N	EN 12164 EN 12165 EN 12167	CuZn39Pb2	2.0380	C 377 00
CuZn39Pb3	CW614N	EN 12163 EN 12164 EN 12165 EN 12167	CuZn39Pb3	2.0401	–
CuZn40Pb2	CW617N	EN 12163 EN 12164 EN 12165 EN 12167	CuZn40Pb2	2.0402	C 378 00

3.2.2. BRASS PROFILES

Brass profiles are produced in shapes and tempers specified in company's CATALOGUE, or in accordance with specific requirements of our customers.

Typical alloys for manufacture of brass solid profiles are: CuZn39Pb2, CuZn39Pb3, CuZn37. The minimum cross section available is 10mm2. Profiles are supplied in coils of 40-60 kgs and in straight lengths up to 4m, depending on profile shape or customer's request.

BRASS DESIGNATION*				
EN		Designation as per other standards		
alphabetic	numeric	DIN		ASTM
		alphabetic	numeric	
CuZn37	CW508L	CuZn37	2.0321	C 272 00
CuZn39Pb2	CW612N	CuZn39Pb2	2.0380	C 377 00
CuZn39Pb3	CW614N	CuZn39Pb3	2.0401	–

3.2.3. BRASS WIRE

VBS has capacity of brass wire production offering a number of alloys, broad dimensional mix and high-performance quality. Brass wire is available even in the finest sizes, starting Φ0,05mm according to EN 12166.

This type of wire is manufactured according to EN, DIN, GOST, BS or other world standards and special customers' requests as well. Such requests may be related to tighter tolerances, fulfillment of specific engineering characteristics, narrower range of mechanical properties, particular surface finish and other characteristics specified to satisfy a targeted application.

BRASS WIRE ASSORTMENT*			
MATERIAL		DIAMETER (mm)	DELIVERY FORM
LEAD-FREE BRASSES	CuZn5 CuZn10 CuZn15 CuZn20 CuZn30 CuZn33 CuZn36 CuZn37	0,05 – 0,60	reel
		0,60 – 1,50	steel core, coil
		1,50 – 8,0	coil
BRASSES CONTAINING LEAD	CuZn36Pb1,5 CuZn36Pb3 CuZn38Pb2 CuZn39Pb2 CuZn39Pb3 CuZn40Pb2	2,0 – 8,0	coil

Brass designation and standards according to which wire is produced					
EN		Applicable EN	Designation as per other standards		
			DIN		ASTM
alphabetic	numeric		alphabetic	numeric	
CuZn10	CW501L	EN 12166	CuZn10	2.0230	C 22 000
CuZn20	CW503L	EN 12166	CuZn20	2.0250	C 24 000
CuZn30	CW505L	EN 12166	CuZn30	2.0265	C 26 000
CuZn33	CW506L	EN 12166	CuZn33	2.080	C 26 800
CuZn36	CW507L	EN 12166	CuZn36	2.0335	C 27 000
CuZn37	CW508L	EN 12166	CuZn37	2.0321	C 27 200
CuZn40	CW509L	EN 12166	CuZn40	2.0360	C 28 000
–	–	–	CuZn36Pb1,5	2.0331	C 35 000
CuZn36Pb3	CW603N	EN 12166	CuZn36Pb3	2.0375	C 36 000
CuZn38Pb2	CW608N	EN 12166	CuZn38Pb1,5	2.0371	–
CuZn39Pb2	CW612N	EN 12166	CuZn39Pb2	2.0380	C 37 700
CuZn39Pb3	CW614N	EN 12166	CuZn39Pb3	2.0401	–
CuZn40Pb2	CW617N	EN 12166	CuZn40Pb2	2.0402	C 37 800

4. PACKAGING

Valjaonica Ambalaza is a factory of packaging units operating within the company Valjaonica bakra Sevojno AD, owned by East Point Metals.
On foundations of the former carpentry workshop established in fifties as a part of Valjaonica bakra Sevojno AD, a modern factory arose involved with manufacture of all types of wood packaging, cardboard reels and cardboard boxes.
Organization and qualified personnel of our company enable us to offer to potential customers products that meet a widest range of their requirements, for both local and foreign markets.
Aware of such requirements, as first in Serbia we built the chamber for phytosanitary treatment of wood. This way treated packaging, marked with number 1, so far crossed the borders of all continents.
Production is performed by improving the existing and adopting a new technology in the field of packing and packaging, following respective regulations of local and international standards.

CONTACT
Valjaonica Ambalaza Sevojno D.O.O.
Prvomajska b.b. 31205 Sevojno, Serbia
Tel/ Fax: +381 (0)31.532.836

PRODUCT PORTFOLIO

1. Wood packaging
1.1. Cases
1.1.1. Cases with retracted fronts
1.1.2. Cases with beech fronts
1.1.3. Plate type cases
1.2. Pallet
1.2.1. Euro pallet
1.2.2. Covered euro pallet
1.2.3. Latticework pallet
1.2.4. Full-surface pallet
1.2.5. Solid pallet
1.2.6. Specific purpose pallet
1.3. Crates
1.3.1. Crates with beech fronts
1.3.2. Crates with cut-in fronts
2. Cardboard packaging
3. Cardboard reels
4. Phytosanitary treatment

1. WOOD PACKAGING

Production of all types of packaging units, exclusively from fir, spruce and beech timber. Our program is characterized by absolutely diversified wood packaging, such as pallets with or without cover as per EURO standards, cases and crates of various sizes, shapes and applications, as well as other wood packaging units, all in accordance with customers' specifications and requirements.

2. CARDBOARD BOXES

Manufacture of all types of cardboard boxes from the triple– and five-layer cardboard tailored to satisfy any needs of our customers. The manufacture is carried out on productive and modern technology machines, resulting in high quality cardboard boxes available in different sizes with narrow tolerances.

3. CARDBOARD REELS

Production of cardboard reels (tubes) is based on technology of uncoiling various paper types. This production involves manufacture of reels of several diameters and lengths, depending on customer's request. The use of our cardboard reels is highly versatile, ranging from cores for uncoiling all types of foils, nets, textiles, carpets, upholstery fabric, but also all types of aluminum, copper, and other foils in the industry of non-ferrous metals.

4. PHYTOSANITARY TREATMENT

With this treatment Valjaonica Ambalaza protects its wood packaging intended for both local and foreign markets, that, under conditions of harsh competition, become more and more

demanding. We provide the customer with all accompanying documentation in Serbian and English languages, as a prove that the packaging was subjected to HT (Heat Treatment).

5. MANUFACTURE AND SALE OF ECOLOGICAL FIREWOOD (BRIQUETTES)

The company produces briquettes from sawdust of the equal calorific value like a coal, which can be used for all types of stoves. Thermal calorific value of our briquettes amounts to app. 20.000 kJ/kg. Briquette generates just a small quantity of ashes and can be used in households and industry as well. Quantity and packing of briquettes vary depending on needs of the customer.

6. SERVICES OF DRYING AND SELLING DRIED TIMBER

We are drying all kinds of timber, with whatsoever initial level of moisture. Our state-of-the-art plant provides as the end result completely dry timber suitable for all applications in wood industry.

ENVIRONMENT

Permanent care for and improvement of the environment is one of our strategic goals, implying alignment of all operations with the applicable legislation and execution of work duties in a healthy and safe work environment. Implementation of these measures provides us a favorable status on western markets where we place more than 90% of our products.

PHYTOSANITARY TREATMENT

The phytosanitary treatment (HT) provides protection of wood packaging used to ship the goods between countries against disease and insects. This issue was also taken into consideration by our Ministry of Agriculture, Forestry and Water Management, and as a result a draft “Regulation on phytosanitary requirements to be met by wood packaging material in

cross-border trade and the conditions and procedures of its treatment and labeling" was issued.
This regulation was adopted, and our company, after all conditions have been met, developed electrothermal chamber for the said treatment.

The plant for phytosanitary treatment consists of a chamber designed to take in a wood material or packaging to be treated, the system for command, control and monitoring, as well as a system for measuring and recording temperature. Along with all aforementioned, the heat treatment is accompanied by all supporting documentation, i.e. a HT chart in English and Serbian language and confirmation on executed HT, by authority of the Ministry for Agriculture, Forestry and Water Management.

QUALITY

For production of wood and cardboard packaging, it is very important to choose and apply the appropriate material. As for the wood packaging, our company uses high quality timber – fir, spruce and beech wood solely.
Wood is chosen carefully, debarked and checked on weevil and mechanical damages.

Regarding the cardboard packaging, we use a multilayered cardboard of high quality – as per customers' request, which is EA LSSFS and suitable for all specified dimensions.

Complete production and services of Valjaonica Ambalaza are based on the JUS ISO 9001 standard, which proves our commitment to follow actual movements concerning standards, thus largely protecting both ourselves and our potential customers in the present harsh market and competition circumstances.

5. FEMOD (Electromachinery equipment and parts plant)

Company Valjaonica – FEMOD Sevojno is founded 01.01.2007 by merge of Electro and Machinery Workshops, which separately were part of Valjaonica Bakra Sevojno a.d. Manufacturing workshops of FEMOD were and still are permanent, specialized, technical service for production and equipment maintenance in Valjaonica bakra a.d. workshops and also achieve noticeable results and sales on markets other than Valjaonica bakra a.d. Sevojno. During the perennial period FEMOD manufactured, delivered and assembled numerous machines, equipment and spare parts for various companies in the country and in the region, which helped achieving reputation of a important manufacturer and reliable partner in production of equipment, based on our own documentation, buyer's projects or samples.

FEMOD's products are used in machinery industry, metallurgy, shipbuilding, refineries, electro industry, petrochemical industry, hydro and thermal power plants, distillery facilities, foundries, smelters, technical gases facilities etc. (cooling systems and heat exchangers, smooth tubes evaporators, radiators and coolers, alcohol distilling units, induction heating facilities, quenching, melting and casting, core reactors-chokes, air reactors-chokes, special windings parts, tools, machine parts, mechanical compositions, etc.). A strong emphasis should be placed on FEMOD's manufacturing ability of high-finned tubes with wide appliance in heat-exchangers production, with possibility of combining various metals.

As a result of perennial experience in mounting and reconstruction production-equipment, FEMOD offers special treatment and services on the very spot, without dismantling and transporting activities, whenever it is technically possible. If parts made of copper and copper alloys (brass and bronze) are required, FEMOD is fully supported by its parent company – Valjaonica bakra Sevojno a.d., the most prominent and the largest manufacturer of copper and copper alloys semi-products in Republic of Serbia, including wide assortment of tubes, rods, bars, various profiles, wire, strips, sheets, roundels, foils, etc., which are all used in FEMOD's production as a raw materials.

Production programme:

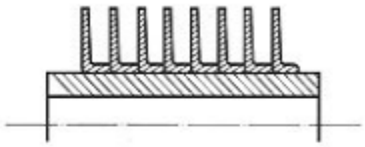
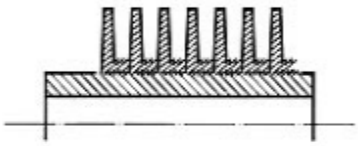
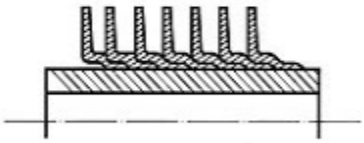
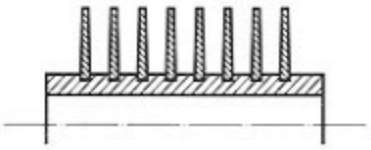
5.1. HIGH-FINNED TUBES FOR HEAT EXCHANGERS

The use of high-finned tubing significantly enhances the effect of heat transfer between external (air) and internal fluids. Basic tube is made of copper, brass, aluminum or steel, with aluminum and/or copper fins.

FEMOD manufactures several types of finned tubing for various applications, if required for heavy-duty operation as well. Such tubes are used for production of all types of air coolers, condensers, gas coolers, drying units, etc.

Apart from their extraordinary technical characteristics, application of finned tubing significantly reduces investments in equipment for water supply, filtration, water preparation and return into natural waterflows as well.

TYPES OF FINNED TUBING

Type"L" 	• max. working temperature up to 120 °C, • temperature oscillations up to 60 °C, • temperature oscillation cause no deformation of fin shape which remain in firm contact with the basic tube • fin base protects the tube from corrosion.
Type"KL" 	• max. working temperature up to 180 °C, • temperature oscillations up to 100 °C • fin base is "L" shaped and imbedded in knurled basic tube surface. The imbedded fin bases do not deform providing perfect antirust protection • the wide temperature oscillations are acceptable permanently providing high heat coefficient transfer • during high temperature oscillations fins remain in firm contact with the basic tube, thus eliminating occurence of elastic fin deformation and contact weakening
Type"LL " 	• max. working temperature up to 150 °C • temperature oscillations up to 60 °C • temperature oscillation cause no deformation of either fin base or fin shapes • in case of heat expansion fins remain in contact with basic tubes which ensures permanently high rate of the heat coefficient transfer • fin base protects the tube from corrosion • this type of finning replaces bimetal finned tube with extruded fins
Type"G" 	• max. working temperature up to 350 °C • fins imbedded in the basic tube • extremely high stability in relation to temperature oscillations and mechanical vibrations • the imbedding technology ensures compact, homogenous and firm contact with the basic tube, which considerably reduces resistance during heat exchange from tube to fins

STANDARD SIZES:

FINS: TYPE "KL" AND "L"

Tube O.D.		Fin height	Strip thickness	Number of fins	
mm	col	mm	mm	per 1m	per col
14,3	9/16"	7,6	0,38	390	10
16	5/8"	10,3	0,4	390	10
16	5/8"	11,1	0,38	390	10
16	5/8"	12,7	0,4	430	11
16	5/8"	12,7	0,45	430	11
19	3/4"	12,7	0,43	390	10
25,4	1"	6,35	0,35	390	10
25,4	1"	12,7	0,4	390	10
25,4	1"	12,7	0,4	430	11
25,4	1"	15,9	0,45	390	10
25,4	1"	15,9	0,45	430	11
38	1 1/2"	12,7	0,4	390	10
38	1 1/2"	12,7	0,4	430	11
38	1 1/2"	15,9	0,45	390	10
38	1 1/2"	15,9	0,45	430	11

FINS: TYPE "G"

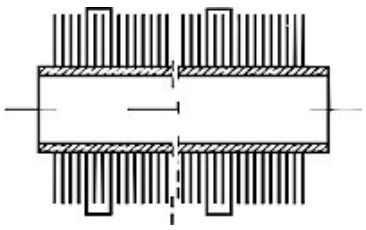
Tube O.D.		Fin height	Strip thickness	Number of fins	
mm	col	mm	mm	per 1m	per col
25,4	1″	12,7	0,4	390	10
25,4	1″	15,8	0,45	350	9
25,4	1″	15,8	0,45	390	10
25,4	1″	15,8	0,45	430	11
25,4	1″	15,8	0,5	315	8
31,7	1 1/4″	15,8	0,45	390	10
38	1 1/2″	15,8	0,45	350	9
38	1 1/2″	15,8	0,45	390	10
50,8	2″	12,7	0,45	390	10
50,8	2″	12,7	0,45	430	11

FINS: TYPE "LL"

Tube O.D.		Fin height	Strip thickness	Number of fins	
mm	col	mm	mm	per 1m	per col
18	–	10	0,4	390	10
25,4	1″	12,7	0,4	390	10
25,4	1″	15,9	0,45	315	8
25,4	1″	15,9	0,75	315	8
25,4	1″	15,9	0,45	350	9
25,4	1″	15,9	0,45	390	10
25,4	1″	15,9	0,58	390	10
25,4	1″	15,9	0,45	430	11
25,4	1″	15,9	0,45	275	7
31,7	1 1/4″	15,9	0,4	430	11
31,7	1 1/4″	19	0,78	350	9
38	1 1/2″	25,4	0,78	350	9
38	1 1/2″	25,4	0,75	315	8
50,8	2″	25,4	0,78	350	9

CONNECTION RINGS

All types of finned tubes are also available with interleaved connection rings made of zinc or aluminum, tightly bundling each single finned tube in a heat exchanger at projected arrangement.



ORDERING INFORMATION

Inquiries for quotations should include following data:

Nature of the basic tube (material, standard, size), end use, finning material, working pressure and temperature, corrosion resistance, height and number of fins by meter of length or inch, number of finned tubes.

If possible, a drawing of finned tube should be enclosed, indicating sizes of non-finned tube parts.

Apart from named sizes, other tubes with outer diameters range as shown in tables can be finned as well.

Orders may indicate both metric and inch measuring units. As for connection rings, data on axial distance of tubing in bundle, their arrangement and supporting spots are required (in-line or „chess-like" layout).

5.2. HEAT EXCHANGERS

FEMOD manufactures wide assortment of heat exchangers used in processing industrial facilities, electro and petrochemical industries, refineries, as well as heating and cooling and air-conditioning units, etc.

Heat exchangers can be divided into those operating on the principle of change of aggregate state (phase) of fluids such as: evaporators, condensers and recuperates, and those operating without change of fluid phase.

According to place of mounting, operating mode and purpose, heat exchangers are used as: heaters, coolers, condensers, evaporators, etc.

High-finned copper tubes grid for air-water cooler

Basic tube …….. Cu

Fins …… Al

Exchange power …….. 340 kW

Size …….. 2950 x 1250 x 450 mm

("US Steel" – Smederevo)

High-finned brass tubes cooling bundle for water-hydrogen cooler

Basic tube …… CuZn 30

Fins …….. Cu

Exchange power ……. 700 kW

Size ……. Ø 619 x 3400 mm

("TENT – A" Obrenovac)

Smooth copper tubes drum-like water-water heat exchanger

Exchange power ……. 700 kW

Size ……. Ø 436 x 2400 mm

(“Alumina” Skoplje, “Alpro” Vlasenica)

Cooling insert with high-finned brass tubes for additional air-water cooler

Basic tube …… CuZn 30

Fins …… Al

Exchange power …… 2850 kW

Size ……. Ø 1740 x 1650 mm

(“MESSER-Tehnogas” a.d. Smederevo)

Smooth copper tubes bundle for water-nitrogen cooler

Exchange power …… 2000 kW

Size …….. Ø 1300 x 3240 mm

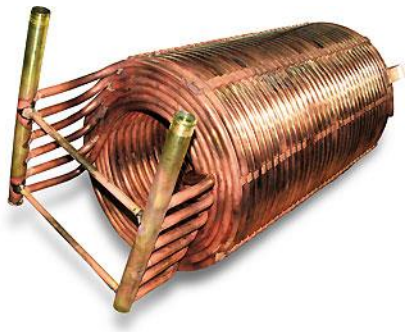
("MESSER-Tehnogas" a.d. Niš)

Spiral smooth copper tubes bundle for water-water cooler

Exchange power …….. 120 kW

Size …….. Ø 265 x 1150 mm

(Valjaonica bakra AD Sevojno)



High-finned brass tubes cooling bundle for water-hydrogen cooler

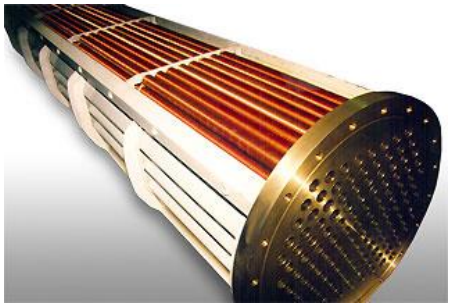
Basic tube …… CuZn 37

Fins …….. Cu

Exchange power …… 1900 kW

Size ……. Ø 619 x 3400 mm

("TENT – B" Obrenovac)



Smooth copper tubes bundle for water-transformer oil coolers type OFWF

Exchange power …….. 160 kW

Size ……. Ø 320 x 1415 mm

("KAP" – Podgorica)

MANUFACTURE

Depending on place of mounting and application, heat exchangers are projected and manufactured so as to fully comply with required working parameters by their construction, choice of material and operating mode.

There are various categories of heat exchangers, according to their construction, application, types of fluids, flow directions, number of changes and number of fluid inlets and outlets, used manufacturing material, etc.

Depending on application and types of fluid, heat exchangers are manufactured in shapes of a drum or a box, with smooth or finned tubes and a strong support frame. Customers choose manufacturing materials bearing in mind purity of used fluid and possible chemical reactions between fluids and used material in envisaged working conditions. When using aggressive fluids, a special analysis of chosen manufacturing material should be made.

Depending on fluid flow direction, heat exchangers are made with parallel unidirectional or counter-directional flow, transversal, spiral, or combined flows. According to number of passes, heat exchangers can be with one, two or more, (up to eight) passes through tubes and up to four passes of fluids through interconnecting area.

In its heat exchangers projects FEMOD gives priority to high-finned tubing from its production assortment, manufactured against world renown technology. Apart from low-carbon and stainless steel, most frequently used manufacturing materials for all types of heat exchangers are copper and copper alloys. Therefore, heat exchangers offered by FEMOD are distinguished by high quality, endurance, good technical performances, reliable operation and compliance with ever stricter environmental requirements.

FLUIDS

Most frequently used fluids in heat exchangers are air, water or oil, and in special cases depending on technical requirements other fluids, (nitrogen, antifreeze, hydrogen, gas mixtures, special technological oils, etc.).

Depending on the choice of fluids, various combinations are possible, such as: water-water, air-water, air-oil, water-oil, oil-oil, nitrogen-water, water-hydrogen, etc.

5.3. OIL COOLERS FOR ENERGETIC TRANSFORMERS

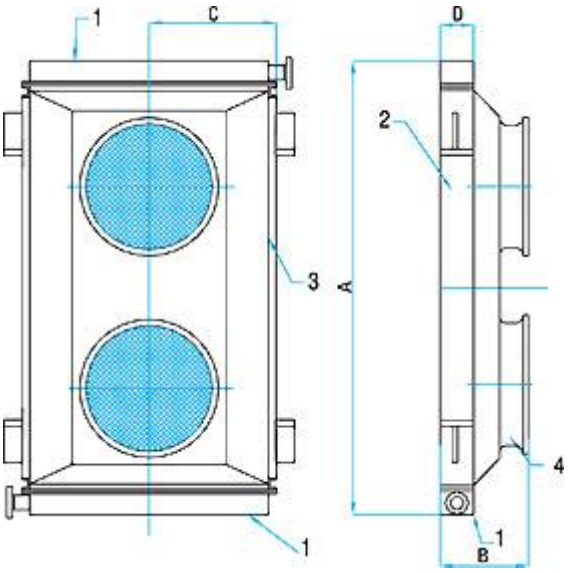
FEMOD manufactures several types of oil coolers for energetic and distributive transformers, using water or air as cooling fluid, with power range from 50 KW up to 700KW, of forced and natural flow. Types of exchangers are: **OFAF**, **OFWF** or **ONWF**. (**OF** – oil forced; **AF** – air forced; **ON** – oil natural; **WF** – water forced)

All types of coolers can be made according to buyer's plans and documentation, samples or personal projects based on comprehensive projects.

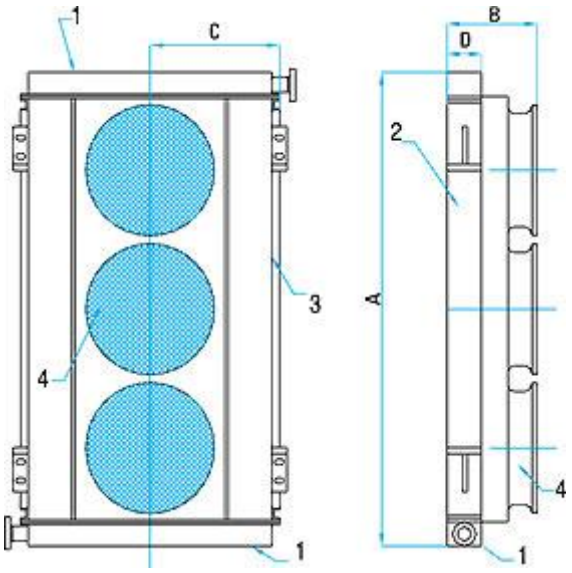
Air coolers **OFAF** are manufactured as standard, serial product in several different sizes and out of high-finned copper tubes in chess-like layout. Fins are made of aluminum and fin-type defined in accordance with working conditions (see catalogue of finned tubes).

Dimension of the exchangers are defined in accordance with requested heating capacity, storage and buyer's special demands.

The same or at least resembling structure is used for cooling stator windings of generator in hydroelectric power plants.



With 2 fans

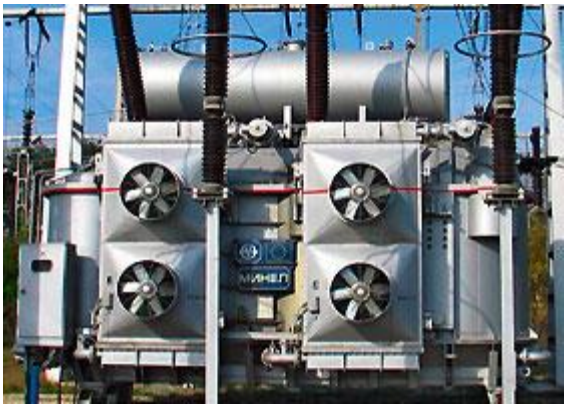


With 3 fans

Items: 1 – Manifold, 2 – Cooler body, 3 – Cooler enclouser, 4 – Fan

Oil – Air coolers (OFAF) for energetic transformers production:

"ABS MINEL TRANFORMATORI" – Ripanj



Transformer 150 MVA, EMS – TS Jajinci

Transformer 400 MVA, EMS – TS Obrenovac

Type of cooler OFAF	Cooling power kW	SIZES				Total weight kg	Fan unit		Outside connections	Noise dB
		A mm	B mm	C mm	D mm		Number	Power kW		
HTU 175	175	2600	894	742	314	1250	2	1.1	PM16, DN125	75
HTU 225	225	3554	785	808	278	1400	2	1.1	PM16, DN125	75
HTU 300	300	3554	815	980	305	1600	3	1.1	PM16, DN125	80
HTU 380	380	3554	890	980	340	1800	3	1.1	PM16, DN125	80
HTU 400	400	3554	890	980	340	1900	3	1.1	PM16, DN125	80

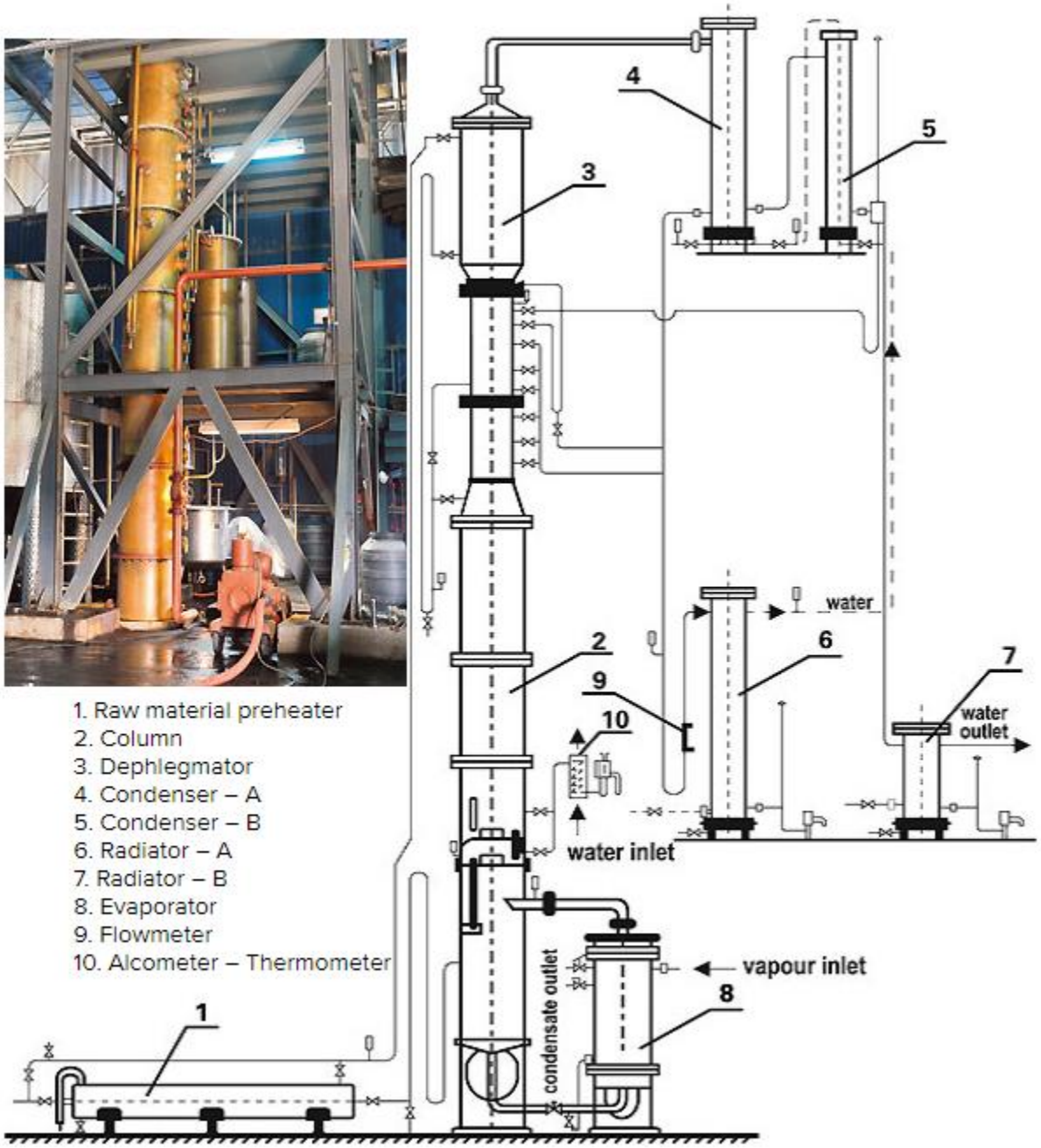
Oil-water coolers (**OFWF**, **ONWF**) are made upon buyer's request with all technical para- meters defined (required exchange power, flows, pre- assures, input and output temperatures of water and oil, built-in-sizes, dimensions and connection type for fluids, etc.). **OFWF** cooler of 250 KW for transformer 112 MVA in HPP (Hydro Power Plant) Bajina Basta on Perucac lake (picture right).

5.4. DISTILLERIES – CONTINUOUS ALCOHOL DISTILLATION DEVICES

Alcohol distilling units of STV type are used for continuous distillation of wine, passivized fruit pulp, fermented starch husk raw materials, diluted wine precipitate, and raw mild brandy.

Alcohol distilling units of STV type are manufactured from quality materials: electrolytic EdCu 99,9% copper, stainless steel C 4571 and other construction steels, with mounted finished parts and equipment purchased from renowned suppliers. Functional construction is made of acid-resistant cast metal, with Teflon lining inside in the form of ball-shaped spouts, enabling easy and reliable operation at increased temperatures in accordance with technical requirements.

Water and vapor armature are of usual quality for these types of fluids. Flowing and recirculation water cooled in a separate tower are used as cooling fluids in radiators/coolers, condensers and deflagrator's.



STV distilling units are placed into civil engineering building of standard steel construction, with corrugated painted aluminum sheet used for façade and glass windows. If required by customer, civil engineering building can be constructed by separate project, in strict accordance with technological requirements for equipment accommodation.

Modern regulating and measuring equipment enable exact monitoring and functioning of distilling unit. Complete facility, equipment and accessories are projected so as to facilitate cleaning and maintenance.

TECHNICAL CHARACTERISTICS	UNIT	TYPE OF DESTILLERY UNIT		
		STV-40	STV-80	STV-120
Capacity	t / 24h	40	80	120
Dry vapour consumption	kg / h	550	900	1300
Cooling water consumption	m^3 / h	3.5	7	9
Installed power	kW	10	33	45
Required room space	m	6x7x18	6x8x22	7x9x27
Quality of destilled material	vol%	65 – 80		
Raw material (husk) quality: wine, passivized fruit pulp, fermented starch husk raw materials, dilluted wine precipitate, raw mild brandy.				
Alcohol content in the husk	vol%	4 – 25		
Max. sulfur content	mg / l	100		
Min. husk temperature	^0C	+1		
Specific husk weight	kg / dm^3	0.97 – 1.10		
Dispersive dry matter quantity	%	8		
Husk particles size	mm	do 3		
Power supply	3×400 / 230V; 50Hz			
Control voltage	24V; 230V AC/DC (or as required)			

LIST OF REFERENCES

NEW DISTILLERIES SOLD

Sloga – Trstenik, **Džervin** – Knjaževac, **V.Z.Z. Sićevo** – Sićevo, **Navip** – Zemun, **Voćarske plantaže Boleč** – Beograd, **Vrelo** – Bujanovačka Banja, **Povlen** – Kosjerić, **RB Global** – Užice, **Godomin** – Smederevo

GENERAL REPAIR AND TOWER REPLACEMENT

Tikveš – Kavadarci, Makedonija, **13. juli a.d. plantaže** – Podgorica, **Takovo** – Gornji Milanovac, Srbijanka – Valjevo

5.5. INDUCTION WINDINGS

In its production programme FEMOD includes a wide assortment of inductors for all metallurgical applications.

They feature various windings for quenching, induction heating, high-frequency welding, melting, local preheating, thermal treatment, etc., with power ranging from several tens of watts up to over 2 MW, operating frequencies of 50 Hz up to 450 kHz, and all voltage levels used for this application. Most commonly used material for inductors is pure electrolytic copper. Cooling fluids for inductors are water or air.

According to operating frequencies, induction windings can be:

LF – low frequency induction windings,

MF – medium frequency induction windings and

HF – high frequency induction windings.

Low frequency (LF) windings for steel melting induction furnaces

Model	IP 8t
Power	1800 kVA
Voltage	1500 A
Frequency	50 Hz
Cast metal quantity	8000 kg
Cooling	water
Size	Ø1320 x 1500 mm

Low frequency (LF) induction furnace windings for melting nodular cast metal

Model	ST 2000
Power	600 kVA
Voltage	575 V
Frequency	50 Hz
Cast metal quantity	2000 kg
Cooling	water
Size	Ø1000 x 1050 mm

Low frequency (LF) 3-phase induction furnace windings for heating copper and brass billets for extrusion

Power	1100 kVA
Voltage	170-420 V
Current	3000 A
Frequency	50 Hz
Cooling	water
Billet sizes	Ø200 or 250 mm

Medium frequency (MF) crucible induction furnace windings

Model ..... AJAX 1500/300

Power ..... 1500 kVA

Frequency ..... 500 Hz

Cast metal quantity ..... 1500 kg

Cooling ... water with exit cooling installation made of chromium-steel

Size ..... Ø840 x 1300 mm

Medium frequency (MF) induction furnace windings

Power ..... 30 kVA

Voltage ..... 250 V

Frequency ..... 4,0 kHz

Cast metal quantity ..... 2000 kg

Cooling ..... water

Size ..... Ø370 x 720 mm

Medium frequency (MF) induction windings

Rated power ..... 15 – 250 kVA

Power supply ..... 3 x 380 V; 50Hz

Frequency ..... 2400 Hz

Maximum operational voltage 800V

Cooling ..... water

Size ..... Ø100 – 220 x 1400 mm

Different types of MF induction windings

Power ..... 2-10 kVA

Frequency ..... 500-1000 Hz

Cooling ..... water

Windings of HF inductors for welding

Power ..... 5 kVA

Frequency ..... 10 kHz

Cooling ..... water

Size ..... Ø 200 x 50 mm

Inductors for high frequency (HF) seam tube welding and quenching

Power ..... 200 VA – 100 kVA

Frequency ..... 100 – 440 kHz

Cooling ..... water

Inductors for high frequency (HF) surface quenching of motor crankshafts

Power ..... 90 – 120 kVA

Operational voltage ..... 460 – 550 V

Frequency ..... 8 – 9 kHz

Cooling ..... water

5.6. INDUCTION FURNACES AND REGULATING TRANSFORMERS

FEMOD offers construction or repair of regulating dry transformers for power supply of induction furnaces, as well as construction of complete billet reheating furnaces against documentation submitted by customer, including all supporting, connecting, cooling and other accompanying devices.

Low frequency (LF) induction furnace for heating aluminum billets for extrusion

Power ..... 675 kW

Power supply ..... 3 x 400 V

Operating voltage ..... 3 x 90 – 140 V

Frequency ..... 50 Hz

Capacity ..... 1500 kg/h

Operational temperature ..... up to 550 °C

Cooling ..... water

Billet sizes ..... Ø 200 x 1600 mm

Low frequency (LF) induction furnace for heating Cu and Ms billets for extrusion

Power ..... 1100 kVA

Power supply ..... 3 x 400 V

Operating voltage ..... 170 – 420 V

Frequency ..... 50 Hz

Capacity ..... 1500 kg/h

Operational temperature ..... up to 900 °C

Cooling ..... water

Billet sizes ..... Ø 200 mm x 200-800 mm
i Ø 250 mm x 200-800 mm

Transformer for LF crucible furnace for melting copper and brass

Power ..... 450 kVA

Power supply ..... 400 V

Exit voltage ..... 125 – 550 V

Frequency ..... 50 Hz

Cooling ..... air

Weight ..... approx. 1100 kg

Transformer for LF metal melting furnace

Power	37 kVA
Power supply	400 V
Exit voltage	80 – 170 V
Frequency	50 Hz
Cooling	air
Weight	approx. 500 kg

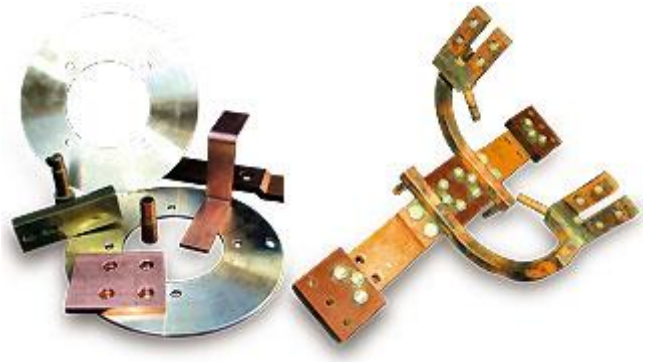
5.7. CONTACT ELEMENTS FOR HIGH CURRENTS

Industrial metallurgical, machinery, chemical and other processes often use high currents, safe and lasting transfer of which should be secured by reliable contacts.

Fixed connections, sliding contacts and connecting cables for high currents, depending on working conditions, can be manufactured with air or water cooling. Assortment of possible shapes, sizes and connecting ways is practically unlimited, and FEMOD is capable of satisfying almost all technical requirements.

Connecting, sliding and elastic contacts made of copper and copper alloys

Manifold bars, bridges, plates, sliding segment elements, contact discs, different types of connecting elements, etc.



Water cooled connecting cables

Current ..... 400 – 2500 A

Conductor size ..... 100-600 mm^2

Water pressure ..... 5 bar

Water flow ..... up to 22 l / min

Protection ..... reinforced asbestos or rubber hose covered with glass-silk enclosure

REACTORS-CHOKES

FEMOD manufactures and repairs all kinds of low-voltage reactors with low and medium operating powers and working frequency (JUS IEC 310; JUS N.H1. 289). There are monophasic and multiphase reactors, with magnetic core (ferrite or magnetic circuit of transformer plates) or without magnetic core, (air reactors). Cooling can be conducted by forced or natural circulation of air or water. According to its purpose and place of installation, reactors are made as commutational, filtering, compensational, impact, etc.

OTHER SERVICES

FEMOD repairs and rewinds low-voltage electro-motors (DC and AC), magnets, windings of power and control switches, windings of electromagnetic couplings and brakes, pneumatic and hydraulic valves, control transformers and all other types of electric windings.

Apart from this, FEMOD undertakes repairs of all kinds of professional electric accessories and tools, such as drills, grinders, saws, mowers etc.

CONNECTORS FOR TECHNICAL AND MEDICAL GASES

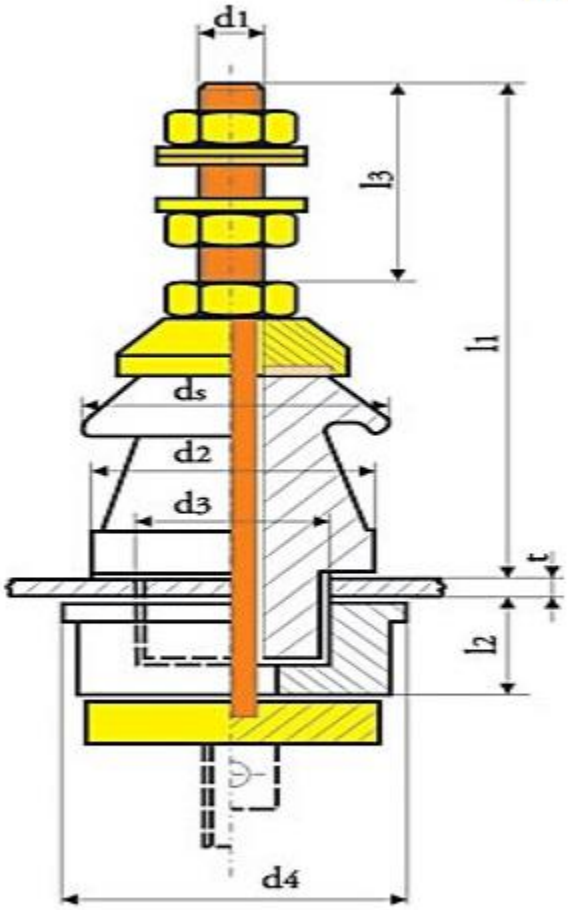
For manufacturing fixed or removable connections made for use of technical, medical and other gases, various distributing and connecting parts are mostly made out of copper and brass. These are the installations for oxygen, carbon-dioxide, nitrogen–suboxide, argon, acetylene, hydrogen, helium distribution. The equipment has to satisfy very rigid demands for internal clearness and work under very high pressures.

ELEMENTS FOR ENERGY TRANSFORMERS EXIT CONNECTIONS

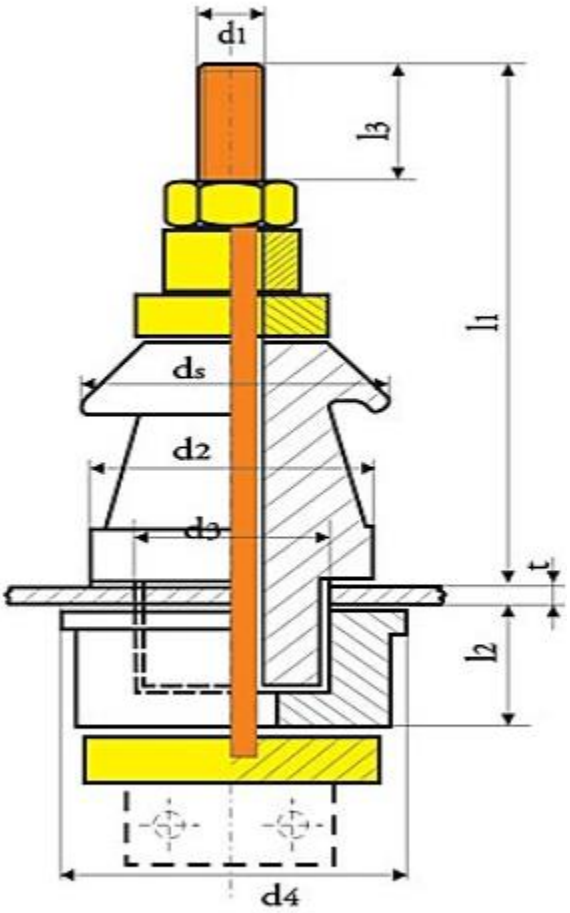
FEMOD manufactures outer contact elements of distributive and energetic transformers produced under strict requirements concerning chemical composition, mechanical properties, quality of all, and especially contact surfaces, size tolerances, etc. Production assortment comprises sets of contact parts consisting of threaded rods, caps, flags, washers, nuts and rings for all currents from 250 A up to 5000 A. All parts are manufactured in complete accordance with DIN 42 530 or EN 50 386 standards, or other norms, documentation or special requirements of the customer.

STANDARD TRANSFORMER CONNECTIONS

EN 50 386



Size 1-3 (250 to 630A)

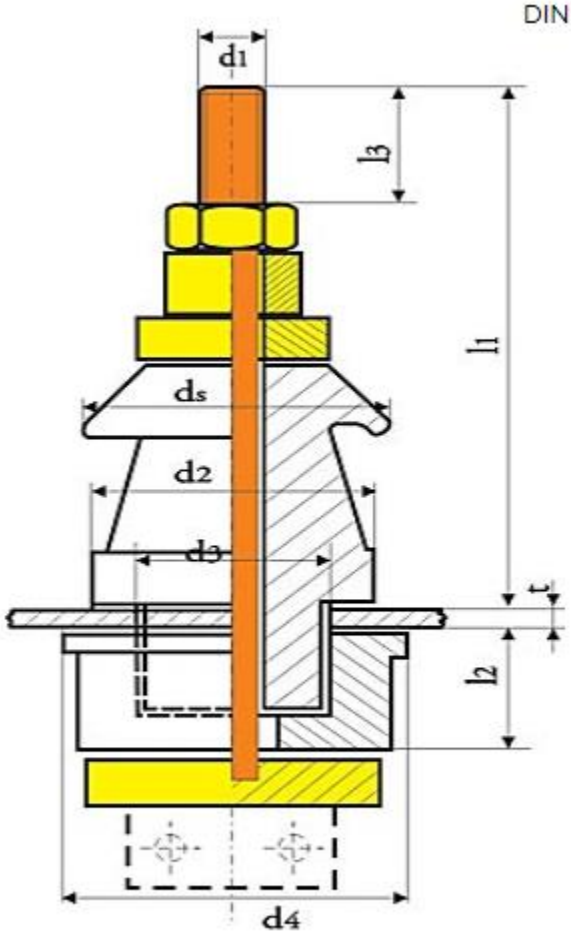


Size 4-8 (1250 to 5000A)

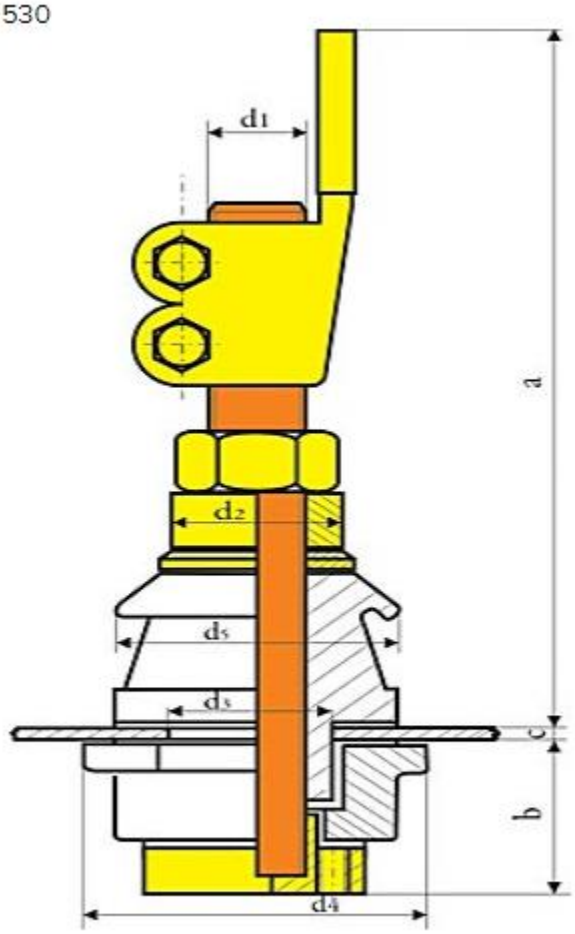
STANDARD SIZES ACC.TO EN 50 386 (mm)

Size	1	2	3	4	5	6	7	8
I_r (A)	250	250[a]	630	1 250	2 000	3 150	4 000	5 000
l_1 max.	138	160	178	200	240	250	300	310
l_2 min.	30	30	30	35	35	35	40	40
l_3 min.	40	40	65	70	90	90	110	110
t max	6	6	6	6	10	10	10	10
d_1	M12	M12	M20	M30x2	M42x3	M48x3	M55x3	M64x3
d_2 max.	56	56	70	90	104	125	160	160
$d_3{}^{+2}{}_{0}$	28	28	45	56	70	90	118	118
d4 max.	60	60	85	110	125	150	180	180
d5 max.	56	70	70	90	104	125	180	180
a) The type with extended creeping currents.								

DIN 42 530



250A to 630A



1000A to 3150A

STANDARD SIZES ACC.TO DIN 42 530 (mm)

Type	DT 250	DT 630	DT 1000	DT 2000	DT 3150
a	138	178	263	340	372
b	68	82	60	65	70
c	4 – 8	4 – 8	4 – 8	6 – 10	6 – 10
d_1	M 12	M 20	M30 x 2	M42 x 3	M48 x 3
d_2	28	40	56	70	80
d_3	28	45	56	70	90
d_4	60	85	110	125	150
d_5	50	70	90	104	125

5.8. TOOLS, MACHINE PARTS, AUXILIARIES, CONSTRUCTIONS

FEMOD manufactures wide assortment of tools for metallurgy purposes (hot and cold metal processing), machine components and constructions, based on technical documents provided by customer, available samples or own projection.

Various sorts of material are in use: high-alloyed, tool and construction steel, copper, brass, aluminum, bronze, etc., processed by all types of machine and heat treatment.

The maximum sizes for processing are: lengths up to 5000 mm, diameters up to Ø 1000 mm and weights up to 12 t.

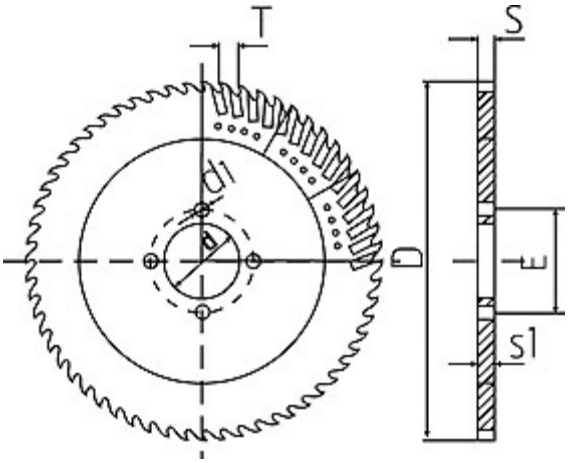
FEMOD's production equipment and skilled personnel enable the plant to perform even the most difficult and specific machine working operations and reworks on large sized equipment and constructions at site, thus eliminating need for demanding activities on dismantling, transportation and new installation of equipment and considerably decreasing costs of such refurbishment works.

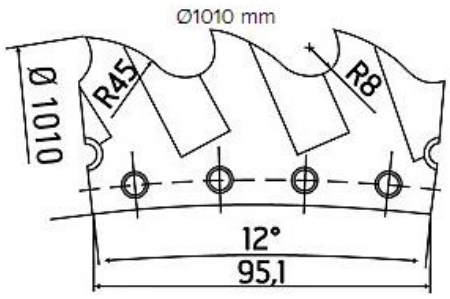
DIES AND CRYSTALIZERS

Made of copper, aluminum, steel or graphite for casting steel, copper and aluminum, (round, rectangular, or “T”-shaped)

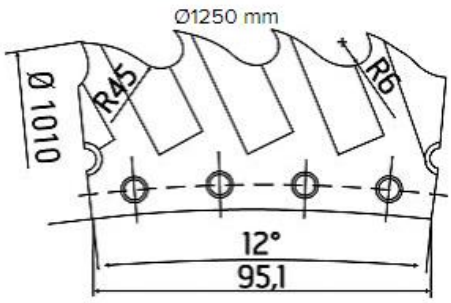
SAW SEGMENTS

FEMOD manufactures segments for two types of segment saws used for cutting non-ferrous metals: Ø 1250 and Ø 1010mm. The following saw segments are used to cut copper and brass billets and slabs:





3 zuba



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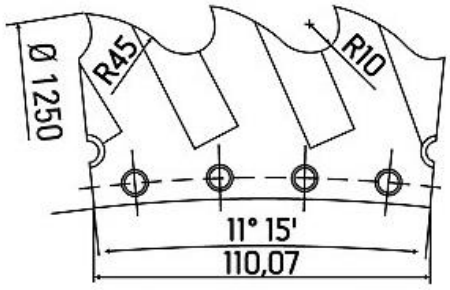
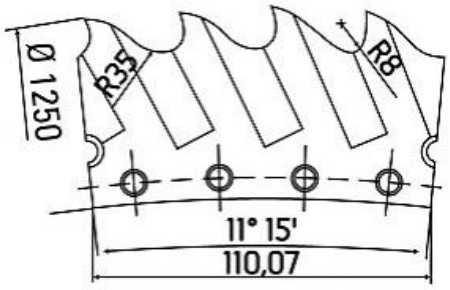


4 zuba



4 zuba

D	d	E	d1	S	S1	Number of teeth by segment (3-4)				N	Weight (kg)	
						3		4				
mm	mm	mm	mm	mm	mm	Z	T	Z	T	Piece	Saw	Segment
1010	120	185	26,5	8	6	90	35	120	26	30	37,5	0,21
1250	120	225	26,5	9	6,3	96	41	128	30,5	32	61,5	0,38

N – number of saw segments, Z – total number of saw teeth, T – teeth pitch

MACHINERY PARTS

Steel, copper, brass, bronze, aluminum with all sorts of machining and heat treatment.

EXTRUSION AND DRAWING TOOLS

Used for various profiles, tubes, bars, rods.

STEEL CONSTRUCTIONS

Oil tank for horizontal hydraulic press of 25 MN

Capacity ..... 15 m^3

Size ..... 5.5 x 2 x 1.4 m

Housing of the copper and copper alloys casting line of 1200 kW and 4 tph capacity

Size ..... 3.2 x 2.8 x 1.8 m

Vacuum and cooling water chamber of the passing annealing furnace

Size ..... 7.5 x 2.2 x 1.5 m

HAVY DUTY CARRIAGE

FEMOD is completely equipped for production of industrial transportation devices to be used for internal transportation of large loads. Following picture shows a carriage for transportation of rotors weighing up to 20 t, with diameters up to 3,5 m (TE Kostolac).

CONTACT

For more information about our products and terms of sale, please contact our sales department:

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