

<b>The continuous casting and rolling line for aluminium and aluminium alloys wire rods production</b>		
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<i>General description of the continuous casting and rolling line:</i>		
<p>Continuous casting and rolling of wire rod is a final stage of the aluminium and aluminium alloys wire rod production technology after the stage of refining and filtration process. The line consists a several technological process/operations such as: casting of the bar, straightening of the bar, treatment of the bar, temperature setting of the bar, rolling of the bar, cooling of the wire rod and coiling of the wire rod. As a result of the continuous casting and rolling process, the coil of the wire rod with specified diameter is obtained. Critical parameters of the continuous casting and rolling line are: production rate of wire rod - 5000 kg / hour at aluminium EN AW 1370, required wire rod geometry.</p>		
<b>Zakres</b>	<b>Parametr</b>	<b>Wymagania</b>
<b>Liquid metal parameters</b>	<b>Produced aluminium alloys</b>	<b>Aluminium alloy with added elements such as: Cu, Mn, Si, Mg, Zn, Zr. (series: 1xxx, 2xxx, 3xxx, 4xxx, 5xxx, 6xxx, 7xxx, 8xxx, AlZr) Especially aluminum alloys listed in standards: EN 1715-3: 2008 and 1715-4: 2008</b>
	Liquid metal temperature during casting and rolling	700 – 850°C
<b>Wire rod (product) parameters</b>	Diameter and tolerance of the wire rod	9,5; 12; 15; 19; 22; 25; 30 mm – details and tolerances in Table 1 and Table 2
	Weight of the coil	max 2500 kg
	Coils dimensions and standards	Table 3
	The strapping device/method	Two devices for automatic or manual strapping system for the steel tape
<b>Continuous casting and rolling line construction</b>	Composition	Integrated continuous casting and rolling (CCR) together with all necessary devices and water-emulsion infrastructure
	Production rate of wire rod	5000 kg / hour at aluminium EN AW 1370
	Direction of the CCR line	From left to right
	The investment location	Documents: Plan 1 and Plan 2 - investment location - C.
	Available area for water-emulsion infrastructure	Documents: Plan 1 and Plan 2 - investment location – C, D and E.
	Available media at the investment locations	Document: Media, Plan 1
<b>Casting machine construction</b>	Casting system (transfer of the liquid metal to the casting area)	Required, Set of two tundish with regulation of level and flow for liquid metal (large and small tundish)

	Control of level and flow for liquid metal in set of tundish	Required, Electronic or floater with the counterweight
	Transport launder	Required, included as a part of a CCR line
	Construction of casting machine	Machine for continuous casting of aluminium and aluminium alloys on a rotary crystallizer
	Crystallizer cooling system	Four cooling sections placed around the crystallizer: outer section/ inner section / 2 x side section
	Number of independent segments in each cooling section	Total min. 8 segments independently controlled by electronic valves equipped with a set of cooling spray nozzles
	<b>Method of regulations of the cooling nozzles</b>	<b>Nozzles with adjustable or constant flow</b>
	Range of adjustments of working parameters of the casting machine	Ability to achieve of crystallization parameters of the mentioned aluminium alloys
	Cooling water circuit for the casting machine	Separate, dedicated for the crystallizer cooling system. Water type according to manufacturer's recommendations
	<b>Regulations cooling water temperature of the casting machine</b>	<b>Closed cycle with cooling tower - included in the offer</b>
	<b>Exhaust system for Casting Machine</b>	<b>Required. Delivery includes an extraction hood with support structure. The delivery of the chimney and connecting ducts is on the side of the Purchaser</b>
<b>Additional devices construction</b>	Bar conveyor, sensor and speed control	Required, according to supplier solution
	<b>Emergency bar cutter</b>	<b>Required, Manual by movable, hydraulic guillotine</b>
	Bar straightener	Required, according to supplier's solution
	Bar shear	Required, Automatic, in line after bar straightener
	Device for collecting pieces of cutted bar	Required, Automatic
	Device for bar milling	Required, Upper part and corners of the bar
	Chips removal system	Required, Brushes and cyclon type collector
	Induction heater No. I	Required to increase the temperature of the cast bar before entering the rolling mill
	<b>Method of cooling water in the circulation of induction heater No. 1</b>	<b>Closed cycle with chiller No. 1 - included in the scope of the offer</b>

	Regulation of temperature of the bar by induction heater No. 1 before entering the rolling mill	Increase temperature of the bar by max. 100°C
	Method of controlling temperature in induction heater No 1.	Automatic, controlled by pyrometric system No. 1.
	Cast bar cooling chamber (replacement for induction heater No. 1)	Required to decrease the temperature of the bar before entering the rolling mill
	<b>Method of cooling water in the circulation of cast bar cooling</b>	<b>Closed cycle with chiller No. 2 - included in the scope of the offer</b>
	Regulation of temperature of the bar by cast bar cooling chamber before entering the rolling mill	Decrease temperature of the bar by max. 200°C
	Control method of cast bar cooling chamber during operation	Automatic, controlled by pyrometric system No 1.
	Separate water circuit for cast bar cooling chamber	Required, together with cooling water circuit for casting machine
	Pyrometric system No. I for temperature control	Required, First pyrometer before induction heater No. 1/cast bar cooling chamber. Second pyrometer before the entrance to the rolling mill
	Range of temperature measurements of the pyrometric system No. I	From 300 to 600 °C
<b>Rolling mill section construction</b>	Constructions of rolling mill section	Section composed with two stages of rolling mill: roughing mill and finishing mill
	Rolling system in Roughing mill	Two rolls technology
	<b>System for adjusting and controlling the settings of rolls in Roughing mill</b>	<b>Required, According to supplier solutions. Externally or as a component of rolling mill</b>
	Rolling system in Finishing mill	Two or three rolls technology
	<b>System for adjusting and controlling the settings of rolls in Finishing mill</b>	<b>Required, According to supplier solutions. Externally or as a component of rolling mill</b>

	Induction heater No. II between Roughing mill and Finishing mill	Optional
	<b>Method of cooling water in the circulation of induction heater No. II</b>	<b>Closed cycle with chiller No. 3 - included in the scope of the offer</b>
	Regulation of temperature of the rolled bar by induction heater No. II before entering the finishing mill	Increase temperature of the rolled bar by max. 50°C
	Range of temperature measurements of the pyrometric system No. II	From 300 to 600 °C
	Method of cooling the oil in the circuits of the rolling mills	<b>Closed cycle with chiller No. 4 - included in the scope of the offer</b>
	Method of cooling the emulsion in the circuits of the rolling mills	<b>Closed cycle with chiller No. 5 - included in the scope of the offer</b>
	<b>Exhaust system for Rolling mill section</b>	<b>Required. Delivery includes an extraction hood with support structure. The delivery of the chimney and connecting ducts is on the side of the Purchaser</b>
<b>Coiler construction</b>	Rod quenching section	Ability to cooling of the wire rod to 50 ° C above the cooling water temperature
	Method of cooling the water in the circuits of rod quenching section	<b>Closed cycle with chiller No. 6 - included in the scope of the offer</b>
	Cooling water circuit for the quenching unit	Separate, dedicated for the quenching unit Water type according to manufacturer's recommendations
	Regulation of the water temperature of the quenching unit	Required
	Maximum temperature of wire rod after quenching unit.	Max 250 °C
	Main shear/Cropping Shear	Automatic, Synchronized with the line
	Coiler	Automatic twin reel coiler
	Rod temperature during coiling	Winding of wire rods up to a temperature of 250 °C
<b>Measurement and control</b>	Place of liquid metal temperature measurement	In the large tundish

	<p>Recording of measurement process parameters</p>	<p>Continuous recording of process parameters:</p> <ul style="list-style-type: none"> <li>• Temperature of liquid metal in large tundish,</li> <li>• Pressure and flow of the cooling water supply to the casting machine</li> <li>• Temperature of the cooling water supply to the casting machine,</li> <li>• Flow of the water to the cooling zones of the casting machine</li> <li>• Rotating speed of the rotary crystallizer</li> <li>• Pressure of the pneumatic belt tensioning of the casting machine</li> <li>• Level of the milling head of the milling machine</li> <li>• Temperatures in pyrometric system no I (before induction heater and before roughing mill)</li> <li>• Temperature and pressure of the cooling water of the cast bar spray cooling chamber</li> <li>• Temperatures in pyrometric system no II (before finishing mill)</li> <li>• Information of status (ON/OFF) of induction heater no I and II</li> <li>• of the emulsion supply to the rolling mill</li> <li>• Pressure and flow of the emulsion supply to the rolling mill</li> <li>• Load control (Amper) of the main rolling mills and casting machine motors</li> <li>• Pressure and temperature of the stand oil supply to the rolling mills</li> <li>• Temperature of the transmission oil supply to the rolling mills</li> <li>• Temperature of the rod quench cooling water supply</li> <li>• Pressure and flow of the rod quench cooling water supply</li> <li>• Weight and meters of the coils,</li> <li>• Standby information of each element of the CCR line</li> </ul>
	<p>Control panel</p>	<ol style="list-style-type: none"> <li>1. Main Control desk of the casting machine located near to this unit</li> <li>2. Main control desk of the rolling mills located near to this unit</li> <li>3. Main Control desk of the coliler located near to this unit</li> <li>4. Main control desk supervision - collecting all measurement and data's from line (furnaces,</li> </ol>

		refining and filtration, casting, rolling) located in operator cockpit
	Availability of measurement process parameters	Output of measurement process parameters to the NPA Skawina IT system
	Data integration	Integration of all measurement process parameters with the operating panel
	Report	Required, production report with editable data
	Type of PLCs	Compatible or equivalent to the standard driver used in the NPA Skawina. Type of standard: PLC - SIEMENS S7
Tools and parts and another parts	<b>Tools for commissioning of the line</b>	<b>The supply includes all the tools needed to commissioning and technical acceptance tests of the line.</b>
	<b>Spare parts</b>	<b>The supply includes tools / spare parts needed to maintain continuous production in 12 months</b>
	<b>List of spare parts</b>	<b>The supplier will provide a list of consumable / spare parts (necessary for User) with pricing and delivery times.</b>
	<b>Reserve elements</b>	<b>As part of the delivery, additional complete rolling stands for the rod diameter of 9.5 and 12 mm are required. The quantities: two sets.</b>
	<b>Cabling system</b>	<b>The supply includes full cabling required to make connections between devices and control panels and power cabinets</b>
	<b>Technical documentation</b>	<b>Required in Polish</b>
	<b>Control software</b>	<b>The supplier will provide the user, after the warranty period, full access to the device control software</b>

### Additional tables

*Table 1. Diameters and tolerances of the wire rod*

Diameter, mm	Tolerance, mm	Ovality, mm
9,5	± 0,25	0,15
12,0	± 0,3	0,2
15,0	± 0,3	0,2
19,0	± 0,4	0,3
22,0	± 0,4	0,3
25,0	± 0,5	0,4
30,0	± 0,6	0,5

*Table 2. Required range of alloys and diameters*

Range of alloys (acc. to EN 573-3)	Diameter of wire rod, mm						
1xxx	●	●	●	●	●	●	●

2xxx	•	•						
3xxx	•	•	•	•				
4xxx	•	•						
5xxx	•	•	•	•				
6xxx	•	•						
7xxx	•	•						
8xxx	•	•						
Al59, AlZr	•	•						

*Table 3. Coils standards, dimensions and weights*

Type of standard	Internal diameter	Max. Outside diameter	Width	Max. weight
	mm	mm	mm	kg
European	570	1 600	850	2 500
American	760	1 650	850	2 500

**Remarks:**

Aluminium and aluminium alloys rods with diameters 9,5; 12; 15; 19 mm. have to be coiled in European Standard.

**Acceptance**

1. Project coordinator:.....

Head of Innovation, Research  
and Development Department

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