The stations for the melting and alloying of aluminium alloys	
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Part 1 – The description of an aluminium melting station

General description of the aluminium melting station:

Aluminium melting is a stage of the aluminium and aluminium alloys wire rod production technology after the stage of preparing the metal for melting process. The aluminium melting station is an element designed for the melting of aluminium with specified melting rate. As a result of the melting process, the liquid aluminium at the specified temperature is obtained. Critical parameters of the aluminium melting station are: melting rate adapted to the CCR line productivity - 5000 kg / hour at liquid metal temperature 850 °C, permissible dust emission - max 0,005 kg/h, gas consumption - max 75 m3/per tonne (during melting of 20-22 kg ingots, gas-air fuel and liquid metal temperature 850°C) and the use of oxygen in the melting process.

The scope	The parameter	The requirement
The furnace feed	Type of feed for melting process	1. Primary aluminium min 99,7 % Al. 2. Own scrap material min 99,7 % Al.
	Size of feed for melting process	1. Sows 20-22 kg – packed in to 1 tone bundle, sizes - 740 × 740 × 1030 mm 2. T-bars/ingots - mass in range 500-700 kg
	Size of own scrap material	1. Wire rods coils diameter – ø 1650 mm, width 850 mm 2. Wire rods coils diameter – ø 600 mm
	Share of own scrap material	Max 10 %
	Loading method	According to supplier solution (adapted to the furnace construction)
	Loading device	Required, included in the offer as an option
The furnace construction	The investment location	Documents: Plan 1 and Plan 2 - investment location - A. Note: The A area will be designed and built after chosen of the offer.
	Available media at the investment location	Document: Media, Plan 1
	Type of furnace construction	According to supplier solution
	Type of furnace fuel	**Natural gas-oxygen / Natural gas -air**
	Type of gas	Natural gas with the following parameters: 1. calorific value, kWh/m^3 - 10±5%, 2. gross calorific value, kWh/m^3 - 11±5%, 3. total sulfur, mg/ m^3 – 5,2±5%, 4. sulfuretted hydrogen content, mg/m^3– 5,5±5%,
	Installation for the Oxygen	Required, included in the offer as an option
	Type of burner	Preferred - AGO (Air – Gas – Oxygen)

	Furnace lining / refractory materials	Compatible or equivalent to the NPA standard for the construction of aluminium melting furnaces. Standard description: 1. Bottom Hearth, ramp: - working lining: Alugard A95 – 92,5 % Al_2O_3. - insulating & subhearth: Insulating Paper & Bricks & Alugard LW185 44,6 % Al_2O_3. 2. lowerwalls: - working lining: Alugard A95 – 92,5 % Al_2O_3. - insulating & intermediate layers: Insulating Block & Litewate Insulating mono 3. Upperwalls: - working lining: Surcast 65PRT 63,7 % Al_2O_3. - insulating & intermediate layers: Insulating Block & Brick 4. Roof: - working lining: Surcast 65PRT 63,7 % Al_2O_3. - insulating lining: Insulating monos Litewate 5. Door: - working lining: Surcast 65PRT 63,7 % Al_2O_3. - insulating lining: Insulating Block 6. Door Frame: - working lining: Surcast 65PRT 63,7 % Al_2O_3 – precast shapes
	Temperature of the furnace shell	Max. 50 °C above ambient temperature
	Exhaust system above charging door	**Required. Delivery includes an extraction hood with support structure. The delivery of the chimney and connecting ducts is on the side of the Purchaser**
The operating parameters	Melting rate / Production rate (Ability to deliver of the liquid aluminium - including: loading processes, liquid metal processing, melting, transport)	Adapted to the CCR line productivity – 5000 kg / hour at liquid metal temperature 850 °C
	Temperature of melting chamber during melting	**Max 1200°C**

	Liquid metal temperature during pouring out	Max 900°C
	Max. gas consumption	Max 75 m^3/per tonne (during melting of 20-22 kg ingots, gas-air fuel and liquid metal temperature 850°C)
	Max. Oxygen consumption	According to the proposed solution presented in the offer
	Permissible dust emission measured on the furnace emitter (in the chimney)	Max 0,005 kg/h
	The Installation for combustion/gas gas filtration	**Required, as a part of the offer**
	Type of combustion/exhaust gas filters	**Arbitrary, guaranteeing a specific dust emission**
	Chimney	**Required, as a part of the offer**
	Scope of delivery of combustion/gas installations	**Delivery includes: chimney, filter, connecting installation and support structure.**
	Material losses during the melting process (Sow ingots/ ingots/ T-bars)	Max. 1,5 %
The operation method	Mixing of liquid aluminium	Manually, using tools
	Electromagnetic stirrer	**Required, as an option of the offer**
	Removal of the slag / melting losses	Manually, using tools or mechanical
	Device for mechanical removal of dross	**Required, as an option of the offer**
	Refining of liquid aluminium	Required, using refining salts
	Adding of refining salts	Manually
	Used refining salts	KCl, NaCl i Kriolit
	Device for mechanical removal of slag / melting losses	Required, included in the offer as an option
	Transfer of the liquid aluminium to a holding furnace	Gravitational, by a transport launder
	Transport launder	Required, included as a part of a melting station
	Max reduces of liquid aluminium temperature over the length of the transport launder	Max 0,5°C / per 1 m of launder length

Measurement and control	Places of temperature measurement in the furnace	Required, points of measurement: 1. liquid aluminium 2. furnace chamber
	Controlling the furnace operation	Required, as a function of set point temperature / aluminium temperature
	Control method of furnace operation	Manual and automatic according to melting programs
	Recording of measurement process parameters	Continuous recording of process parameters: • Aluminium liquid temperature, • Furnace chamber temperature, • Mass of liquid metal, • Exhaust gas temperature, • Signalling the working of burners, • Signalling the opening of furnace doors, • Percent of burners power, • Electric energy consumption, • Gas consumption, • Oxygen consumption.
	Report	Required, production report with editable data
	Availability of measurement process parameters	Output of measurement process parameters to the NPA Skawina IT system
	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	**Tools for commissioning of the section**	**The supply includes all the tools needed to commissioning and technical acceptance tests of the section.**
	Spare parts	**The supply includes tools / spare parts needed to maintain continuous production in 12 months**
	List of spare parts	**The supplier will provide a list of consumable / spare parts (necessary for User) with pricing and delivery times.**
	Cabling system	**The supply includes full cabling required to make connections between devices and control panels and power cabinets**
	Technical documentation	**Required in Polish**
	Control software	**The supplier will provide the user, after the warranty period, full access to the device control software**
Part 2 – The description of an aluminium alloying station		

General description of the aluminium alloying station:

Alloying of aluminium is a stage of the aluminium and aluminium alloys wire rod production technology after the stage of aluminium melting process. The aluminium alloying station is an element designed for the preparing of correct chemical composition of the alloy and the degassing of liquid metal. The station consists of two holding furnaces that continuously feed the casting machine. As a result of the alloying process, the liquid aluminium or aluminium alloys of specified chemical composition and temperature is obtained. The next stage of technology is refining and filtration. Critical parameters of the aluminium alloying station are: production rate adapted to the CCR line productivity - 5000 kg / hour at aluminium EN AW 1370 at temperature 850 °C and holding the temperature of the liquid metal max 850°C.

Note: This description refers to two holding furnaces in the station.

The scope	The parameter	The requirement
The furnace feed	Type of liquid aluminium	Aluminium min 99,7 % Al.
	Liquid metal temperature during pouring out	Max 900°C
	Furnace loading method	Gravitational, by a transport launder and a transport ladle
The station composition	Number of furnaces	2
	Type of furnace	Holding-casting
	Type of work	Alternate, continuous supply of aluminium / aluminium alloys
	The investment location	**Documents: Plan 1 and Plan 2 - investment location – B and C. The holding furnaces must be filled from two sides. For this reason, furnaces should be positioned between hall columns (place in areas B and C) or as close as possible to columns (place in area B).**
The furnace construction	Type of furnace construction	Tilting holding / casting furnaces.
	Number of doors used to operate the furnace	2 doors to handle the entire surface of liquid metal
	Type of furnace fuel	Natural gas - air
	Type of gas	Natural gas with the following parameters: 1. calorific value, kWh/m^3 - 10±5%, 2. gross calorific value, kWh/m^3 - 11±5%, 3. total sulphur, mg/ m^3 – 5,2±5%, 4. sulfuretted hydrogen content, mg/m^3– 5,5±5%,

	Furnace lining / refractory materials	Compatible or equivalent to the NPA standard for the construction of aluminium melting furnaces. Standard description: 1. Bottom Hearth, ramp: - working lining: Alugard A95 – 92,5 % Al_2O_3. - insulating & subhearth: Insulating Paper & Bricks & Alugard LW185 44,6 % Al_2O_3. 2. lowerwalls: - working lining: Alugard A95 – 92,5 % Al_2O_3. - insulating & intermediate layers: Insulating Block & Litewate Insulating mono 3. Upperwalls: - working lining: Surcast 65PRT 63,7 % Al_2O_3. - insulating & intermediate layers: Insulating Block & Brick 4. Roof: - working lining: Surcast 65PRT 63,7 % Al_2O_3. - insulating lining: Insulating monos Litewate 5. Door: - working lining: Surcast 65PRT 63,7 % Al_2O_3. - insulating lining: Insulating Block 6. Door Frame: - working lining: Surcast 65PRT 63,7 % Al_2O_3 – precast shapes
	Temperature of the furnace shell	Max. 50 °C above ambient temperature
	The hood above the charging door	**Required. Delivery includes an extraction hood with support structure. The delivery of the chimney and connecting ducts is on the side of the Purchaser**
	Available media at the investment location	Document: Media, Plan 1
The operating parameters	Casting rate / Production rate (Ability to deliver of the liquid aluminium - including: loading processes, liquid metal processing, melting, transport)	Adapted to the CCR line productivity - 5000 kg / hour at liquid metal temperature 850 °C

	Liquid metal temperature during casting and rolling	Max 850°C
	Max. gas consumption during holding of the liquid aluminium temperature at 850 °C	4 m^3/ per tonne
	Produced aluminium alloys	**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**
	Method of alloys production	Master Alloys and pure elements (Zn, Mg) addition
The operation method	Mixing / degassing of liquid aluminium and aluminium alloys	Automatic, by use of special porous plugs to inject inert gases such as Nitrogen and Argon for degassing
	Removal of the slag / melting losses	Manually, using tools
	Adding of alloying elements	Manually
	Transfer of the liquid aluminium to a refining and filtration station	Gravitational, by a transport launder
	The filled/transport of liquid metal to the holding furnaces by the transfer/crane ladle	**The holding furnaces must be filled from two sides. The cranes working on both part of production hall (areas C and B).**
	Transport launder	Required, included as a part of a holding station
	Max reduces of liquid metal temperature over the length of the transport launder	Max 0,5°C / per 1 m of launder length
Measurement and control	Places of temperature measurement in the furnace	Required, points of measurement: 1. liquid aluminium 2. furnace chamber
	Controlling the furnace operation	Required, holding of constant metal temperature
	Control method of furnace operation	Manual and automatic according to alloying/holding programs
	Control of the furnace tilting	Automatic, by means of the metal level control in the tundish of casting machine (integrated) and manually from the operating panel of casting machine

	Recording of measurement process parameters	Continuous recording of process parameters: • Aluminium liquid temperature, • Furnace chamber temperature, • Signalling the working of burners, • Signalling the opening of furnace doors, • Percent of burners power, • Electric energy consumption, • Gas consumption, • Level and time of the furnace tilting • Signalling and flow rate of refining/degassing gas
	Report	Required, production report with editable data
	Availability of measurement process parameters	Output of measurement process parameters to the NPA Skawina IT system
	Data integration	Integration of measurement process parameters with the operating panel of casting machine
	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	**Tools for commissioning of the section**	**The supply includes all the tools needed to commissioning and technical acceptance tests of the section.**
	Spare parts	**The supply includes tools / spare parts needed to maintain continuous production in 12 months**
	List of spare parts	**The supplier will provide a list of consumable / spare parts (necessary for User) with pricing and delivery times.**
	Cabling system	**The supply includes full cabling required to make connections between devices and control panels and power cabinets**
	Technical documentation	**Required in Polish**
	Control software	**The supplier will provide the user, after the warranty period, full access to the device control software**
Acceptance		
1. Project coordinator:.....		Head of Innovation, Research and Development Department PhD Eng. Piotr Uliasz