

KES

T6 Combustion Heat Treatment Path

KES G – B305B

(EST.) 1989 – 10 – 03
(REV.) 1990 – 03 – 20
(REV.) 1991 – 05 – 20

Contents

1. Scope of Application
2. Definition of Term
3. Equipment Component
4. Equipment Specification
5. Related Standard

1. Scope of application

This standard shall be applied to T6 combustion heat treatment of the product for Al Casting.

2. Definition of term

(1) T6 Heat Treatment

T6 Heat Treatment is defined as Heat Treatment that strengthens material by solution treatment, Quenching and aging treatment during the heat treatment for Al product.

(2) Solution Treatment

The treatment that heats materials below process temperature in order to diffuse and distribute alloying element that is contained in A1 alloy in state of solidification structure into the Al Matrix structure equally.

(3) Quenching Treatment

The treatment that maintains alloying element in Al Matrix in state of supersaturated solid solution by cooling solution treated product.

(4) Aging Treatment

The treatment that precipitates alloying element into Al Matrix and reforms Matrix by heating the material (or product) that is changed into supersaturated solid solution by treatment (2) and (3)

3. Equipment Component

(1) Solution path

- ① Solution path body
- ② Carrier device on path
- ③ Dry sand ejector device
- ④ Door on the side of entry and way out

- ⑤ Sand falling device

(2) Quenching tank

- ① Tank body
- ② Cooling water agitation device
- ③ Watered sand recovery equipment and drainage pump
- ④ Carrier Roller

(3) Aging path

- ① Aging path body
- ② Carrier device on path
- ③ Door on the side of entry and way out
- ④ Sand cleaning window

(4) Carrier Device

- ① Charging table
- ② Taking out table
- ③ Basket transfer Conveyer
- ④ Waste sand ejector Conveyer
- ⑤ Basket & Tray

(5) Combustion Device

- ① Burner and combustion circuit
- ② Attachment equipment for combustion and Blower
- ③ R/C Fan
- ④ Temperature Control specification

(6) Exhaust Duck and Dust precipitator

(7) Utility standard and coating specification

(8) Test items and test method

4. Equipment specification

Division	Item	Specification
Solution Path Body	Casing Structure	1. Compose it with SS iron plate + Heat insulating material + SUS iron plate from outer of path.
	Surface Temperature	1. Surface temperature (Except opening part and around of Burner) shall be adjusted within the room temperature + 50℃ 2. For the Surface temperature of opening part, the temperature within 300mm from opening part shall be adjusted within the room temperature + 90℃ 3. For the temperature around of the Burner, the surface temperature within 350mm from Burner shall be adjusted within the room temperature + 120℃
	Safety Equipment of High temperature part	1. At the part that surface temperature is more than 90℃ equip the place that someone who touch it will get burnt with protective cover. 2. Install heatproof plate at the part that surface temperature is more than the room temperature + 90℃ for deformation and safety of path body. 3. Gas piping shall be avoided if possible. In an unavoidable case, piping temperature shall be adjusted below Gas (LNG) flash point. And in case of temperature is more than flashpoint, carry out adiabatic construction.
	Muffle on path	1. Material of the Muffle on path shall be SUS310 and structure that has little thermal deformation. 2. The structure of Muffle on path shall be the structure that has equal flow velocity and uniform distribution of pressure on path for transmitting temperature to the product equally. (Direction regulator shall be installed)
Carrier device on path	Roller on path	1. Form of roller on path shall be Hearth Roller Type if possible 2. Material of Hearth Roller shall be heat resistant cast steel centrifugal casting product. 3. Pumping of Roller shall be had enough safety rate with considering Basket and the weight of product.

Division	Item	Specification
Carrier device on path	Roller on path	<div>4. Decomposition direction of Roller shall be secured Maintenance space with considering neighboring appendage and equipment.</div> <div>5. Surface of Roller shall be secured equal unevenness part with considering friction coefficient with Tray. (Knurling processing)</div>
	Roller Guide	<div>1. External diameter of Roller Guide shall be large to the highest degree within Roller Pitch.</div> <div>2. For equipping of Roller guide assemble Roller first, fix with Set Screw, and later fix Guide and Roller tack welding..</div>
	Sealing Treatment between Roller and Body	<div>1. Crack space between Roller and Cutting part of body shall be limited to the minimum within the range of considering thermal expansion.</div> <div>2. Carry out insulating sealing treatment on a crack in order to minimize the heat loss.</div>
	Level adjustment of Roller	<div>1. Level adjustment of Roller shall be free plan type.</div> <div>2. Establish preventive measure for not being changed by vibration, heat expansion, etc.</div>
Dry sand ejector device	Ejector method	<div>1. Choose ejector method of Hopper type or Screw type, especially the structure that having little heat loss.</div> <div>2. Ejector action shall be able to eject them once in a Cycle with discontinuous method.</div>
Dry sand ejector device	The temperature of ejector sand	<div>1. The temperature of ejector sand shall be within 150℃.</div> <div>2. Dry sand ejector part shall have the structure that can prevent the inflow of the inflammables for the measures against a fire.</div>
Door on the side of entry and way out	The structure of Door Frame	<div>1. The structure of Door Frame shall be the structure of not being distorted by the heat deformation.</div> <div>2. In the case of being concerned heat loss by heat deformation, adopt Water Jacket method.</div> <div>3. Install the Seal material on the side of Door Frame.</div>

Division	Item	Specification
Door on the side of entry and way out	Protection of the Seal material	1. The action of Door shall be the structure of not sliding for the securing regular life span of the Seal material. (Use the material but asbestos as Seal material.)
	Door Clamping	1. Adopt the forced pressing method not self-weight falling method as the Door pressing Clamping. And have 4 places as the pressing place.
	Hoppe for removing the sand (Scattered sand)	1. Install the Hopper on the side of entry and way out in order to remove the scattered sand whenever it opens.
Sand falling device	The object of application	1. Apply it to the heat treatment for the product that uses Core.
	Method	1. Apply percussion method or Vibration method to it.
	Equipment Position	1. Equip it on the final Zone of the extraction part or second Zone from the final Zone.
	Action	1. Action cycle of sand falling device shall be the free plan type and act once or twice a Cycle. 2. Operation period or frequency shall be the free plan type.

4.2 Quenching Tube

Division	Item	Specification
Tube body	The structure of body	<ol style="list-style-type: none"> 1. The lower surface of tube shall be the inclined type and have the structure that sands are not piled up in order to remove sands that are mixed to cooling water at the time Quenching. 2. Install Drain Valve at the part that the cooling water of the inside of tube can be drained perfectly in the state of maintenance. 3. Install water for industrial use supply Line at the both side of Valve Gate as a Drain Valve in order to reduce breakdowns by sands. 4. Install water temperature control and agitating Steam Nozzle at the lower part of tube. 5. Stick Silencer to the Steam Nozzle.

Division	Item	Specification
Tube Body	Rust Prevention	<div>1. Use the SS41P more than 2.5¹ or SUS material as the material of cooling tube.</div> <div>2. Carry out rust preventive Epoxy coating at the part of connection with cooling water.</div> <div>3 Carry out rust preventive coating other parts, in addition to cooling tube.</div>
	Water Vapor Capture Hood	<div>1. Install Hood at the upper part of cooling water to capture vapor.</div> <div>2. Make the Hood structure that can lengthen the length of vapor stay.</div>
	Ladder for Maintenance	<div>1. Install vertical lifting ladder at the inside of tube body for maintenance use.</div>
	Control of Cooling Water amount	<div>1. Control the amount of cooling water by Level S/W that the amount for power failure.</div> <div>2. Level is checked by the method of up and down and middle check up. And Control by automatic water supply.</div> <div>3. Water supply valve constitute By-Pass circuit.</div>
Cooling water Agitating device	Agitation method	<div>1. Use the self-agitation method of the tube by Screw Impeller. Or use the agitation method by circulation Pump.</div> <div>2. Agitation power shall consider about the flow of water for water flow all over the tube.</div>
	Measures for troubles	<div>1. In the case of agitation method by Screw Impeller, constitute 2 Set. (When 1 set has the trouble, the other 1set shall work.)</div> <div>2. In the case of agitation method by circulation pump, constitute 2set and piping by By-Pass circuit.</div> <div>3. As the measures for trouble by vibration install dustproof system and vibration cutoff device.</div>
	Measures for troubles by sands	<div>1. As an Impeller material use abrasion resistant material.</div> <div>2. In the case of circulation Pump use Ball Valve. And constitute the circuit that can supply the water for industrial use, as the measure for sands mixing. (Use the steel pipe for Boiler use as a piping.)</div>

Division	Item	Specification
Cooling water Agitating device	Measures for troubles by sands	3. In the case of circulation pump, the position of suction door shall not be the lower part of tube body.
Wet sands recovery device and drainage pump	Suggestion for piping design	1. Reduce tortuosity part of piping as much as possible. 2. Design the piping length between wet sand recovery device and cooling tube to the limit.
	Constitution of wet sands recovery device	1. Have circulation pump, wet sands recovery device, precipitation tank recovery device.
	Structure and Performance	1. Have 2 Sets of circulation Pump and By-Pass circulation. 2. Carry out abrasion resistant treatment on Impeller of Pump. (Use the steel pipe for Boiler use as a piping.) 3. Carry out rust prevention Epoxy coating to the inside of wet sands recovery device. And use the SS41P more than 3.2 ¹ material. 4. Install Pump and Motor on the dustproof frame. And piping part carries out vibration cutoff. 5. Containing water rate shall be within 10% in the state of wet sands recovery. 6. Precipitation tank shall use the type of being able to exchange by a forklift truck or Hoist. And the amount shall be more than 1 time / 1day. 7. Recovery device shall have the structure that can be transported by forklift truck, Hoist or hand.
		8. Install the desorption type of Level S/W in order that operator can perceive it by alarm at the time of sands fullness. 9. Install reducing velocity Motor of wet sands recovery device that has the structure that Oil doesn't flow to the inside of Motor Coil.
Carrier Roller	Basic specifications that be required	1. Bearing part of Roller shall guarantee the life length against flooding. (Measures against mixing with Bearing material and sands) 2. In the case of using the Photo-Sensor method as the Basket location detection method install high performance of Sensor that prevents wrong operation by vapor.
	Bearing Specification	1. Use the waterproof, heat-resistant (100℃) and non-refueling type of Bearing.