

## Heat Treatment for Small Size Pipes

### 1. Heat Treatment for Small Size Pipes

Heat treatment is an important process for determining the characteristics of metals. Optimal heat treatment of small size pipes, for example, is a critical technique for producing needles/nozzles for medical/analysis use in high quality. FUTA-Q conducts a solution and/or ageing treatments to adjust the characteristic of a metal including stainless steel, titanium, and cobalt alloys to the predetermined values.

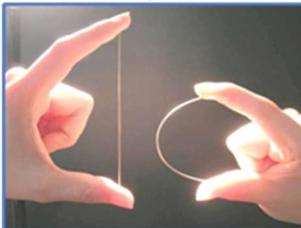
### 2. Heat treatments in FUTA-Q

FUTA-Q is equipped with a **vacuum heat-treatment furnace** and a **continuous heat-treatment furnace**.

- **The vacuum heat-treatment furnace:** Heat-treating a metal in the atmosphere generates an oxide film on the metal surface, resulting in changes in the color and property of the surface. A vacuum heat-treatment can avoid this influence caused in the atmosphere.
- **The continuous heat-treatment furnace:** Continuous heat-treatment furnace conducts heat-treating continuously by moving a product with a belt conveyor while the furnace is filled with argon or nitrogen gas to prevent the influence from the atmosphere.
- **Solution treatment:** A metal is heated to a high temperature followed by quenched, resulting in the uniformized distribution of its alloying elements to form a homogeneous alloy. The annealing effect is provided at the same time, resulting in a softened structure at the area hardened by mechanical processing.
- **Ageing treatment:** A metal increases its strength and hardness by forming minute structures under proper treatment temperature and time. This process is mainly applied to titanium alloys or precipitation hardening stainless steel like SUS306, using a different hardening mechanism from the normal hardening mechanism in steels.

### 3. Heat treatment condition

Example:  $\beta$ -titanium



Materials	Solution treatment (°C)	Ageing treatment (°C)
$\beta$ -titanium (e.g. Ti-22V-4Al)	760 - 815	420 - 510
Ti-6Al-4V	900 - 970	480 - 690
ELGLOY (Fe-40Co-20Cr-15Ni-7Mo)	1010 - 1120	500 - 580
SUS304 (Fe-18Cr-12Ni-2.5Mo)	1010 - 1150	Not applied
SUS316L (Fe-18Cr-8Ni)	1010 - 1150	Not applied

### 4. Facilities for heat treatment

The whole length of a long rod can be treated at a heating and cooling temperatures which are controlled to a unified condition.

Vacuum heat-treatment furnace



- Reachable vacuum degree: 10<sup>-4</sup> Pa
- The furnace length: 2.8 m

Continuous heat-treatment furnace



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