Procedure 03-8083-P14

Stress Relief

REVISION RECORD

Revision	Date of Issue	Description of Change	Prepared by	Reviewed by	Approved by
0	03/15/04	New	Tom Gilmore	Gary Armstrong	David Rioux

STRESS RELIEF

1.0 **Purpose:**

To establish the method for Stress Relief of the Prototype Vacuum Vessel Segment for the National Compact Stellarator Experiment.

2.0 Scope:

The Prototype shall be placed in a controlled environment and a Stress Relief cycle applied. This procedure is specific to the Prototype Vacuum Vessel Segment for the National Compact Stellarator Experiment only.

3.0 References:

- National Compact Stellarator Experiment (NCSX) Specification NCSX-CSPEC-121-01-01.
- Thermetco Solution Anneal Procedure for Inconel 625, Rev 0.

4.0 Equipment:

- See Thermetco Solution Anneal Procedure for Inconel 625 Rev 0.

5.0 Procedure:

1. Place Die with 3/8” inconel formed segment closed in place inside furnace.
2. Place furnace lid over Die being stress relieved.
3. Follow Thermetco Solution Anneal Procedure for Inconel 625.
4. Once part temperature has dropped below 200 Deg. F, package die for shipping to PMW.

Thermetco INC.

DETAILED TECHNICAL INSTRUCTIONS

TITLE : SOLUTION ANNEAL PROCEDURE FOR Inconel 625

Prepared by :
Milenka Kamenova P. Eng

Approved by :
André Houle

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➢ *1.0 Objective*

The principal objective of this procedure is to describe the steps to follow and minimal requirement to satisfy during solution anneal heat treatment for Inconel 625 material

➢ *2.0 Application domain*

This procedure is applicable for solution anneal heat treatment for pieces made in Inconel 625

➢ *3.0 Procedure technical instructions :*

3.1- Positioning

The pieces must be supported in a manner that all movement during treatment is kept to a minimum and any deformation attributable to heating is minimised at the maximum. No direct contact between the part and the flame is allowed.

3.2 – Furnace

The furnace can be natural gas fired and/or electrical type. The furnace atmosphere is ambient atmosphere. The heat treatment must be performed under inert gas protection (Argon or Nitrogene)

3.3 – Thermocouples

Cromel-Alumel thermocouples used to measure the temperature during the heat treatment process will be calibrated to tune with an automatic recording equipment of the heat cycle. There will a minimum of 3 thermocouples on each heat treated load. Thermocouples are welded to the part with capacitive discharge method or attached mechanically on the piece.

3.4 – Recorder

The automatic recording equipment of the heat cycle will be calibrated with traceability to national recognized standards. The serial number of the recording equipment will be written on the temperature-time record of the heat treated product.

3.5- Parameters

3.5.1 Initial temperature

Furnace will be temperature controlled above 800°F. No holding is required as long as all thermocouples are within 800 ± 25°F.

3.5.2 Heating rate

Above 800°F, the temperature ramp speed rate is 100°F/hr.

3.5.3 Holding temperature

Soaking temperature time will be 1600ºF ± 25ºF

3.5.4 Minimum soaking time

3 hours (core temperature)

3.5.5 Uniformity

During heating and cooling, maximum temperature difference between any two points will not exceed 100ºF.

3.5.6 Protection

A constant supply of Argon or Nitrogen is required during the heat cycle. The gas volume should be 6 times per hour.

3.5.7 Cooling method

After soaking time accomplished, furnace is open at 1600°F and the load should be allowed to cool down on still air.

3.5.8 Bell Opening

The bell should be opened and the inert gas supply suppressed at 400°F.

4- Records

For each treatment, a temperature-time diagram must be recorded with the following information: furnace identification, year, month, day and baking number. This identification must be transcribed on the treatment procedure sheet in the space reserved for this. A heat treatment positioning sketch will also be supplied with each load.

5- Documents

A heat treatment certificate with an original and a copy of the temperature-time diagram is transmitted to the client.