



## Annexure 1 for Special Purpose Steel Forging

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30-WI-PR-14  
Annex 1

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**Purpose:** Heating and Forging of Closed Die and Open Die parts of Special purpose grades.

**Scope:** It is applicable for production processes.

### Procedure:

#### Common guidelines to be followed for all special purpose Steel Grades.

- Rapid Heating should never be done in order to avoid internal cracks.
- Start forging as soon as final soaking completed.
- Use of pyrometer is recommended for temperature measurement and recording during preheating forging and at finishing stage.
- At a pre decided interval, recording of furnace temperature, billet temperature at exit and billet temperature at finishing stage must be ensured.
- It is the responsibility of production to actually monitor the temperature and soaking time as per format billet heating cycle in 40-DF-PR-02.

#### **A) Material Grade: Austenitic Stainless Steel (AISI 316, F316 / AISI 316L, F316L / AISI 304, F304 / AISI 304L, F304L / AISI 317, F317)**

Follow the sequence given below for heating of specific grades of Steel in the PUSHHER type furnace.

- Heat the furnace and set the temperature 1050°C. After reaching the temperature 1050°C, push the cut billets in furnace.
- Raise the furnace temperature to 1100°C and push the cut billets after 30 minutes in furnace.
- Raise the furnace temperature to 1150°C and push the cut billets after 30 minutes in furnace.
- Raise the furnace temperature to 1220°C and push the cut billets after 30 minutes in furnace.
- Raise the furnace temperature to 1270°C and push the cut billets after 15 minutes in furnace.
- Push the cut billets after every 15-20 minutes.
- Start the forging after soaking complete.
- Billet temperature should be 1180 – 1200°C.
- Ensure finishing temperature of forging is never below 870°C.
- Wait every time 20 Minutes for soaking. Its mandatory.
- Record the soaking time in log book.
- After forging is completed, cool the forgings to be slow cooled.

**B) Material Grade: Duplex Stainless Steel (1.4462 / AL-111-2377 / AL-111-2398 / F51)**


Follow the sequence given below for heating of specific grades of Steel in the PUSHER type furnace.

- Heat the furnace and set the temperature 1050°C. After reaching the temperature 1050°C, push the cut billets in furnace.
- Raise the furnace temperature to 1100°C and push the cut billets after 30 minutes in furnace.
- Raise the furnace temperature to 1150°C and push the cut billets after 30 minutes in furnace.
- Raise the furnace temperature to 1230°C and push the cut billets after 30 minutes in furnace.
- Raise the furnace temperature to 1280°C and push the cut billets after 15 minutes in furnace.
- Push the cut billets after every 15-20 minutes.
- Start the forging after soaking complete.
- Billet temperature should be 1180 – 1200°C.
- Ensure finishing temperature of forging is never below 970°C.
- Wait every time 20 Minutes for soaking. Its mandatory.
- Record the soaking time in log book.
- After forging is completed, cool the forgings to be slow cooled.

**C) Material Grade: Martensitic Stainless Steel (AISI 410 / AISI 420 / AISI 431 / 1.4418 / 1.4057 / UNS S41000 / X12Cr13 / X12Cr13+A / AL-111-2387)**

Follow the sequence given below for heating of specific grades of Steel in the PUSHER type furnace.

- Heat the furnace and set the temperature 1050°C. After reaching the temperature 1050°C, push the cut billets in furnace.
- Raise the furnace temperature to 1100°C and push the cut billets after 20 minutes in furnace.
- Raise the furnace temperature to 1150°C and push the cut billets after 20 minutes in furnace.
- Raise the furnace temperature to 1200°C and push the cut billets after 20 minutes in furnace.
- Raise the furnace temperature to 1250 - 1280°C and push the cut billets after 20 minutes in furnace.
- Push the cut billets after every 30 minutes.
- Start the forging after soaking complete.

 <b>WESTERN</b> HEAT & FORGE	<b>Annexure 1 for Special Purpose Steel Forging</b>	Document No.	30-WI-PR-14 Annex 1
		Rev. No. & Rev. Date	00/01.03.2022
		<b>MASTER COPY</b>	

- Billet temperature should be 1180 – 1200°C.
- Ensure finishing temperature of forging is never below 870°C.
- Wait every time 20 Minutes for soaking. Its mandatory.
- Record the soaking time in log book.
- After forging is completed, cool the forgings to be slow cooled.

**D) Material Grade: Precipitation Hardened Stainless Steel (ASTM A630 17-4 PH, 15-5 PH)**

Follow the sequence given below for heating of specific grades of Steel in the PUSHER type furnace.

- Parts Heat the furnace and set the temperature 1050°C. After reaching the temperature 1050°C, push the cut billets in furnace.
- Raise the furnace temperature to 1100°C and push the cut billets after 20 minutes in furnace.
- Raise the furnace temperature to 1150°C and push the cut billets after 20 minutes in furnace.
- Raise the furnace temperature to 1200°C and push the cut billets after 20 minutes in furnace.
- Push the cut billets after every 30 minutes.
- Start the forging after soaking complete.
- Billet temperature should be 1180 – 1200°C.
- Ensure finishing temperature of forging is never below 870°C.
- Wait every time 20 Minutes for soaking. Its mandatory.
- Record the soaking time in log book.
- After forging is completed, cool the forgings to be slow cooled.



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### E) Material Grade: Precipitation Hardened Stainless Steel (AISI 303, SS303)

Follow the sequence given below for heating of specific grades of Steel in the INDUCTION type furnace.

- Grind all cut billets from both side sharp corners. Load the cut billets on conveyor
- Billet temperature should be 1180 – 1200°C.
- After forging, keep the parts in box furnace back door at 1050 – 1100° for 4 - 5 minutes heating and then trim the parts.
- Ensure finishing temperature of forging is never below 940°C.
- After trimming, parts to be added in water.
- Change water after every 100 Nos. forging.
- After every one hour, 10 Nos. cold forgings to be added in acid for pickling. Check for cracks if any. If crack observed, then intimate to supervisor for next action.
- Record the soaking time in log book.

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