WESTERN HEAT & FORGE	Work Instruction For Heating & Soak Time	MASTER COPY	Document No.:	30-WI-PR-14
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Pusher Type Furnace

Guideline for soaking of all material grades other than Stainless Steel in pusher furnace

Sr. No.	Section in (Round/ Square in mm)	Soaking Instruction
1	Up to 75 RCS	Produce 100 to 150 nos & wait for soak for 5 to 10 min
2	100	Produce 80 to 125 nos & wait for soak for 10 to 15 min
3	125	Produce 60 to 90 nos & wait for soak for 15 to 20 min
4	160	Produce 40 to 75 nos & wait for soak for 20 to 25 min

Box type Furnace

1) Rapid heating should never be done to avoid internal cracks i.e. Klink.
2) Start forging as soon as temperature is achieved.
3) Finished forgings to be slow cooled either in empty furnace or by some other method.
4) Temperature measurement and recording during preheating, forging process & at finishing by pyrometer is recommended.
5) Record Furnace temperature also along with Billet temperature at exit and billet temperature at finishing stage at pre-decided intervals.

General instructions to follow-

1) Heat the furnace to a+G8:M12pprox. 600°C minimum if furnace is idle for long time before loading the billets.
2) Allow the billets to Pre heat in the range of 650 to 925°C as per the below guidelines
(A)75 RCS----650 ° C (B) 90 RCS----750 ° C (C)122 RCS----850 ° C
(D) >122RCS---925 ° C
3) As a onetime exercise, establish that time taken to reach forging temperature from pre heat temperature for each grade is as per the table given below for each section.
Record this exercise for every furnace to be used for forging AISI 410 & Other stainless steel.
• For 75 Rcs ------- Minimum 2 Hrs • For 90 Rcs ------- Minimum 3 Hrs • For >122 Rcs------- Minimum 4 Hrs
• Rapid heating should never be done to avoid internal cracks i.e. Klink.
• Holding at forging temperature should be avoided. Start forging as soon as temperature is achieved.
• After Forging is complete, slow cool the parts to about 590 DegC, either by keeping in an insulating medium e.g. covered pallet from all sides or by temperature equalizing in a separate furnace.
• Air cooling / Forced cooling to be strictly avoided.
• Temperature measurement and recording during preheating, forging process & at finishing by pyrometer is recommended.
• Establish Furnace temperature at exit for easy monitoring to ensure the above recommended preheating and forging temperatures.
• Record Furnace temperature also along with Billet temperature at exit and billet temperature at finishing stage at pre-decided intervals.
• ***Please refer Annexure 1 in continuation of this work instruction for Special purpose steel heating & soaking process for forging.***

Sr. No.	Material Grades	Pre Heat Temperature ° C	First Soaking Time in Hours	Raise Furnace Temperatue ° C	Second Soaking Time in Hours	Raise Furnace Temperature to ° C	Third Soaking Time in Hours	Billet Heating Temperature Range ° C	Minimum Finish Forging Temp. ° C
A	AISI 316; AISI316L; AISI 304; AISI 304L	840	2	N.A.	N.A.	N.A.	N.A.	1040-1120	870
	AISI303	840	2	N.A.	N.A.	N.A.	N.A.	1040-1200	940
	M52 (1.4057)	840	1	1210	1	N.A.	N.A.	1040-1120	870
B	M50 (1.4462); Al-111-2377; Al-111-2387; Al-111-2398,ASTM A182F51	680	2	840	1	1200	1	1100-1200	970
C	AISI 410 ODF-125 to 340RCS / 360Round	680-700	4-5	840	4	N.A.	N.A.	1095-1205	870
	F6NM							900-1150	

Sr. No.	Material Grades	Pre Heat Temperature ° C	First Soaking Time in Hours	Raise Furnace Temperature ° C	Second Soaking Time in Hours	Furnace Temperature ° C	Billet Heating Temperature Range ° C	Minimum Finish Forging Temp. ° C
A	ASTM A 182 F22	680	1	840	2	1140	1040-1120	1120
B	F6NM	680	1	1205	Soak As per above guidelines	1170	900-1150	1150
C	AISI 316/AISI316L/ AISI 304/ AISI 304L	***Please refer Annexure 1 section A***						
D	***1.4462 / Al-111-2377 / AL-111-2398 / F51***	***Please refer Annexure 1 section B***						
E	AISI 410 / ***AISI 420 / AISI 431 / 1.4418 / 1.4057 / UNS S41000 / X12Cr13 / X12Cr13+A / AL-111-2387***	***Please refer Annexure 1 section C***						
F	ASTM A630 17-4 PH/ ***15-5 PH***	***Please refer Annexure 1 section D***						
	AISI 303/ ***SS303***	***Please refer Annexure 1 section E***						

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