

 WESTERN HEAT & FORGE	Work Procedure for Heat Treatment of Closed Die Forgings	Doc. No.	20-IWP-HT-02
		Rev. No. & Rev. Date	01/10.08.2019
		MASTER COPY	

Reference Standards: ISO 9001:2015 / IATF 16949:2016, API Q1 9th Edition. API 20B, API 20C, PED 2014/68/EU Annex-1 Clause 4.3

Purpose : To establish Heat Treatment process and heat treat close die forgings so as to meet end product requirement

Scope : *Applicable to all activities related to heat treatment of close die forgings.*

Activity Flow	Input	Activity / Process Description	Output	Responsibility
Receipt of Material duly identified at designated place.	Route Card & Material Identified as per 30-WI-PR-19	Shall verify that incoming material is duly identified with duly filled tag at waiting for heat treatment area. Shall coordinate with previous process owner in case of non-compliance in identification & tagging.	Identified Material at allotted Place	HT Supervisor
HT Planning	Dully Filled Route card 40-DF-MQC-02 / 40-DF-MQC-04 from previous process and Delivery Schedule,	Shall decide daily heat treatment planning in consultation with PPC & Marketing after reviewing availability of parts & equipment so as to optimize furnace utilization considering Ex-works delivery date. Shall do H.T. planning in Furnace Schedule Register.	Daily production plan 40-DF-HT-09	HT Supervisor/Head H.T.
Selection of QTC/Test piece	Route Card 40-DF-MQC-02 / 40-DF-MQC-04	Shall take a separate QTC/Test piece as per Route card and heat-treat along with parts. Shall use Sacrificial part for testing for all Customers if heat treatment is done in Continuous Heat Treatment Furnace.	Daily production plan 40-DF-HT-09 HT Charging Sheet 40-DF-HT-03	HT Supervisor
Calibration of Equipment	Calibration Status with visual display on equipment	Shall ensure that all furnaces, temperature controllers, recorders and thermocouples, Hardness Testers are calibrated and calibration status is displayed on each instruments/equipment.	Calibrated equipment	HT Supervisor/Head HT
Quench Tank cleaning	Tank cleaning schedule as displayed on tank.	Shall ensure Cleaning of Tanks as per Work Instruction no. 30-WI-HT-01.	Cleaned Tank	Head HT/HT Supervisor
Quench tank Contamination check	Contamination limit / 30-WI-HT-02.	Shall ensure checking of Quenchant for Contamination as per Work Instruction no. 30-WI-HT-02.	Contamination within limit	Head HT/HT Supervisor

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Furnace Loading	Route card & Standard Process Sheet.	<p>Shall load parts in furnace as specified in SPS. Follow controls as specified in Route card & SPS.</p> <p>Record actual process results on Route Card & Charging book/ Charging sheet.</p> <p>Shall ensure that QTC /Test piece (if required) is quenched along with parts.</p> <p>Shall coordinate with forge QA to take a scrap part for metallurgical analysis.</p>	<p>CDF charging book 40-DF-HT-08 / Charging sheet 40-DF-HT-03 and Route card with relevant details.</p>	Head HT/HT Supervisor
Hardening & Tempering / Normalizing / Annealing / Solution annealing / ISO Annealing	<p>Heat Treatment Guidelines 30-WS-HT-01</p> <p>Standard Process Sheet 40-DF-HT-09</p> <p>Route Card</p> <p>Furnace Operation work instruction 30-WI-HT-09, 30-WI-HT-11,</p>	<p>Shall follow Heat Treatment Guidelines as per SPS to achieve hardness & other metallurgical requirement so as to meet ex works delivery date given in Route card as per 30-WI-HT-09. 30-WI-HT-11 and Heat Treatment Guidelines 30-WS-HT-01.</p> <p>Shall enter appropriate details in Route Card and record actual process parameters in CDF charging book & charging sheet</p> <p>For hardened & tempered jobs, Pick 5 jobs from 1st tray of tempered jobs to verify hardness and adjust tempering temperature if required .</p>	<p>Heat Treatment Charging sheet 40-DF-HT-01 for batch furnace</p> <p>charging book 40-DF-HT-04 for CHTF</p> <p>HT Ok material as per plan.</p>	Head HT/HT Supervisor
Hardness Checking	Standard Process Sheet and Route Card	<p>Shall carry out 100 %Hardness or Sample Hardness (10 %) at designated location(s) as per SPS. In case of any doubt consult with supervisor.</p> <p>Shall record hardness in Register 40-DF-HT-02& mention hardness range with quantity disposition in Route Card.</p> <p>Shall identify parts suitably as per 30-WI-PR-19</p>	Hardness as per specifications	HT Supervisor/Hardness Supervisor

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QTC / Test piece handover to Lab for testing	Daily production plan 40-DF-HT-09 HT Charging Sheet 40-DF-HT-01	Shall handover heat-treated QTC / Test piece to MQC Lab duly identified with by Die No., Material Grade, Heat No & HT Lot No along with hardness inspection report after hardness checking.	Route Card	
Review of Non-Conformance	Internal Quality Fall Out (HT)	Shall review and analyze Internal Quality Fall Out (HT) and prepare action plan. Keep non-conforming parts duly identified with NC Tags at a designated place as per 30-WI-PR-19	Internal Quality Fall out HTReport40-DF-HT-03at designated place,	
Rework of NC parts.	Rework HT Process Sheet / action plan	Shall plan rework actions and execute.	Rework actions plan on 40-DF-HT-03.	
Re-Inspection After Rework	Non-Conformance Report	Shall carry out hardness check on 100% parts at specified location and record in 40-DF-HT-05 Shall dispose the fallout after rework suitably.	Hardness register40-DF-HT-05	
Validation & Revalidation	Validation & Revalidation frequency & HT Guidelines	HT process to be validated & revalidated as per HT 30-WS-HT-01 & 30-WI-HT-06. Record observation in 40-DF-HT-07	Validation Record 40-DF-HT-07, validated Process	
Communication	Works Standard for communication 30-WS-MR-01	Shall ensure to communicate relevant information internally & externally as and when required.	Display , Emails , MOM etc	Head HT
Work Environment	Work Standard for Maintaining Work Environment (20-WS-HR-01)	Shall maintain good housekeeping , Clean & Safe Work Environment needed to achieve conformity applicable to the manufacturing of the product.	Clean & Safe Work Environment	Dept HOD

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Reference Documents: -

Sr. No.	Document Description	Document No.
01	Work Instruction for Cleaning of Oil and Water Tanks	30-WI-HT-01
02	Work Instruction for Checking Oil Contamination	30-WI-HT-02
03	Work Instruction for Hardness Testing by King's Tester	30-WI-HT-03
04	Work Instruction For Calculating Soaking Time For Continuous Furnace	30-WI-HT-04
05	Work Instruction For Hardness Testing Location.	30-WI-HT-05
06	Work Instruction for Process Validation-HT	30-WI-HT-06
07	Work Instruction For Continuous Furnace Operation.	30-WI-HT-09
08	Work Instruction For Batch Type Furnace	30-WI-HT-11
09	Work Instruction For Brinell Hardness Tester	30-WI-HT-13
10	Work Instruction for Deep Throat Brinell Hardness Tester	30-WI-HT-14
11	Work Instruction for Deep throat Brinell hardness tester with inbuilt measurement system	30-WI-HT-15
12	Rework Work Instructions	30-WI-HT-16
13	Work Standard For Qualification and requalification of API 20B & 20 C as per FSL levels	30-WS-MQC-01
14	Work Standard For Heat Treatment Guideline.	30-WS-HT-01
15	Works Standard for communication	30-WS-MR-01

Quality Records

Sr.No.	Document	Document No	Retention For	Maintained By
01	Route card ODF	40-DF-MQC-04	10 Years	HT Production
02	HT charging sheet	40-DF-HT-01	10 Years	
03	Hardness register	40-DF-HT-02	10 Years	
04	Internal Quality Fall out HT & Reinspection Report	40-DF-HT-03	10Years	
05	Heat Treatment Charging Book- Tempering Furnace	40-DF-HT-04	10 Years	
06	Heat Treatment Process sheet	40-DF-HT-05	10 Years	

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07	Heat Treatment Charging Book-Hardening Furnace	40-DF-HT-06	10 Years	
08	Process Validation Report(HT)	40-DF-HT-07	10 Years	
09	Hardness Test Report	40-DF-HT-08	10 Years	
10	Daily production plan	40-DF-HT-09	10 Years	

PREPARED BY. Head HT	APPROVED BY. Mangement Representative