FAILURE MODE AND EFFECTS ANALYSIS (PROCESS FMEA)

SSB ENGINEERS PVT. LTD.

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Rev. - 0

Part Name	**PLANTERY GEAR**	**Key Contact/No.-**	**Vinod Kuntal / 09829218488**
Part No.	**4475_480_053_DES001** **Drawing rev. no. - None (….)**	**PFMEA Rev. No. / Date : 04/27.06.2024**	**Core Team - CHANDAN JANGID, LOKESH JANGID,BIRESH KUMAR,SATISH KUMAR,AMIT SHARMA, DEVENDRA**
Customer	**ZF India** **PART Rev. No. :- None (….)**	**Date (Original)**	**05.11.2022**

Op. No.	Process / Function Description	Requirements	Potential Failure Mode	Potential Effect(s) of failure	SEV	CLASS	Potential cause Mechanism(s) of Failure	OCC	Current Process Controls Prevention	Current Process Controls Detection	DET	RPN	Recommended Action(s)	Responsibility & Target completion date	Action taken	SEV	OCC	DET
10	Raw Material (Bar) Receipt	Qty. as per challan	Not as per challan	Challan closing problem	4	PR I 3	-Wrong documentation done by customer	2	Weighing at Supplier end	Incoming inspection	5	40	None					
	Receipt Inspection of Raw Material	Rod Diameter	Oversize	Next Process-Setting problem & variation in cutting process Assembly Operation:-nil Customer Operation:-nil Vehicle Operation:-nil	8		-Wrong grade material supplied by customer -Wrong color coding	1	Inspection by Supplier	Incoming inspection	8	64	None					
			Undersize	Next Process-Setting problem & variation in cutting process Assembly Operation:-nil Customer Operation:-nil Vehicle Operation:-nil	8		-Wrong grade material supplied by customer -Wrong color coding	1	Inspection by Supplier	Incoming inspection	8	64	None					
		Chemical Composition	Wrong Chemistry	Next Process-tool life Isue Assembly Operation:-nil Customer Operation:-nil Vehicle Operation:-Part Failure	8		-Wrong grade material supplied by Supplier -Wrong color coding	1	Inspection by Supplier	Incoming inspection	8	64	None					
		Grain Size	Not up to Mark 5 & finer As per ZFN 5016 (ZF 15-53)	Next - nil Assembly Operation:-nil Customer Operation:-nil Vehicle Operation:-Part Failure before its self life	8		Incoming source varitation	1	Controlled by steel supplier	incoming inspection As per ZFN 5016 (ZF 15-53)	8	64	None					
20	Billet Cutting	Rod Diameter	Oversize	Next Process-Setting problem & variation in cutting process Assembly Operation:-nil Customer Operation:-nil Vehicle Operation:-nil	3		-Wrong grade material supplied by customer -Wrong color coding	2	Inspection by customer	Incoming inspection	6	36	None					
			Undersize	Next Process-Setting problem & variation in cutting process Assembly Operation:-nil Customer Operation:-nil Vehicle Operation:-nil	2		-Wrong grade material supplied by customer -Wrong color coding	2	Inspection by customer	Incoming inspection	6	24	None					
		Billet Weight	More	Next Process-extra flashes in forging Assembly Operation:-nil Customer Operation:-nil Vehicle Operation:-nil	5		-Stopper disturbed - Rod dia oversize	2	Set-up Approval	In-process Inspection	6	60	None					
			Less	Next Process-unfilling Assembly Operation:-nil Customer Operation:-nil Vehicle Operation:-nil	7		-Stopper disturbed - Rod not touch with stopper -Rod dia less	2	Set-up Approval	In-process Inspection	5	70	None					
30	Bar Heating	Temperature	More	Forging process & microstructure problem	5		-Voltage Variation -Ampere Variation -Input parameter not controlled	2	Set-up Approval	In-process Inspection	6	60	None					
			Less	Forging process & microstructure problem	5		-Voltage Variation -Ampere Variation -Input parameter not controlled	2	Set-up Approval	In-process Inspection	6	60						
		Outer Dia 104.40 ± 0.5mm	Oversize	Next Process-less tool life Assy-nil Cust-nil Veh-nil	5		-Tool expansion due to production -Measuring Instrument with out calibration	2	Set-up Approval	In-process Inspection	6	60	None					
			Undersize	Next Process-unclean problem Assy-nil Cust-nil Veh-nil	6		-Tool size not as per tool drawing -Measuring Instrument with out calibration	2	Tool inspection before use & Set-up Approval	In-process Inspection	6	72	None					

40	Hot Forging (NHF-1000 Ton)	Total Thickness 48.0± 0.5mm	Oversize	Next Process-less tool life Assy-nil Cust-nil Veh-nil	5		-Tool expansion due to production -Holder & Sowblock Taper Problem -Measuring Instrument with out calibration	2	Set-up Approval	In-process Inspection	6	60	None					
			Undersize	Next Process-unclean problem Assy-nil Cust-nil Veh-nil	6		-Tool size not as per tool drawing - Holder & Sowblock Taper Problem - Measuring Instrument with out calibration	2	Tool inspection before use & Set-up Approval	In-process Inspection	6	72	None					
		Bore 68.8 ± 0.5mm	Oversize	Next Process-less tool life Assy-nil Cust-nil Veh-nil	5		-Tool expansion due to production -Holder & Sowblock Taper Problem -Measuring Instrument with out calibration	2	Set-up Approval	In-process Inspection	6	60	None					
			Undersize	Next Process-unclean problem Assy-nil Cust-nil Veh-nil	6		-Tool size not as per tool drawing - Holder & Sowblock Taper Problem - Measuring Instrument with out calibration	2	Tool inspection before use & Set-up Approval	In-process Inspection	6	72	None					
		Radius	Oversize / Undersize	Next Process-unclean problem, less tool life Assy-nil Cust-nil Veh-nil	4		-Tool size not as per tool drawing	2	Tool inspection before use & Set-up Approval	In-process Inspection	6	48	None					
		Mismatch	Oversize	Next Process-unclean problem, less tool life Assy-nil Cust-nil Veh-nil	7		-Tool size not as per tool drawing - Dies & Holder not properly setting - Piller key not properly setting	2	Tool inspection before use & Set-up Approval	In-process Inspection	6	84	None					
		No pit marks scales	Pit marks scales observed	Next Process-unclean problem, less tool life Assy-nil Cust-nil Veh-nil	5		-Heating process parameters not maintained - Air blower not directed properly on dies	2	Set-up Approval	In-process Inspection	7	70	None					
		No cracks	Cracks observed	Next Process-nil Assy-nil Cust-dissatisfaction Veh-nil	7		-Upsetting size not as per specification - Tooling size not properly	2	Set-up Approval	In-process Inspection	6	84	None					
		No other harmful defects like blow holes	Cracks observed	Next Process-unclean problem, less tool life Assy-nil Cust-nil Veh-nil	5		-Heating process parameters not maintained - Air blower not directed properly on dies	2	Set-up Approval	In-process Inspection	7	70	None					
		Grain Flow	Cracks will be form mechanical properties will change	Next - nil Assy-nil Cust-nil Veh-Part Failure before its self life	7		-Tool size not as per tool drawing - Reduction ratio - High Temp. - Tool & Die Design - L and D ratio	2	Grain Flow report Inspection As per ASTM A983	Inspection As per ASTM A983	7	98	None					
		Grain Size	1. Not up to Mark 5 & finer As per ZFN 5016 (ZF 15-53)	Next - nil Assy-nil Cust-nil Veh-Part Failure before its self life	7		Forging temp. not follow as per std. ZF 15-53. After forging forged material cooling not uniformly.	2	Forging temp. mainted as per std. ZF 15-53. after forging material store properly from uniform cooling.	inspection As per ZFN 5016 (ZF 15-53)	6	84	None					
		Pre-Heat Zone Temp.	More	Hardness Problem & microstructure problem	5		-Heat not controlled by operator	2	Set-up Approval	In-process Inspection	5	50	None					
			Less	Hardness Problem & microstructure problem	6		-Heat not controlled by operator	2	Set-up Approval	In-process Inspection	5	60	None					
		Soak Zone Temp. 1st	More	Hardness Problem & microstructure problem	5		-Soaking time not followed by operator	2	Set-up Approval	In-process Inspection	5	50	None					
			Less	Hardness Problem & microstructure problem	6		-Soaking time not followed by operator	2	Set-up Approval	In-process Inspection	5	60	None					
		Tray Push Time	More	Hardness Problem & microstructure problem	5		Operator not following the standards.	2	Set-up Approval	In-process Inspection	5	50	None					
			Less	Hardness Problem & microstructure problem	6		Operator not following the standards.	2	Set-up Approval	In-process Inspection	5	60	None					
		Cooling Method (fast Air Blower Colling Time)	More	Hardness Problem & microstructure problem	6		Head exchanger not working Proper.	2	Set-up Approval	In-process Inspection	7	84	None					
			Less	Hardness Problem & microstructure problem	7		Head exchanger not working Proper.	2	Set-up Approval	In-process Inspection	7	98	None					
		ISO Zone Temp.	More	Hardness Problem & microstructure problem	5		-Soaking time not followed by operator	2	Set-up Approval	In-process Inspection	5	50	None					
			Less	Hardness Problem & microstructure problem	5		-Soaking time not followed by operator	2	Set-up Approval	In-process Inspection	5	50	None					

50	ISO thermal Annealing	Hardness	Higher Side / Lower Side	Next Process-nil Assy-nil Cust-dissatisfaction Veh-early failure	8		-Material loading quantity lass/more - Low/High temperature of furnace -Tray Push Time - Cooling Time	1	Process validation at Heat Treatment Service provider's end	Incoming inspection	8	64	None					
		Microstructure	ununiform distribution of pearlite & ferrite	Next Process-nil Assy-nil Cust-dissatisfaction Veh-early failure	8		-Material loading quantity lass/more - Low/High temperature of furnace -Tray Push Time - Cooling Time	1	Process validation at Heat Treatment Service provider's end	Incoming inspection	8	64	None					
		Grain Size	1. Not up to Mark 5 & finer As per ZFN 5016 (ZF 15-53)	Next - nil Assy-nil Cust-nil Veh-Part Failure before its self life	7		Austinate temp. not follow as per std. ZF 15-53.	2	Austinate temp. mainted as per std. ZF 15-53.	inspection As per ZFN 5016 (ZF 15-53)	8	112	1. Grain size should add-on 2. Considered improvements as suggest by ZF 2A. Material handling after forging 2B. Increase the temp. of austenite furnace	Lokesh Jangid	Occurrence 1. Improved the method of part handling/storage after forging , part will be store separately for natural and independently cooling i.e. cooldown the parts independently upto reach 400º / 500º C after forging. 2. During ISO annealing Increase the temp. of austenite furnace from 940°C to 955°±5°c Detection - developed the inhouse facility to Sample preparation and measuring of Grain size. Gain size will be checked after every stage as per zfn5016 A. RM stage B. After forging C. After ISO annealing	7	2	6
60	Shot blasting	Materail Should be Scalling Free	Scalling Remain After SB process	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N) Nil O.S:-(N) Nil V.O:-(N) part may be Fail During Operation C.U:-(Y) may reject at customer end L.R:-(N) NIL	6		1. m/c fault 2. Shot Size not as per Required/standard. 3. Hanger not Rotating 3. SB Timing Not As per Required/standard.	2	Preventive Maintenance Plan , Daily M/C Check Sheet	Visually Check the Shot blasted Pieces	7	84	None					
70	Pre Machining	Outer Dia 102.4 ± 0.2mm	Oversize	Next Process-less tool life Assy-nil Cust-nil Veh-nil Sub Ope - nil Ope Saf. - nil Leg Req. - nil	6		-Tool expansion due to production -Measuring Instrument with out calibration	2	Set-up Approval	In-process Inspection	6	72	None					
			Undersize	Next Process-unclean Assy-nil Cust-nil Veh-nil Sub Ope - nil Ope Saf. - nil Leg Req. - nil	6		-Tool size not as per tool drawing -Measuring Instrument with out calibration	2	Tool inspection before use & Set-up Approval	In-process Inspection	6	72	None					
		Total Thickness 46.00±0.2mm	Oversize	Next Process-less tool life Assy-nil Cust-nil Veh-nil Sub Ope - nil Ope Saf. - nil Leg Req. - nil	6		-Tool expansion due to production -Holder & Sowblock Taper Problem -Measuring Instrument with out calibration	2	Set-up Approval	In-process Inspection	6	72	None					
			Undersize	Next Process-unclean Assy-nil Cust-nil Veh-nil Sub Ope - nil Ope Saf. - nil Leg Req. - nil	6		-Tool size not as per tool drawing - Holder & Sowblock Taper Problem - Measuring Instrument with out calibration	2	Tool inspection before use & Set-up Approval	In-process Inspection	6	72	None					
		Bore	Oversize	Next Process-unclean Assy-nil Cust-nil Veh-nil Sub Ope - nil Ope Saf. - nil Leg Req. - nil	6		-Tool expansion due to production -Holder & Sowblock Taper Problem -Measuring Instrument with out calibration	2	Set-up Approval	In-process Inspection	6	72	None					

		70.8 ± 0.2mm	Undersize	Next Process-less tool life Assy-nil Cust-nil Veh-nil Sub Ope - nil Ope Saf. - nil Leg Req. - nil	6		-Tool size not as per tool drawing - Holder & Sowblock Taper Problem - Measuring Instrument with out calibration	2	Tool inspection before use & Set-up Approval	In-process Inspection	6	72	None					
80	1st CNC Setup	1. OD (Ø101.4 -0.1mm)	Over size Under Size Wrong Offset	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	6		Insert wear , Wrong Insert	3	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	5	90	None					
		9. OD Chamfer (K0.6 +1.0)	Over size / Under Size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	5		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	6	60	None					
		14. ID Chamfer angle (45°±5°)	Over size / Under Size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	5		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	6	60	None					
		17. ID Chamfer width (3.0 +0.5mm)	Over size / Under Size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	5		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	6	60	None					
		29. Unspecified chamfer (K0.3 max) (N/A in this Part)	–	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL			Insert wear , Wrong Insert		Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection		0	None					
		30. Unspecified radius (R0.3 max) (N/A in this Part)	–	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL			Insert wear , Wrong Insert		Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection		0	None					
		1. OD (Ø101.4 -0.1mm)	Over size Under Size Wrong Offset	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	6		Insert wear , Wrong Insert	3	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	5	90	None					
		2. Radial Runout (0.03)	Over size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	6		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	6	72	None					
		3. ID (Ø72.3±0.05mm)	Over size Under Size Wrong Offset	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	5		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	5	50	None					
		4. ID Chamfer angle (45°±5°)	Over size / Under Size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	5		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	6	60	None					

		5. Height (8.0mm max)	Over size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	6		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	6	72	None					
		6. Total Height (45.0 -0.4mm)	Over size Under Size Wrong Offset	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	6		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	5	60	None					
		7. Face Runout (0.02)	Over size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	7	PR | 1	Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection Process Capibility (SPC)	6	84	Add pusher in CNC	Satish Kumar Date - 25.03.2024	Pusher has been added in CNC to ansure the proper butting	7	2	4
		8. Face Runout (0.04)	Over size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	6		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	6	72	None					
		10. OD Chamfer (K0.6 +1.0)	Over size / Under Size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	5		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	6	60	None					
		11. Groove Height (21.425±0.1mm)	Over size Under Size Wrong Offset	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	6		Insert wear , Wrong Insert	3	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	5	90	None					
		13. ID (Ø72.3±0.05mm)	Over size Under Size Wrong Offset	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	5		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	5	50	None					
		15. Height (8.0mm max)	Over size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	5		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	6	60	None					
90	2nd CNC Setup	16. Bore (Ø71.8 H7)	Over size Under Size Wrong Offset	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	7	PR | 2	Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection Process Capibility (SPC)	5	70	None					
		18. ID Chamfer width (3.0 +0.5mm)	Over size / Under Size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	5		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	6	60	None					
		19. Groove Dia. (Ø73.9±0.05mm)	Over size Under Size Wrong Offset	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	6		Insert wear , Wrong Insert	3	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	5	90	None					

		20. Groove width (2.22±0.05mm)	Over size / Under Size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	6		Insert wear , Wrong Insert	3	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	5	90	None					
		21. Angle (3° max)	Over size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	6		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	6	72	None					
		22. Angle (3° max)	Over size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	6		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	6	72	None					
		23. Groove chamfer (K0.35±0.1)	Over size / Under Size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	5		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	6	60	None					
		24. Groove chamfer (K0.35±0.1)	Over size / Under Size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	6		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	6	72	None					
		25. Groove radius (R0.2 max)	Over size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	5		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	6	60	None					
		26. Groove radius (R0.2 max)	Over size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	5		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	6	60	None					
		27. Roughness (Rz 25)	Over size	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL	6		Insert wear , Wrong Insert	2	Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection	6	72	None					
		29. Unspecified chamfer (R0.3 max) (N/A in this Part)	_	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL			Insert wear , Wrong Insert		Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection		0						
		30. Unspecified radius (R0.3 max) (N/A in this Part)	_	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N)Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Fitment May Effect L.R:-(N) NIL			Insert wear , Wrong Insert		Insert Life Monitoring , Insert Verification Before Issue	Set-up approval, Inprocess Inspection & patrol Inspection		0						
100	Marking	Identification Code	Wrong Marking	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N) Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) Identification may L.R:-(N) NIL	4		No proper instruction	3	Folow up of Final Inspection plan/marking insrtuction	Setting Approval	7	84						
				N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N) Nil			1. m/c fault			Master test specimen to								

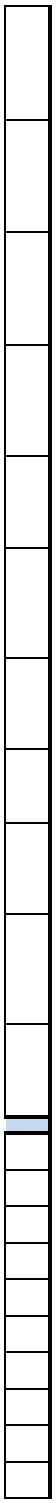
110	MPI	Materail Should be Crack free	cracks not identified	O.S:-(N) Nil V.O:-(N) part may be Fail During Operation C.U:-(Y) may reject at customer L.R:-(N) NIL	7		2. concentration of chemical using for magna flux not as per standard.	2	Annual calibration of m/c	Master test specimen to verify the machine capability before use.	5	70	None					
120	Final Inspection	Measurement should be done accurately	Inaccurate measurements	Non-conforming material will may pass	7		-Untrained inspector Measurement Error Equipment not calibrated	2	-Training - MSA study - Calibration plan	-Calibration status check before use	6	84						
130	100% Visual Insp.	Visual Parameters	Not proper	N.O:- (N) Nil ASSY.:-(N) Nil S.O:-(N) Nil O.S:-(N) Nil V.O:-(N) Nil C.U:-(Y) may reject at customer L.R:-(N) NIL	5		No proper instruction	2	Folow up of Final Inspection plan	Identification & inspection Status tag verification	8	80						
140	Antirust Oil Application	Antirust oil should be applied on full surface	Antirust oil notapplied on full surface	Material will get rusty resulting in poor appearance	5		-Untrained executive -Executive negligence	2	-Training	-100% visual inspection in final inspection	7	70						
150	Packing	Packing as per customer norms & requirements Fixed Qty in each bag	Packing in hazardous manner No. of Pcs. in bag more or less	Damage would not allow part to get assembled Material will not accept at customer end	6		Packing by unskilled person No packing standard	2	Skilled person for packing Qty in each bag is fixed	Visual check -	7	84						
160	Pre-Dispatch Inspection	Measurement should be done accurately	Inaccurate measurements	Non-conforming material will may pass	7		-Untrained inspector Measurement Error Equipment not calibrated	2	-Training - MSA study - Calibration plan	-Calibration status check before use	6	84						
170	Dispatch	-Safe loading of bins into container - Safe receipt of parts at	Damage to the parts due to mishandling	Parts will damage and will not assembled	6		Heavier material on bins during transit	2	-	Feed-back from customer after receipt of consignment	6	72						

Legends:	PR	**<IC>=**Important/Significant Characteristics as per Drawings		**O.S**:- Operator Safety			**C.U**:- Customer Uses		**Assy**.:-Assembly	Prepared By:
	N.O:- Next Operation		**S.O**:-Subsequent Operation	**V.O**:- Vehichle Operation			**L.R**:- Legal Requirement			Sonu Jangid

Amendment History			
Rev. No.	**Rev. Date**		**Revision Description**
1	**20.08.23**	**50 & 40**	**Grain Size Checking frequency revised, Increase the temp. of austenite furnace from 940°C to 955°±5 during ISO annealing against issue received in initial lot related to grain size.**
2	**03.05.2024**	**All**	**Revised againest ZF observation (Mr. Chockklingam)**
3	**14.05.2024**	**Multiple**	**All visual specification detection changed to 7 or 8, Final inspection and Pre despatch Inspection Seperated**
4	**27.06.2024**	**All**	**MPI Process shifted after marking**

Lessons Learnt

S.No.	Problem	Corrective Action / ActionTaken	Corrective Action / ActionTaken	Lessons Learnt	Department
1	Grain Size not Observed as per ZFN5016 (Not up to Mark 5 & finer)	**Occurrence** 1. Improved the method of part handling/storage after forging , part will be store separately for natural and independently cooling i.e. cooldown the parts independently upto reach 400º / 500º C after forging. 2. During ISO annealing Increase the temp. of austenite furnace from 940°C to 955°±5°c	**Detection -** **developed the inhouse facility to Sample preparation and measuring of Grain size.** Gain size will be checked after every stage as per zfn5016 A. RM stage B. After forging C. After ISO annealing	Grain Size inspection was a new topic for SSB , No in-house facility available to check the same , For inspection the grain size SSB was depended on RM Supplier , its a time taking process also SSB Was not 100% confident about the result provided by them. Now SSB developed the inhouse facility and team for Sample preparation and measurement of Grain size.	Met Lab.



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