VE COMMERCIAL VEHICLES LIMITED.
(UNIT : EICHER ENGINEERING COMPONENTS; DEWAS)

CONTROL PLAN

PREV. OPN.	NEXT. OPN.	SURFACE FINISH :	DOC. NO. :
070 - PRE. HT. INSPECTION	090 - TEETH CHAMFERING		APO4 : 160 : 20 REV- 01 (DATE- 05.10.17)

CONTROL PLAN NO : *3257 / 080*

KEY CONTACT PERSON :- SSK

CORE TEAM :- ALM, SK, SRS, SNP, IDS, MM, RK

REVISION: A1 | B | C | D | E | F

EFF DATE	07.12.17	EFF DATE		EFF DATE	
PROTOTYPE	✓	PRELAUNCH		PRODN	
O.E.		EXPORT	✓		

LOCATION → | REST →→ | CLAMP — N → | SPL.CHAR. (CRITICAL DIMN.) | B EECD | CUSTOMER.

PART NO. ***ED 3257*** (341-2037 / REV.-02)

PART NAME: GEAR - OUTPUT — OPN. NO. ***080***

CUSTOMER: CATERPILLAR

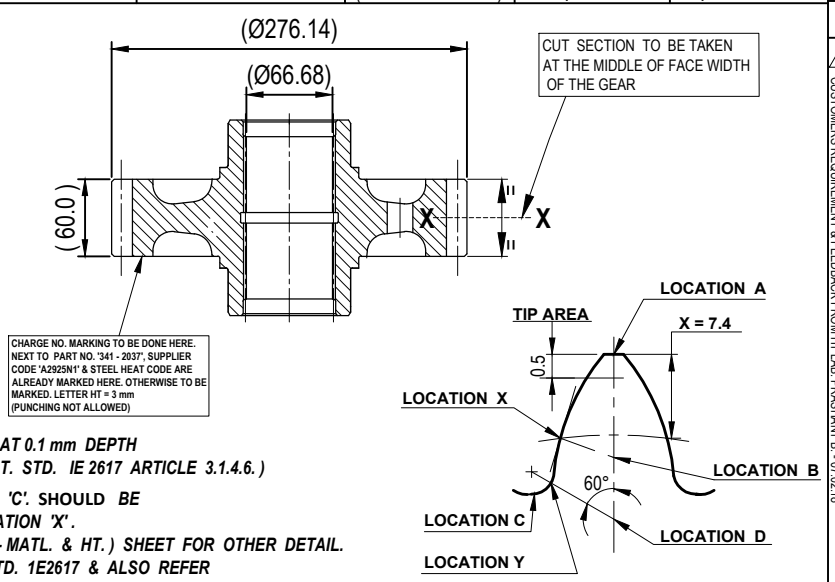
OPERATION: ✱ ***HEAT - TREATMENT***

CELL [OPTIONAL]	M./C.	M / C NO. (OPTIONAL)
	S.Q.F. - 3 & 6	

FIXTURE.	FIX. NO.	TOOL	NO.
H.T. FIXTURE ASSLY. (WT 61.76 Kg.) APPROX.			
BASE TRAY	*G. 065 - 001*		
GROOVED PLATES	*G. 065 - 003*		
HORIZONTAL RODS, VERTICAL RODS & SLEEVES			

MATERIAL - : 1E1120A
Comp. Wt. = 22.947 Kg.

✱ **HEAT-TREATMENT- :**
MARKING ;
PRE-WASHING ;
PRE-HEATING ;
CARBURISING ;
HARDENING ;
POST-WASHING ;
TEMPERING ;
DEGREASING ;
SHOT BLASTING ;



SECTION 'XX'

NOTE:

 # 1) HARDNESS TO BE MEASURED AT 0.1 mm DEPTH FORM LOCATION 'X' (REFER CAT. STD. IE 2617 ARTICLE 3.1.4.6.)

✡ 2) EFF. CASE DEPTH AT LOCATION 'C'. SHOULD BE Min. 60% OF Min. ECD. AT LOCATION 'X'.

3) REFER TECHNICAL REVIEW (TR - MATL. & HT.) SHEET FOR OTHER DETAIL.

4) FOR ECD REFER CUSTOMER STD. 1E2617 & ALSO REFER CUSTOMER STD. 1E2261 (FOR STOCK REMOVAL).

SR. NO.	CHARACTERISTICS: PRODUCT	CHARACTERISTICS: PROCESS	SPL CHAR CLASS	PRODUCT SPECIFICATIONS	EVALUATION MEASUREMENT TECHNIQUE: INSTRUMENT	NO.	SAMPLING: SIZE	FREQ	RESP.	CONTROL METHOD	CORRECTIVE ACTION / REACTION PLAN
1.	***AS QUENCHED HARDNESS***			***60 HRC MIN.***	*HARDNESS TESTER*	---	*1 PC*	*PER CHARGE*	INSP.	*TESTING*	*CHECK FURNACE SETTING DATA & CONFIRM .*
2.	***EFF. CASE DEPTH*** *AT 50 HRC. AT LOCATION 'X'* ***(SEE TOOTH VIEW FOR LOCATION)***			*PROCESS* 0.7 ~ 1.1 mm. (A1) *FINAL REQ.* 0.5 ~ 1.0 mm.	*MICRO-HARDNESS TESTER*	---	*1 PC*	*PER CHARGE*			
3.	***EFF. CASE DEPTH*** *AT LOCATION 'C'* ✡			***0.30 mm. MIN.***							
4.	***SURFACE HARDNESS*** #			***77 HR 30 MIN.***	*HARDNESS TESTER*	---	*1 PC*	*PER CHARGE*			
5.	*HARDNESS AT 1.0 mm DEPTH* ***AT LOCATION 'X'***			***30 MIN. HRC.***							
6.	*HARDNESS AT MID TOOTH* ***AT LOCATION 'B'***			***25 ~ 48 HRC.***							
7.	*CORE HARDNESS* ***AT LOCATION 'D'***			***48 HRC. Max.***							
8.	*MICROSTRUCTURE*			***AS PER CUSTOMER STD 1E2318*** ***ACCEPTABLE BAINITE AT - 0.02 MM DEPTH MAX.*** ***LOC. "X"*** ***B1*** ***LOC. "C"*** ***B7***	*MICROSCOPE*	---	*1 PC*	*PER CHARGE*			
9.	*SHOT BLAST*			*FREE FROM RUST & SCALE*	*VISUAL*	---	*100%*				

DRN BY	AMARDEEP		CHKD BY	R. PATHAK		APRD BY	B. LEVA	

PAGE 01 / 02

A1 LOADING PATTERN ADDED & ECD IN PROCESS 0.7~1.1 WAS 0.6~1.0 CHANGED AS PER CUSTOMERS REQUIREMENT & FEEDBACK FROM HT LAB. PRASHANT B. - 07.02.18

UNSPECIFIED TOLERANCES AS PER IS : 2102 (PART-1) : 1993 MEDIUM CLASS. | *ALL DIMENSIONS ARE IN MILLIMETERS.* | *DO NOT SCALE, IF IN DOUBT, PLEASE ASK.* | *BREAK SHARP CORNERS.*

VE COMMERCIAL VEHICLES LIMITED.
(UNIT : EICHER ENGINEERING COMPONENTS; DEWAS)

CONTROL PLAN

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CONTROL PLAN NO : *3257 / 080*

KEY CONTACT PERSON :- SSK

CORE TEAM :- ALM, SK, SRS, SNP, IDS, MM, RK

REVISION A B C

EFF DATE	07.12.17	EFF DATE		EFF DATE	
PROTOTYPE	✓	PRELAUNCH		PRODN	

LOCATION → REST →→ CLAMP —N→ SPL.CHAR. (CRITICAL DIMN.) Ⓑ EECD ◇ CUSTOMER.

O.E.		EXPORT	✓

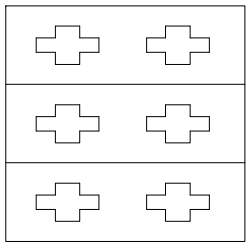
PART NO.	***ED 3257*** (341-2037 / REV.-02)	
PART NAME	GEAR - OUTPUT	OPN. NO. ***080***
CUSTOMER	CATERPILLAR	
OPERATION	**** HEAT - TREATMENT***	

CELL [OPTIONAL]	M./C. **S.Q.F. - 3 & 6**	M / C NO. (OPTIONAL)

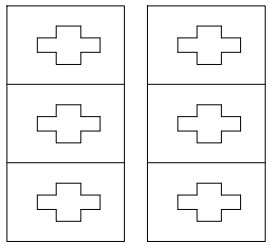
FIXTURE.	FIX. NO.	TOOL	NO.

LOADING PATTERN

(TRAY LOADING) (MAX. 12 PARTS LOAD ONLY) A1



FRONT VIEW



SIDE VIEW

SR. NO.	CHARACTERISTICS PRODUCT	CHARACTERISTICS PROCESS	SPL CHAR CLASS	PRODUCT / PROCESS SPECIFICATIONS	EVALUATION MEASUREMENT TECHNIQUE INSTRUMENT	EVALUATION MEASUREMENT TECHNIQUE NO.	SAMPLING SIZE	SAMPLING FREQ	CONTROL METHOD	CORRECTIVE ACTION/ REACTION PLAN
10.		*TEMPER DELAY*		2 HOUR MAX.						
11.		*CHARGE NO. MARKING*		REFER MARKING W.I. NO. AP03 : 460 : 02 FOR SQF. REFER H. T. W.I. NO. AP03 : 460 : 05 ,						
12.		*CARBURISING & HARDENING*		STANDARD CYCLE SHEET No. AP03 : 460 : 44 , H.T. PROCESS SHEET No. AP04 : 460 : 02						
13.		*TEMPERING / **PRE HEATING***		REFER H. T. W.I. No. AP03 : 460 : 16 , STANDARD CYCLE SHEET No. AP03 : 460 : 44						
14.		*SHOT BLASTING*		REFER H. T. W.I. No. AP03 : 460 : 06						
15.		***WASHING***		GENERAL PROCEDURE , REFER H.T. W.I. No. AP03 : 460 : 04						

DRN BY	*AMARDEEP*		CHKD BY	*R. PATHAK*		APRD BY	*B. LEVA*		PAGE 02 / 02

UNSPECIFIED TOLERANCES AS PER IS : 2102 (PART-1) : 1993 MEDIUM CLASS. | *ALL DIMENSIONS ARE IN MILLIMETERS.* | *DO NOT SCALE, IF IN DOUBT, PLEASE ASK.* | *BREAK SHARP CORNERS.*

VE Commercial Vehicles Ltd. Unit : Eicher Engineering Components, Dewas	S.Q.F 3 STANDARD CYCLE SHEET FOR CAT	Doc No	AP03:460:44
		Rev. No.	0 (03.01.2012)
		Rev. Date	01.10.2017

S.N.	Process Parameter		Set Value	Process Tolerance	S.N.	Parameters	Set Value	Process Tolerance
1	Endo Flow (NM3/HR)		10	± 2	7	Prewashing Temp	70°C	± 10
2	LPG Flow (LPH)		400	± 200	8	Prewashing Time	30 Min	± 10
3	Endo Generator Temp.		1020°C	± 5	9	Preheating Temp	400°C	± 20
4	Endo Generator Dew point		5	± 2	10	Preheating Time	90 min	± 30
5	Tempering Temperature		170°C	± 10°C	11	Soaking Time	30 min	± 10
6	Carbon Potential (Cp)	Carburising	1.10	± 0.10	12	Quenching Time	30 mins	± 10
		Diffusion 1	0.90	± 0.10	13	Tempering Time	90 mins	± 30
		Diffusion 2	1.10	± 0.10	14	Residual Temp	75 -110°C	--
		Soaking	0.90	± 0.10	15	Tempering Dealy Time	2 Hr maximum	

S.N.	ITEM CODE	EECD PART NO.	Material Grade	Carb+Diff Temp. (± 10°C)	Soaking Temp (± 10°C)	Quench Oil Temp (± 2°C)	Carb Time (±20 mins)	Diff Time (± 10 Mins)	Agitation (± 200 RPM)	Remarks
1	2087635	3204	1E1120A	930	840	43	115	55+20	1000	
2	2802139	3205	1E1120A	930	840	43	210	55+20	1000	
3	2S7832	3206	1E1120A	930	840	43	210	55+20	1000	
4	3P2983	3207	1E1120A	930	840	43	230	55+20	1000	
5	3P3059	3208	1E1120A	930	850	43	230	100+30	1000	
6	3P8014	3209	1E1120A	930	840	43	210	55+20	1000	
7	3T3072	3211	1E1120A	930	850	43	230	55+30	1000	
8	3T3077	3212	1E1120A	930	840	43	230	55+30	1000	
9	5S7065	3213	1E1120A	930	840	43	100	55+20	1000	
10	7G1137	3214	1E1120A	930	840	43	230	55+30	1000	
11	9G327	3216	1E1120A	930	840	45	115	55+20	1000	
12	9P3709	3218	1E1120A	930	840	43	115	55+20	1000	
13	419-0183	3229	20MnCr5	930	840	43	250	55+20	1000	
14	246-8757	3222	1E1120A	930	840	43	210	55+20	1000	
15	8E1682	3224	1E1120A	930	840	43	210	55+20	1000	
16	4665108	3226	20MnCr5	930	850	42	120	55+30	1000	
17	4665109	3227	20MnCr5	930	850	42	120	55+30	1000	
18	2G7244	3228	1E1120A	930	850	43	270	140+30	1000	
19	9G9621	3267	1E1120A	930	850	42	180	55+20	1000	
20	1110329	3268	1E1120A	930	850	42	180	55+20	1000	
21	8P7245	3215	1E1120A							
22	9G1918	3217	1E1120A	930	850	43	220	60+20	1000	
23	9S8839	3219	1E1120A	930	850	43	115	55+20	1000	
24	8E1894	3221	1E1120A	930	850	43	220	60+30	1000	
25	3233933	3223	1E1120A	930	850	43	130	55+20	1000	
26	1317419	3252	1E1120A	930	850	43	160	55+30	1000	
27	1941021	3253	1E1120A	930	850	42	180	55+20	1000	
28	2431744	3254	1E1120A	930	850	42	210	55+20	1000	
29	2531337	3255	1E1120A	930	850	43	115	55+20	1000	
30	3412037	3257	1E1120A	930	850	42	210	55+20	1000	
31	3859268	3258	1E1120A	930	850	42	210	55+20	1000	
32	7T-1662	3262	1E1120A	930	850	43	140	60+20	1000	
33	3P8163	3210	1E1120A	930	850	43	260	130+30	1000	
34	389-3085	3263	1E1120A	930	850	43	130	60+20	1000	

Prepared by: Aditya Mishra

Approved by: Ravindra Kale