



ENGINE FACTORY, AVADI

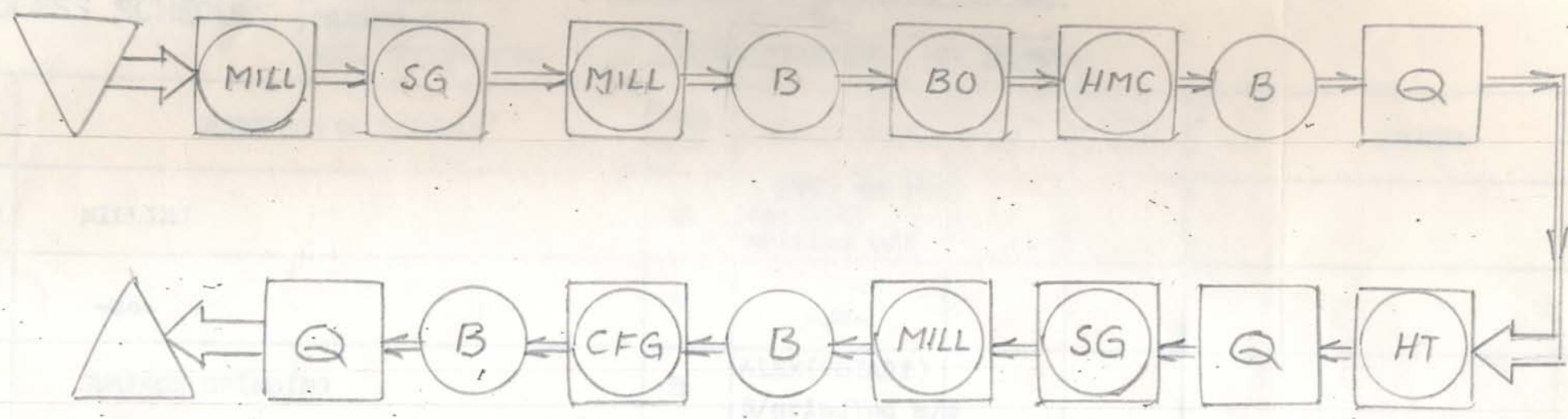
PROCESS SCHEDULEDESCRIPTION :- **MASTER CONNECTING ROD CAP**COMPT. No :- **304.15.2.**MFG. SHOP :- **SPS.**

REV. NO. 00

DATE :- 29.10.96

FLOW PROCESS CHART

STORE: ... DRG. NO.: 304-15-2 END STORE: ...



B	Bench	C	Collection of itmens	HT	Heat treatment	LP	Lead plating
ASSY.	ASSEMBLY	CG	CYLINDRICAL GRINDING	GD	GUN DRILLING	MILL	MILLING
BO	BORING	D	DRILLING	HMC	HORIZONTAL MACHINING CENTRE OPERATION	POL	POLISHING
CD	CRACK DETECTION	DA	DISASSEMBLY	HP	HYDRAULIC PRESS	SG	SURFACE GRINDING
CFG	CREEP FEED GRINDING	FB	FINE BORING	LAP	LAPPING	TUR	TURNING

LEGEND			APPROVAL			SECTION	IPS
TEMP. STORAGE	▽	TRANSPORTATION	⇒	SIGNATURE & DATE		NO. OF SHEETS	
OPERATION	○	INSPECTION BY QC	□	PREPARED BY	MGE <i>[Signature]</i>	QC	SHEET NO.
OPERATION CUM INSPECTION	◻	INSPECTION BY SQA/ECQA (ME) Etc.	I	APPROVED BY	<i>[Signature]</i>		
100% INSP. BY MFG. SEC.	◻	STORAGE	△	AUTHORISED FOR ISSUE	<i>[Signature]</i> 29/10/96		ENGINE FACTORY AVADI, MADRAS-54



ENGINE FACTORY AVADI

FORM No :EFA/P-038

PROCESS SCHEDULE

NOMENCLATURE : MASTER CONNECTING ROD CAP.
 DRAWING No : 304-15-2
 MATL. SPECIFICATION : STEEL STAMPING 18X 2H4MA

OPN No	DESCRIPTION OF OPERATION	SHT No	WORK CENTRE	SET UP TIME	OPN TIME	REMARKS
010	MILLING	6	HMT, FN-3V Vertical milling m/c			
020	-do-	7	-do-			
030	SURFACE GRINDING	8	ALEX(ROTARY) S/grinding m/c			
040	-do-	9	-do-			
050	MILLING	10	HMT, FN-3V Vertical milling m/c			
060	DEBURRING	11	BENCH			
070	BORING	11	HMT-NH, 26/1000 CENTRE LATHE			
080	MILLING, I - SET UP	12 & 13	PRAGA HMC - 400			

PREPARED BY		CHECKED BY		APPROVED BY		AUTHORISED BY						SHT. No
SIGN	<i>Q.S. Varma</i>	SIGN	<i>[Signature]</i>	SIGN	<i>[Signature]</i>	SIGN	<i>[Signature]</i>					1 OF 26
DATE	24/10/96	DATE	29.10.96	DATE	29.10.96	DATE	29/10/96					
C/MAN-II /PDO		/PDO		HOS/PDO		DO/PDO		PDO REF	ISSUE	DATE	SIGN	



ENGINE FACTORY AVADI

FORM No : EFA/P-038

PROCESS SCHEDULE

NOMENCLATURE : MASTER CONNECTING ROD CAP
 DRAWING No : 304-15-2
 MATL. SPECIFICATION : STEEL STAMPING 18 X 2H4MA

OPN No	DESCRIPTION OF OPERATION	SHT No	WORK CENTRE	SET UP TIME	OPN TIME	REMARKS
090	MILLING , II - SET UP	14	PRAGA HMC - 400			
100	-do- , III-SET UP	15	-do-			
110	DEBURRING	16	BENCH			
120	DEMAGNETISING & CRACK DETECTION		Magnetic Flaw detector			
130	INSPECTION	17				
140	TRANSPORT					
150	HEAT TREATMENT 302 Harden & temper to condition BHN 341					
160	INSPECTION					

PREPARED BY	CHECKED BY	APPROVED BY	AUTHORISED BY							SHT. No
SIGN <i>R.S. V...</i>	SIGN <i>[Signature]</i>	SIGN <i>[Signature]</i>	SIGN <i>[Signature]</i>							2 OF 26
DATE 24.10.96	DATE 29.10.96	DATE 29.10.96	DATE 29.10.96							
C/MAN-II /PDO	C/MII /PDO	HOS/PDO	DO/PDO							



ENGINE FACTORY AVADI

FORM No :EFA/P-038

PROCESS SCHEDULE

NOMENCLATURE : MASTER CONNECTING ROD CAP
 DRAWING No : 304-19-2
 MATL. SPECIFICATION : STEEL STAMPING 18X 2H4MA

OPN No	DESCRIPTION OF OPERATION	SHT No	WORK CENTRE	SET UP TIME	OPN TIME	REMARKS
170	TRANSPORT					
180	POLISHING		BENCH			
190	SURFACE GRINDING	18	ELB(RECI) S/grinding m/c			
200	-do-	19	-do-			
210	-do-	20	-do-			
220	DRESSING		BENCH			
230	INSPECTION	REFER 19920				
240	GANG MILLING	21	HMT, FN-3H Horz. milling m/c			

PREPARED BY		CHECKED BY		APPROVED BY		AUTHORISED BY						
SIGN	<i>Q.S. Vasanth</i>	SIGN	<i>DM</i>	SIGN	<i>[Signature]</i>	<i>Make 29/10/96</i>						SHT. No
DATE	24/10/96	DATE	29.10.96	DATE	29.10.96							3 OF 26
C/MAN-II /PDO		<i>elme</i> /PDO		HOS/PDO		DO/PDO		PDO REF	ISSUE	DATE	SIGN	



ENGINE FACTORY AVADI

FORM No :EFA/P-038

PROCESS SCHEDULE

NOMENCLATURE :**MASTER CONNECTING ROD**.....
 DRAWING No :**304-15-2**.....
 MATL. SPECIFICATION :**STEEL STAMPING 18X 2H4MA**.....

OPN No	DESCRIPTION OF OPERATION	SHT No	WORK CENTRE	SET UP TIME	OPN TIME	REMARKS
250	GANG MILLING	22	HMT FN-3H Horz. milling m/c			
260	DRESSING		BENCH			
270	CREEP FEED GRINDING	23	MATTISON Creep feed Grinding m/c			
280	-do-	24	-do-			
290	DRESSING		BENCH			
300	DEMAGNETISING & CRACK DETECTION		Magnetic Flaw detector			
310	FINAL INSPECTION	25 & 26				
320	PRESERVATION					

PREPARED BY		CHECKED BY		APPROVED BY		AUTHORISED BY						
SIGN	<i>R.S. Varad</i>	SIGN	<i>[Signature]</i>	SIGN	<i>[Signature]</i>	<i>Make</i>						SHT. No
DATE	24/10/96	DATE	29.10.96	DATE	29.10.96	<i>29/10/96</i>						4 OF 26
C/MAN-II /PDO		<i>[Signature]</i> /PDO		HOS/PDO		DO/PDO		PDO REF	ISSUE	DATE	SIGN	

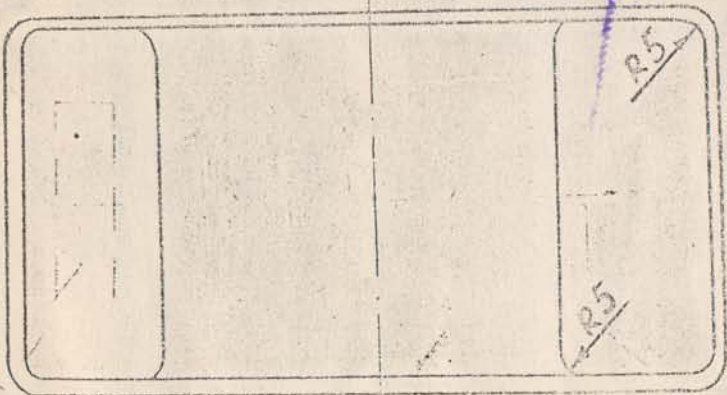
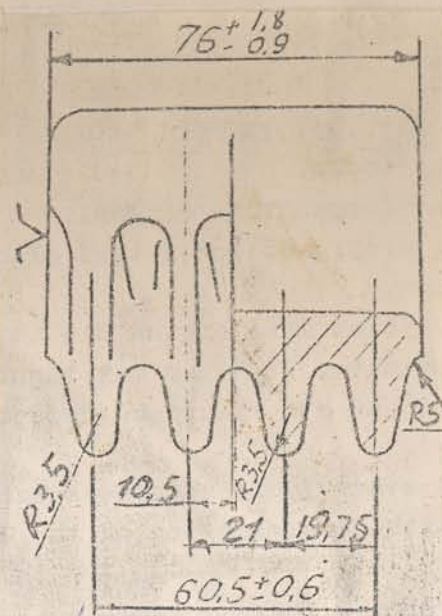
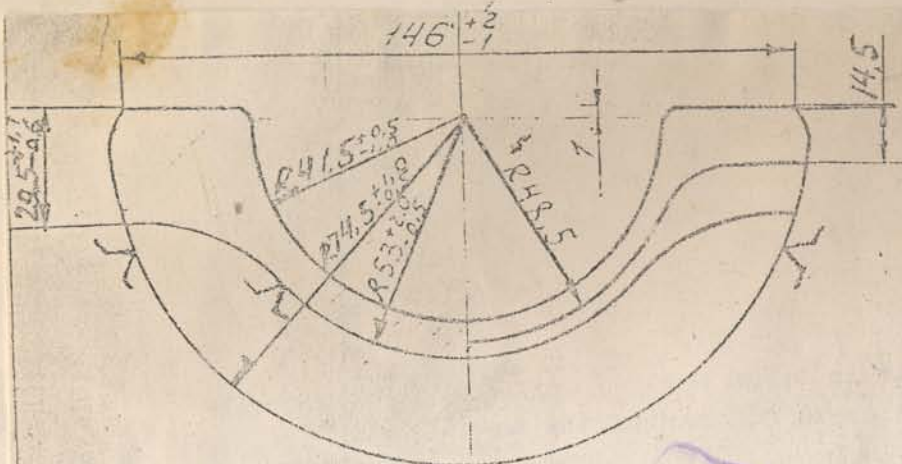
PLANNING SHEET - PDO / E.F. FORM No: EFA/P-039

NOMENCLATURE

MASTER CONNECTING ROD CAP

DRAWING NO
304-15-2

000 FORGING
MACHINE:



TECHNICAL REQUIREMENTS

1. Mismatch of dies upto 1.0 mm.
2. Burrs after parting off 1.0 mm
3. Buckling upto 1.0 mm.
4. Pits may be upto 0.5 mm of machining allowance.
5. Unspecified tolerance ± 0.5 mm
6. Unspecified Raddi 3 mm.
7. Normalized & high tempered to BHN 196 - 269

STD.TOOLS & GAUGES

SPL.TOOLS & GAUGES

QSV	<i>[Signature]</i>	<i>[Signature]</i>	PETE REF	ISSUE	DATE
PRED.	CHD.	APPD.			

PLANNING SHEET-PDO/EF/FORM No: EFA/P-032

NOMENCLATURE

MASTER CONNECTING ROD CAP

DRAWING.NO

304-15-2

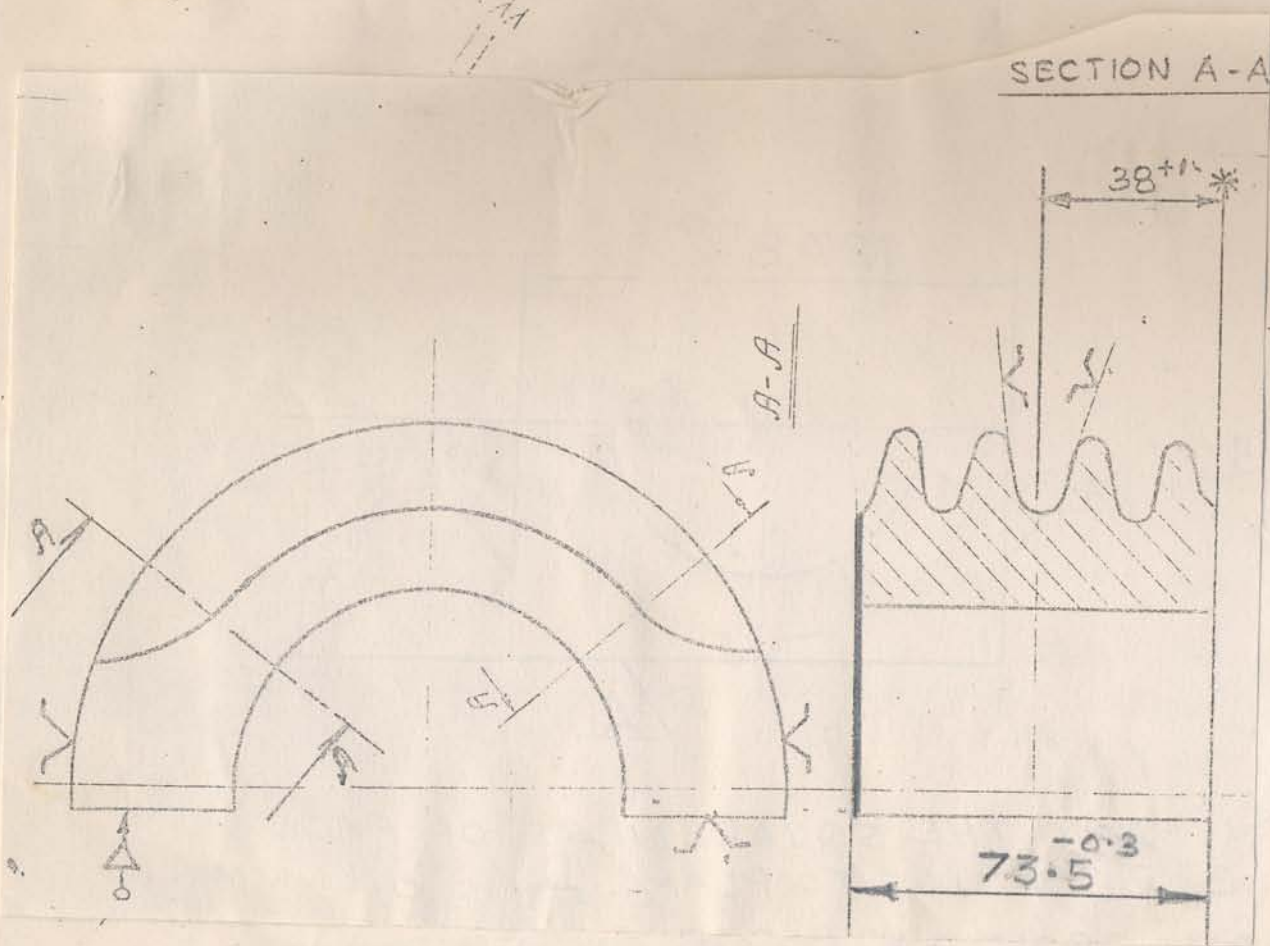
ISSUE

OPN.NO

010

OPERATION

MILLING



Ra 10

MACHINE: Vertical milling machine
HMT, FN-3V

STD.TOOLS&GAUGES

1. Face milling cutter $\varnothing 80$
M40 SP 15
2. Insert:
SPIN 1504 TTR EDR
3. VICE (ALT)

SPL.TOOLS & GAUGES

1. Fixture 401220

PRED.	CHD.	APPD.	PETE REF	ISSUE	DATE

PLANNING SHEET - PDO / EFFORM No: EFA/P-03

NOMENCLATURE

MASTER CONNECTING ROD CAP

DRAWING.NO
304-15-2

ISSUE

OPN.NO
020

OPERATION
MILLING

MACHINE: Vertical
milling machine
HMT FN 3V

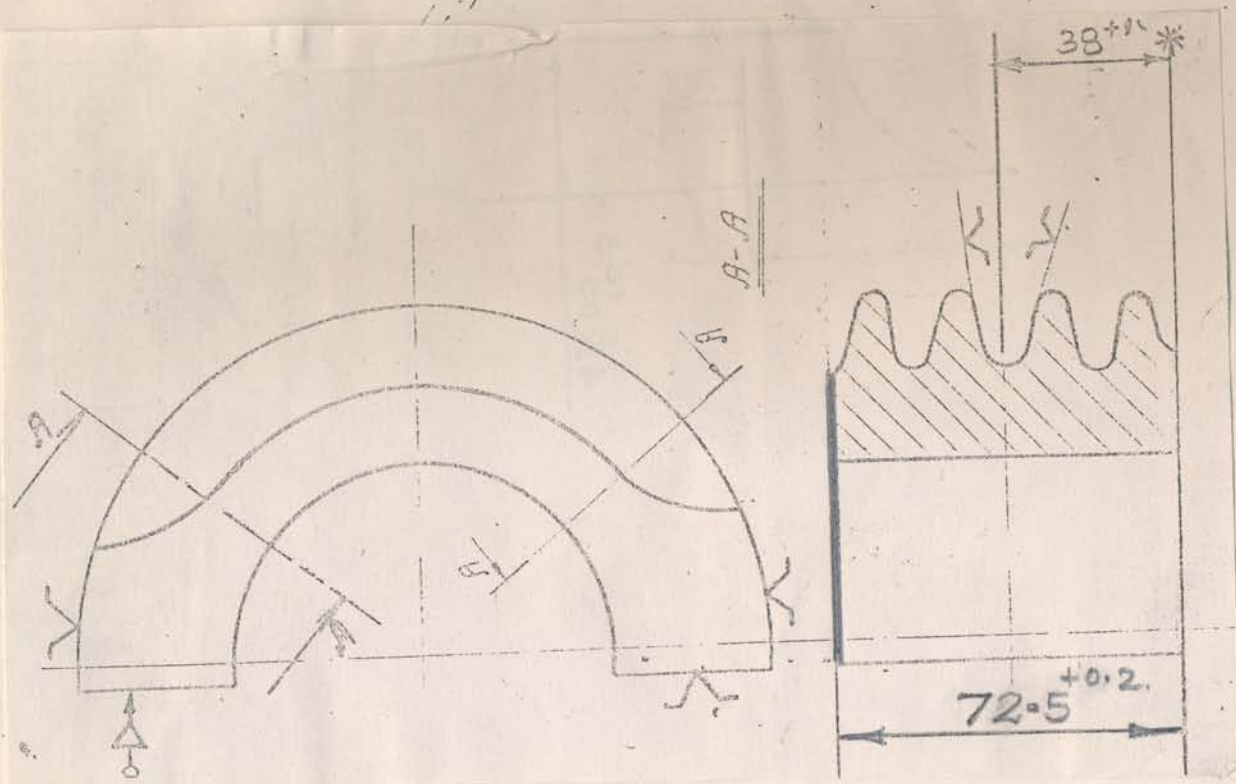
STD.TOOLS&GAUGES

1. Face milling
cutter $\varnothing 80$
M40 SP 15
2. Insert:
SPKN 1504 TTR EDR
3. Flat file
(rough) 150 mm
4. VICE (ALT)

SPL.TOOLS & GAUGES

1. Fixture - 401220

Ra 10



TECHNICAL REQUIREMENTS.

1. Non-parallelism of surfaces (1) & (2) should not exceed 0.5 mm

PRED.	CHD.	APPD.	PETE REF	ISSUE	DATE

PLANNING SHEET - PDO / EFA / P-03

NOMENCLATURE

MASTER CONNECTING ROD CAP

DRAWING.NO

304-15-2

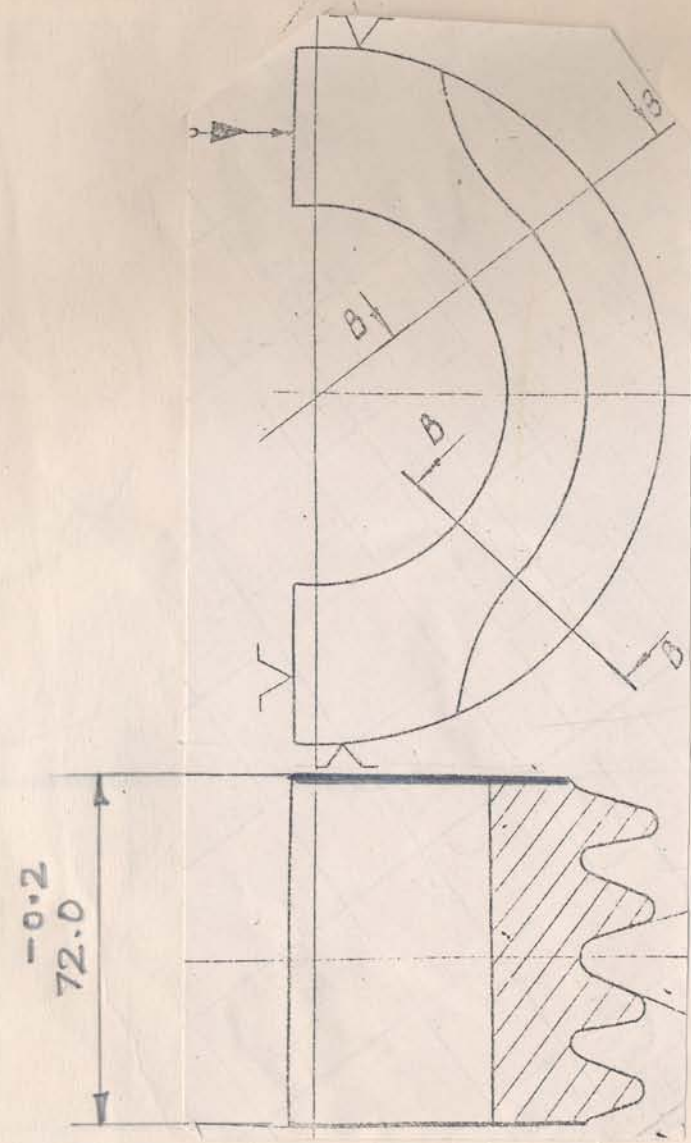
ISSUE

OPN.NO

030

OPERATION

SURFACE GRINDING



Ra 2.5

MACHINE: Surface Grinding machine ALEX

STD.TOOLS&GAUGES

- Grinding wheel segments 6"x4"x1.5" AA36 J23
- HR file 150 mm (smooth)

SPL.TOOLS & GAUGES

PRED.	CHD.	APPD.	PETE REF	ISSUE	DATE

PLANNING SHEET - PDO / EFA FORM No: EFA/P-039

NOMENCLATURE

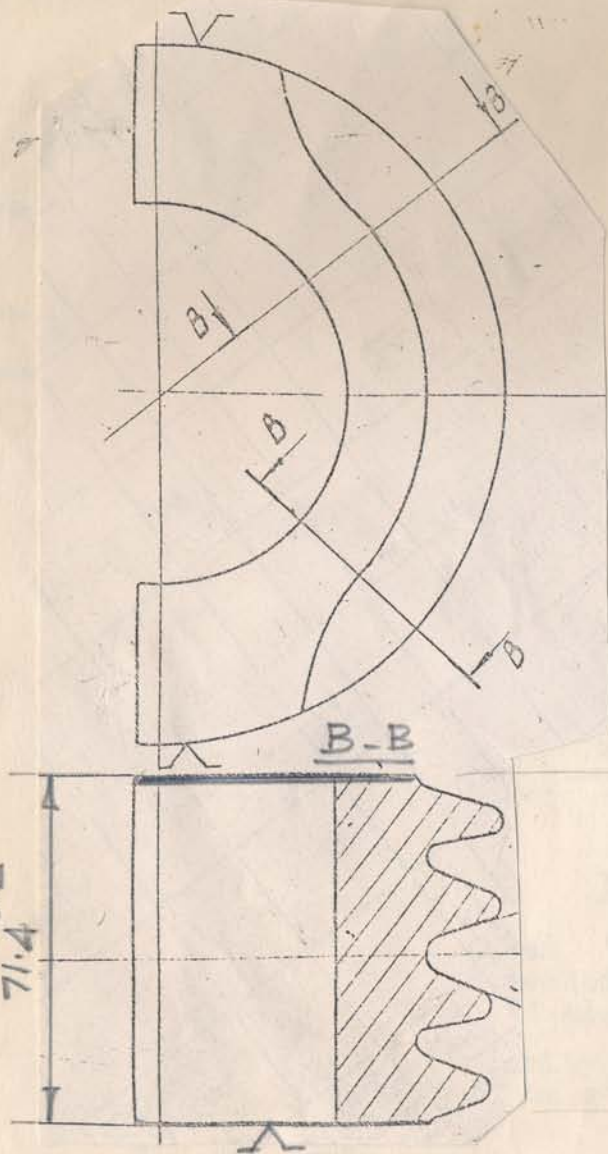
MASTER CONNECTING ROD CAP

DRAWING.NO
304-15-2

ISSUE

OPN.NO
040

OPERATION
SURFACE GRINDING



Ra2.5/

MACHINE: Surface Grinding machine ALEX

STD.TOOLS&GAUGES

- Grinding wheel segments
size; 6" x 4" x 1.5"
Grade; AA36 J23
- HR file 150 mm (smooth)

SPL.TOOLS & GAUGES

TECHNICAL REQUIREMENTS

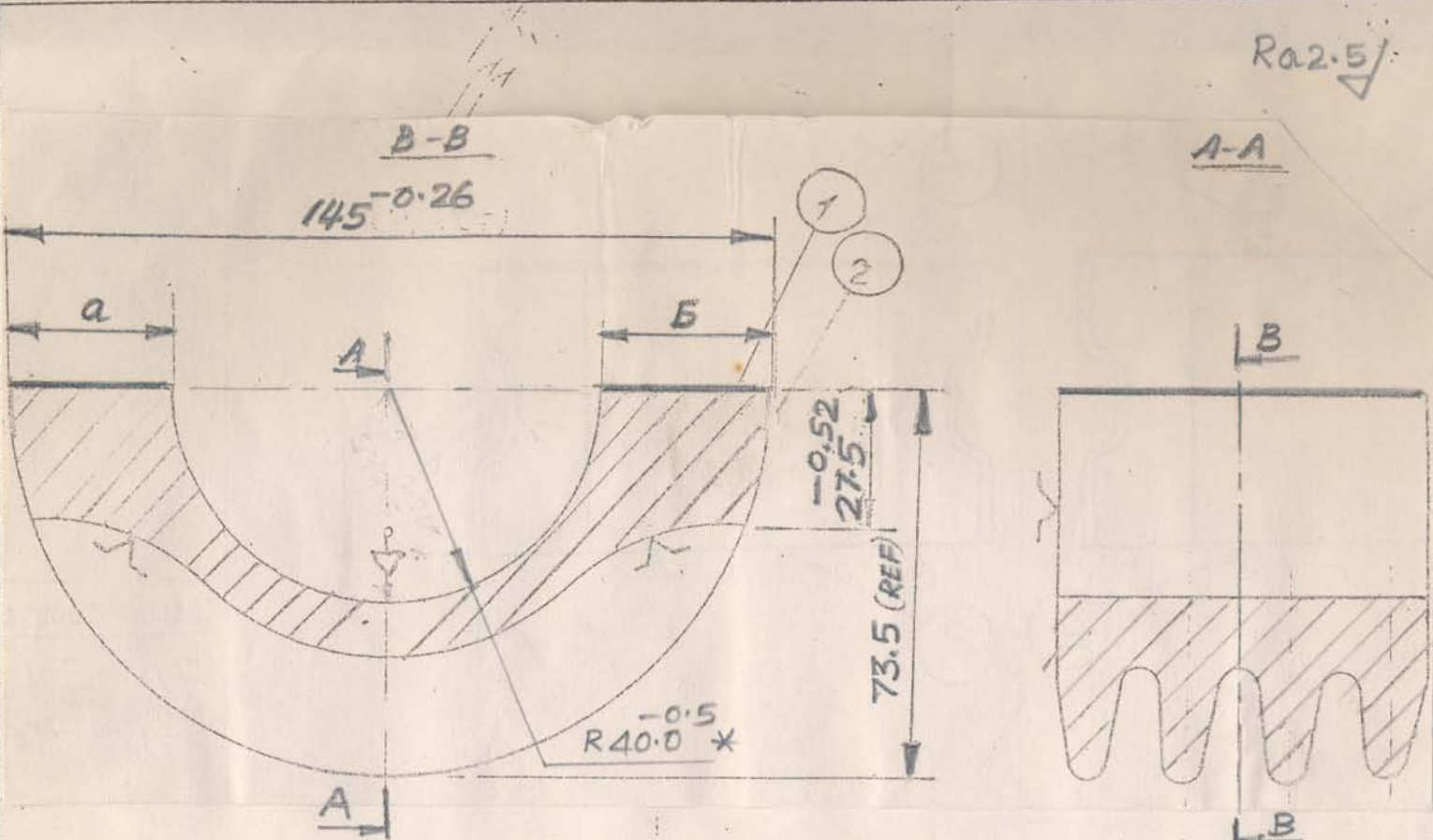
- Non-parallelism of surfaces ① & ② should not exceed 0.05 mm

PRED.	CHD.	APPD.	DATE	ISSUE	DATE

PLANNING SHEET - PDO / EFA

FORM No: EFA/P-03

NOMENCLATURE	MASTER CONNECTING ROD CAP	DRAWING NO	304-15-2	ISSUE		OPN. NO	050	OPERATION	MILLING
--------------	---------------------------	------------	----------	-------	--	---------	-----	-----------	---------



TECHNICAL REQUIREMENTS

1. Difference between 'a' and 'b' may be 0.5 mm max. Ist off to be checked at the beginning of shift after, every setting and also from a batch.
2. Non-perpendicularity of joint plane to the face of cap should not exceed 0.15 mm at a length of 70 mm
3. * Dimension for reference

MACHINE: Vertical milling machine
HMT FN 3V

STD. TOOLS & GAUGES

1. Face milling cutter $\phi 80$
M40 SP 15
2. Insert:
SPKN 1504 TTR EDR
3. Height gauge
73.5
4. Flat file 150 mm

SPL. TOOLS & GAUGES

1. FIXTURE - 401285
2. Gap gauge 26/03/27
- ① 3. MILLING FIX. (ALT) 401476

			004	1	18.2.97
PRED.	CHD.	APPD.	PETE REF	ISSUE	DATE

PLANNING SHEET - PDO / E.F. FORM No: EFA/P-039

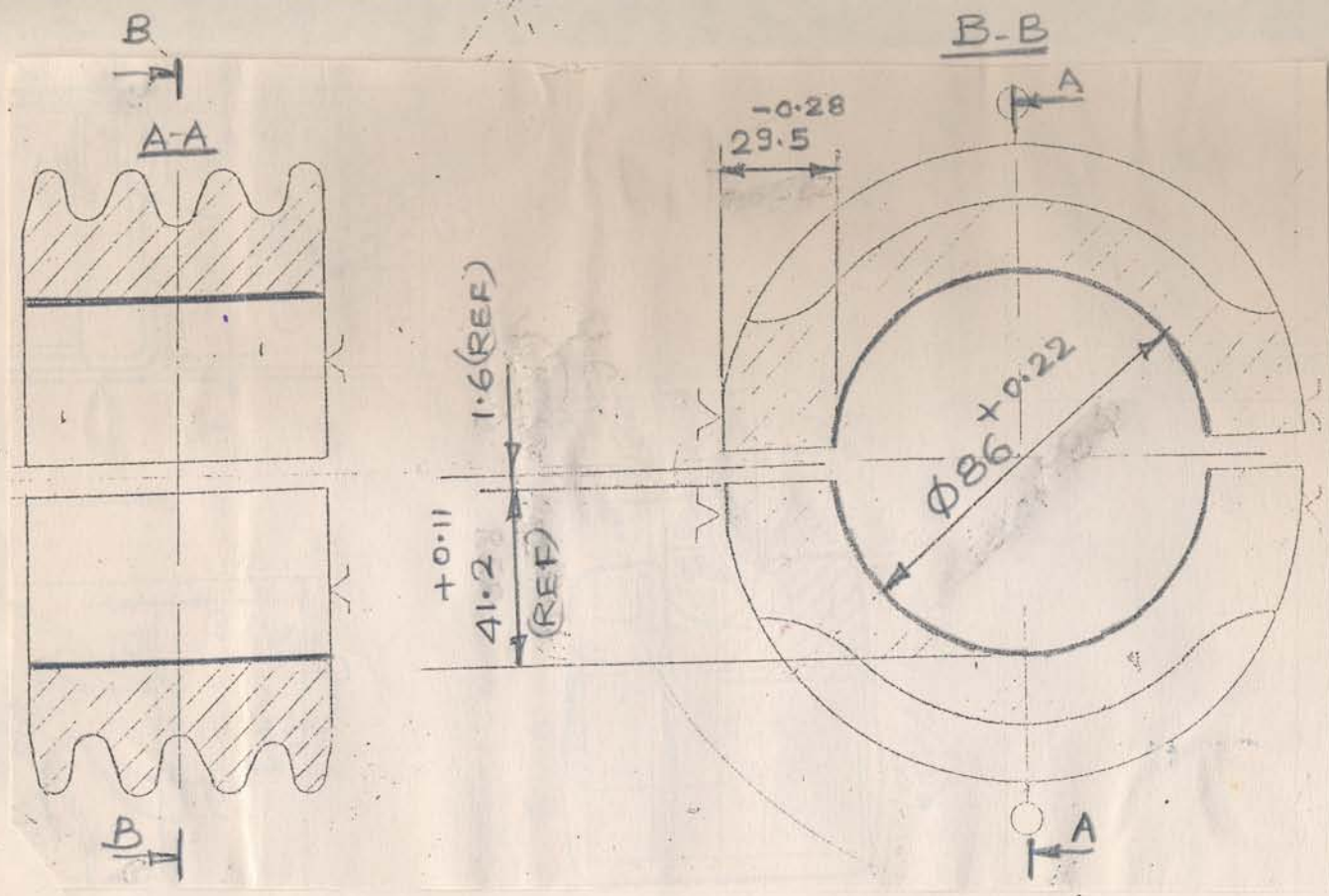
NOMENCLATURE MASTER CONNECTING ROD CAP

DRAWING.NO
304-15-2

ISSUE

OPN.NO
070

OPERATION
BORING



Ra2.5

MACHINE: CENTRE LATHE
HMT NH 26/1000

STD. TOOLS & GAUGES

1. Boring tool
S32U PSLNR 12
2. Insert:
CNMG 120408 TK 15
3. Plug gauge $\Phi 86$
4. HR File 150 mm
(medium)

SPL. TOOLS & GAUGES

FIXTURE 401387

<i>QSV</i>	<i>Dei</i>				
PRED.	CHD.	APPD.	P&T REF	ISSUE	DATE

PLANNING SHEET - PDU / E.F. FORM NO. 88A/02

NOMENCLATURE

MASTER CONNECTING ROD CAP

DRAWING NO

304-15-2

ISSUE

OPN. NO

080

OPERATION

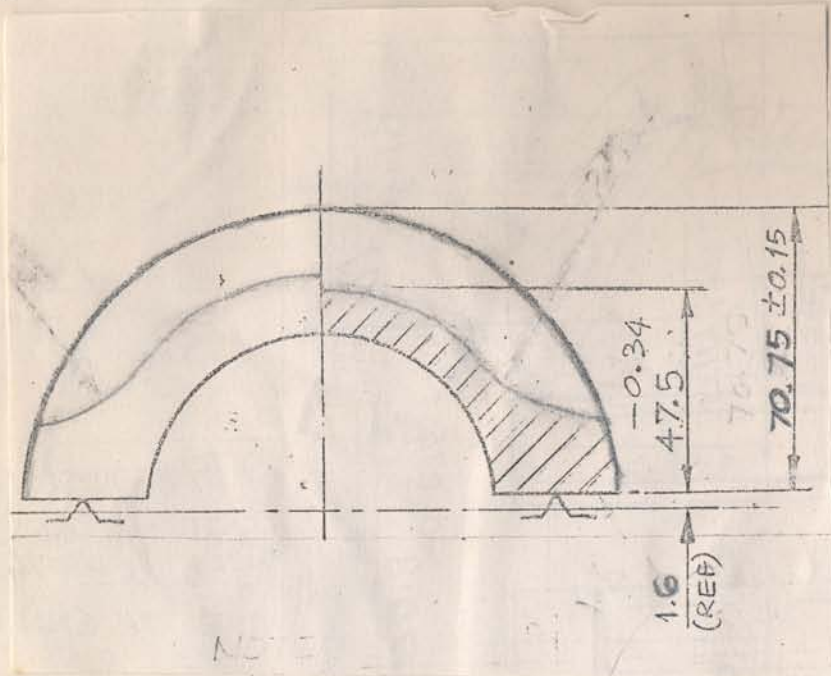
MILLING

MACHINE:

HMC 400

SET UP I

Ra 2.5



STD. TOOLS & GAUGES

1. Deep shoulder end milling cutter
Ø50
Widia No. 80396974
2. Insert
SPMW 120408
3. Height gauge
70.45
4. HR File 150 mm
(fine)

SPL. TOOLS & GAUGES

1. Carbide tipped brazed deep shoulder end mill Ø40 CEL 75
46/00/
2. FIXTURE
3. FIXTURE (alter-nate on VTC) 401346

PRED.	CHD.	APPD.	PSTE REF	ISSUE	DATE

PLANNING SHEET--PDO/EFA FORM N. 001 P. 000

NOMENCLATURE

MASTER CONNECTING ROD CAP

DRAWING.NO

304-15-2

ISSUE

OPN.NO

080

OPERATION

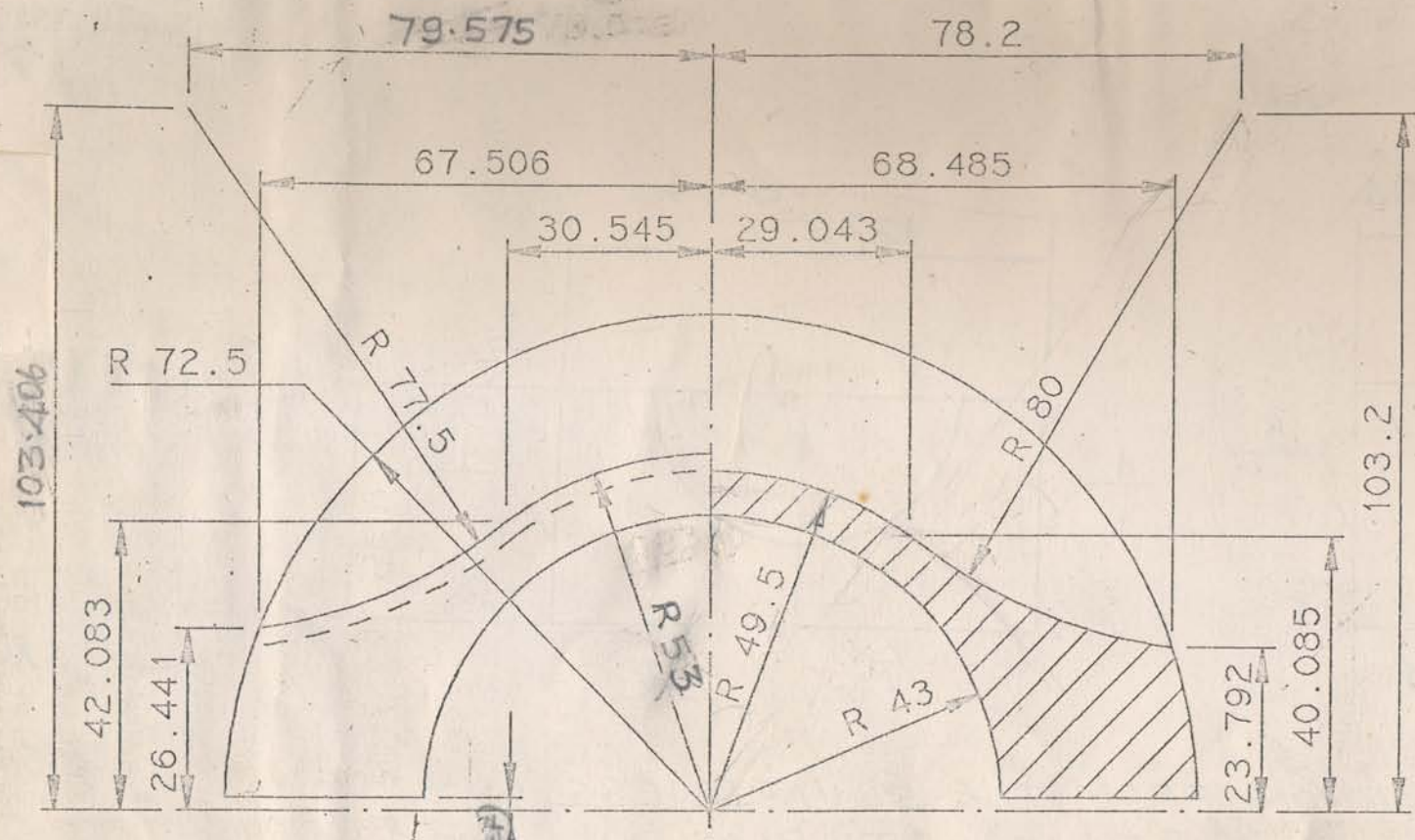
MILLING

CAD DRAWING

MACHINE:

STD.TOOLS&GAUGES

SPL.TOOLS & GAUGES



CAP OF MASTER CONNECTING ROD
 COMPT NO : 304-15-2
 ISSUE NO Dt : 27.11.89

PRED.	CHD.	APPD.	PETE REF	ISSUE	DATE

PLANNING SHEET - PDU / E.F. FORM No: EFA/P-03

NOMENCLATURE

MASTER CONNECTING ROD C

DRAWING NO

304-15-2

ISSUE

O.P. N. NO

O.P. ELEVATION

090

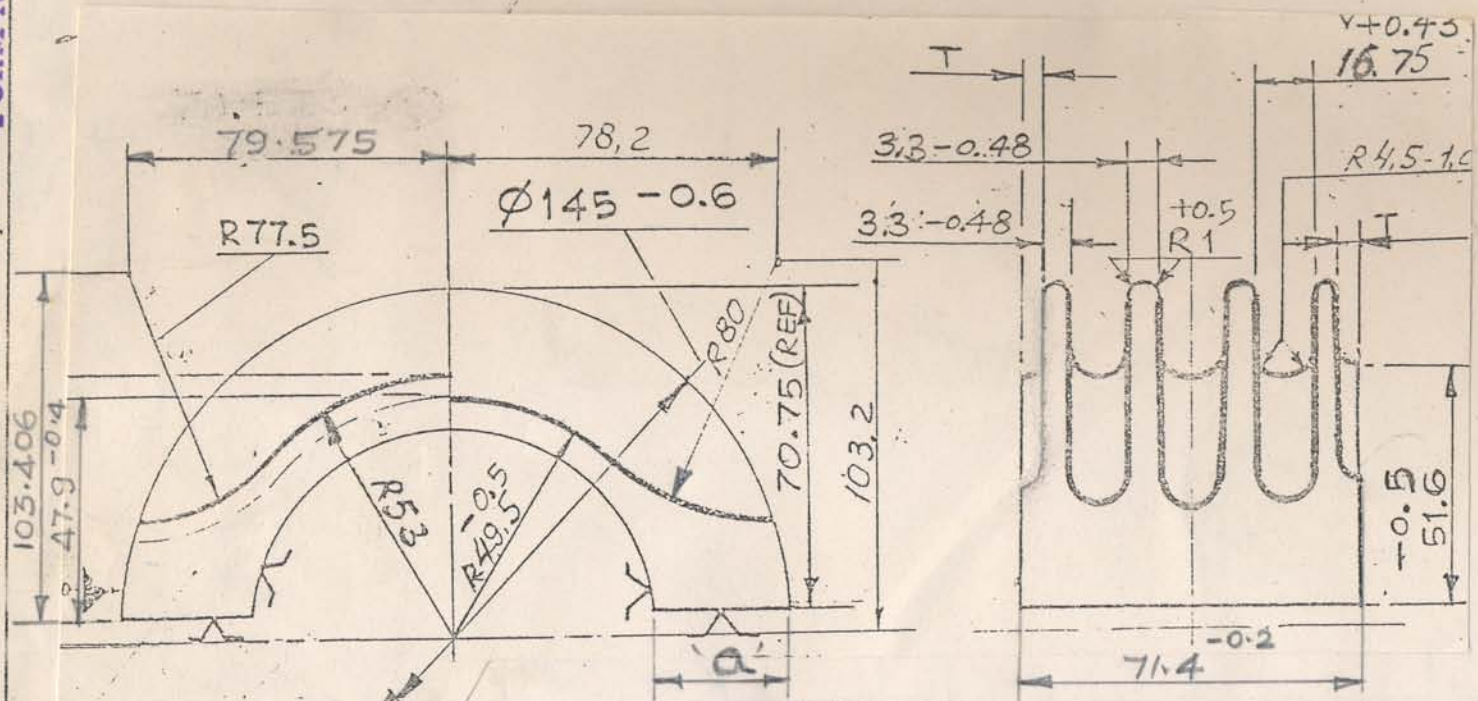
MILLING

MACHINE:

HMC 400

SET UP II

Ra 2.5/



TECHNICAL REQUIREMENTS

- *. Permissible clearance along out line templates should not be more than 0.5 mm.
- 2, Dimension difference along size 'T' should not be more than 0.5 mm
3. Variation in wall thickness along size 'a' should not be more than 0.8 mm

STD.TOOLS&GAUGES

1. Slitting saw
Ø125 6W
Sandvik No.
331.31.100060.235
2. Insert:
331.31.3512.31
3. S&F cutter Ø100
M90 TP11
4. Insert: TPAN 1103 PPN
5. S&F Cutter
Ø125x16Wx2R
6. Spl. Insert: 402159

SPL.TOOLS & GAUGES

7. S&F&Cutter
Ø125x17Wx4.5R 402160
8. Insert: 402162
1. slip gauge
16.75 029/6
2. Template 403056
R49.5, R77.5
R53 R80
3. slip gauge 3.3 025/01/50
4. Height gauge 49.5
5. FIXTURE 401287

PRED.	CHD.	APPD.	PETE REF	ISSUE	DATE

PLANNING SHEET - PDO / EFA FORM No: EFA/P-039

NOMENCLATURE

MASTER CONNECTING ROD CAP

DRAWING.NO

304-15-2

ISSUE

OPN.NO

100

OPERATION

Milling

MACHINE:

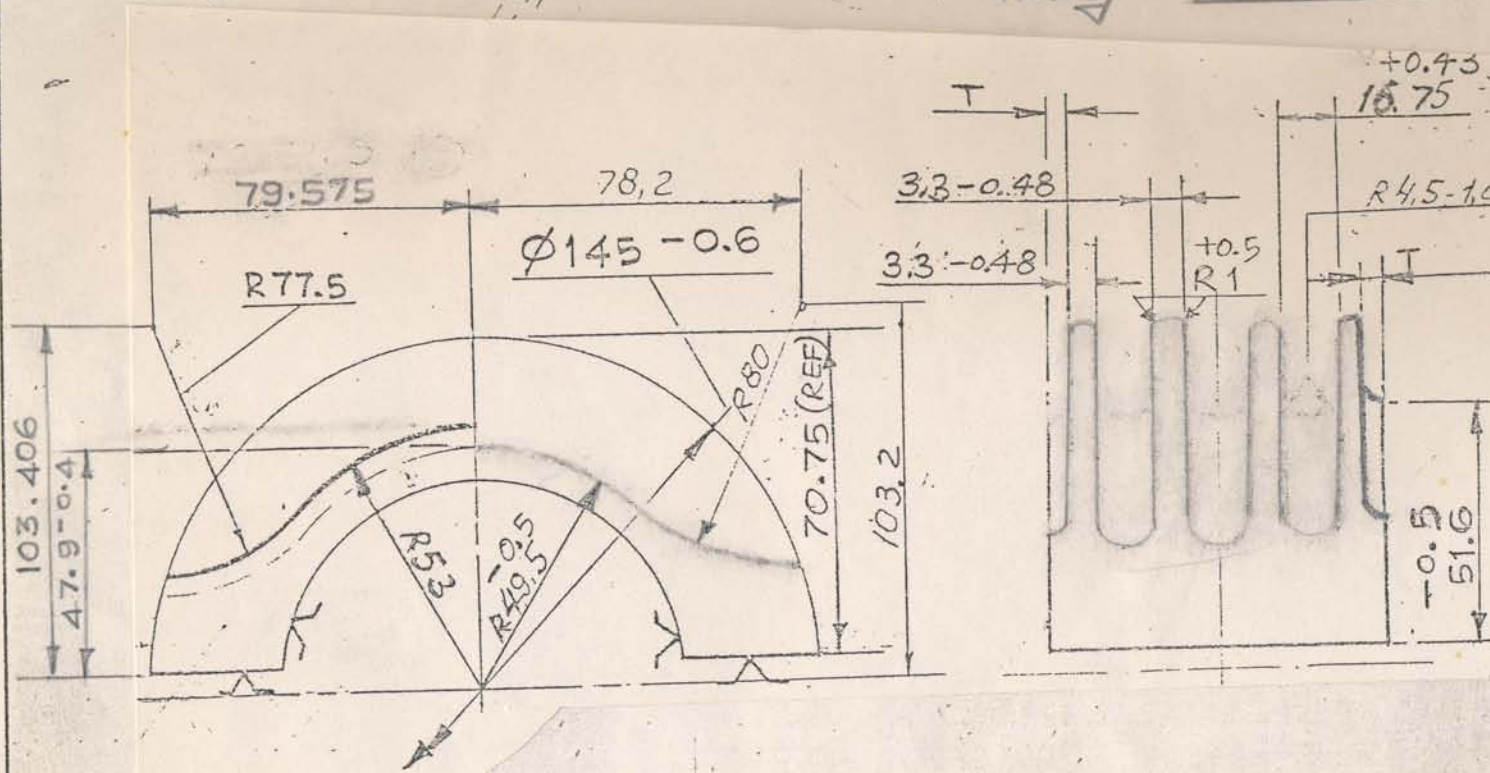
HMC 400

STD.TOOLS&GAUGES

1. S&F Cutter $\phi 125 \times 17 \text{W} \times 4.5 \text{R}$ 402160
2. HR file 150 mm (rough)

SPL.TOOLS & GAUGES

$Ra 2.5$ / SET UP III



PRED.	CHD.	APPD.	DATE	ISSUE	DATE

PLANNING SHEET - PDO / EFA

FORM No: EFA/P-039

NOMENCLATURE

MASTER CONNECTING ROD

DRAWING.No

304.15.2 .

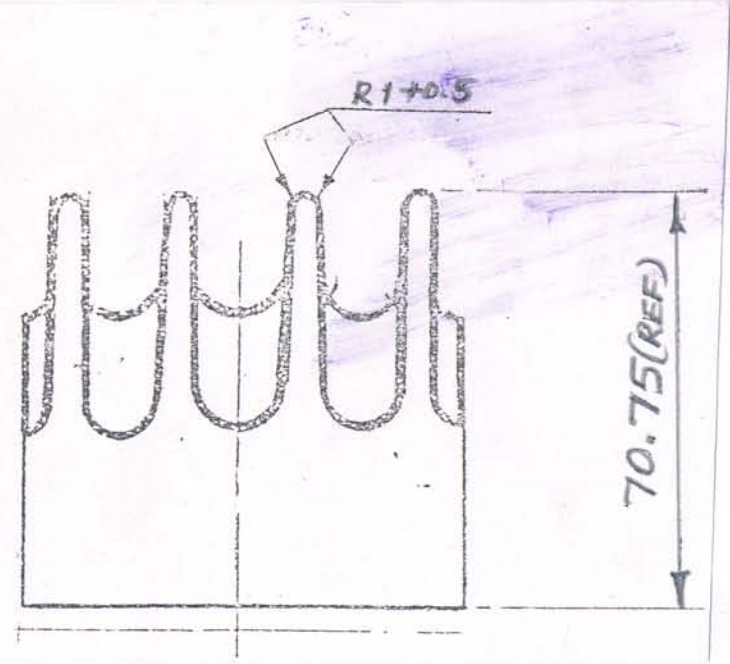
ISSUE

OPN.No

110

OPERATION

DEBURRING.



NOTE: REMOVE BURRS AND FORM RADIUS ON CORNERS AS SHOWN ABOVE.

MACHINE

BENCH

STD.TOOL & GAUGES

SPL.TOOLS & GAUGES

QSV	<i>[Signature]</i>				
PRED.	CHD.	APPD.	PDO. REF.	ISSUE	DATE

PLANNING SHEET - PDO / E-FARM No: EFA/P-03

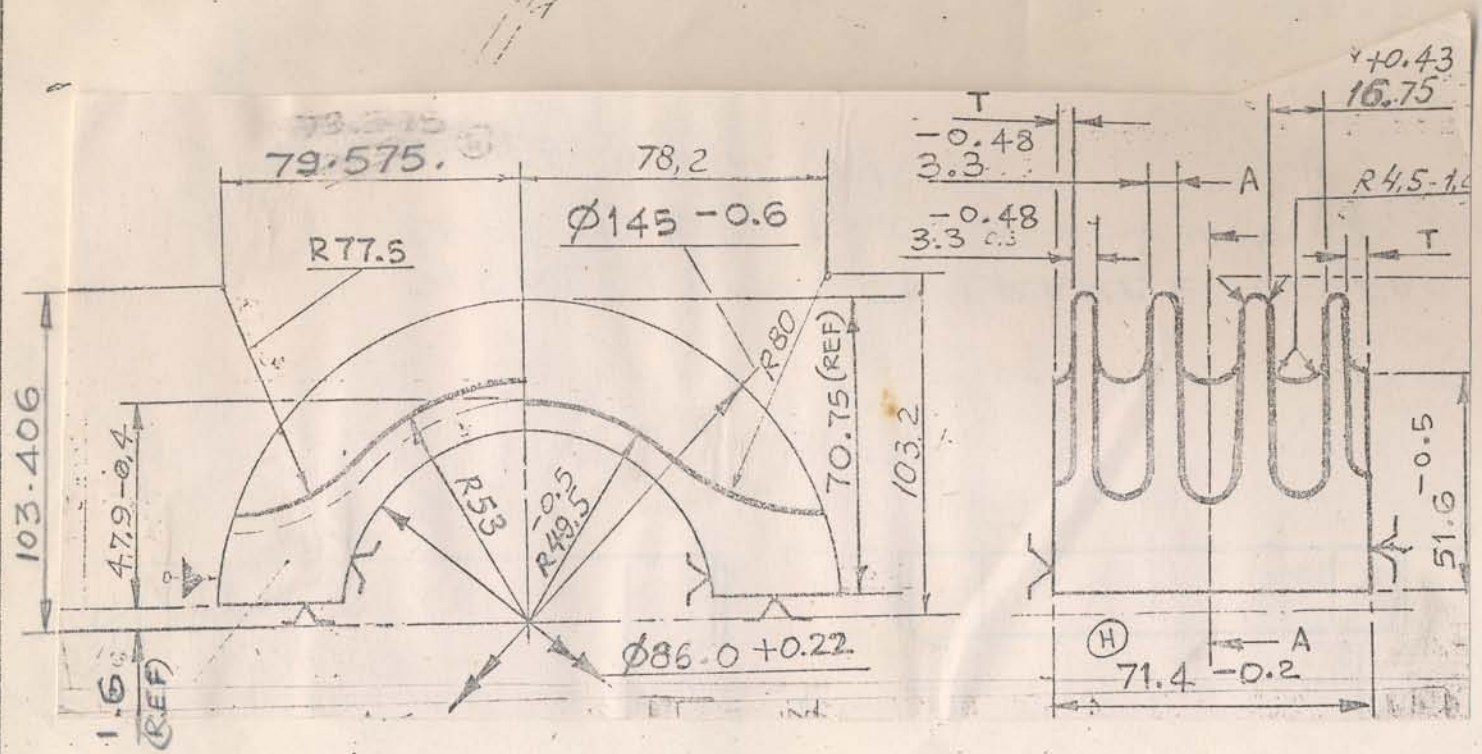
NOMENCLATURE MASTER CONNECTING ROD CAP

DRAWING.NO
304-15-2

ISSUE

OPN.NO
130

OPERATION
INSPECTION



MACHINE:

STD.TOOLS&GAUGES

1. Length gauge	403282
95.5. +0.1	
2. Distance gauge	
50.8 +0.19	
3. Slip gauge	
10 +0.27	
4. Gap gauge	
9.9 -0.15	
5. Radius gauge	403057
R53xR77.5	
6. R49.5xR80	403056

SPL.TOOLS & GAUGES

PRED.	CHD.	APPD.	PETE REF	ISSUE	DATE