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A project of Volunteers in Asia

Design of Cross-flow Turbine BYS/T1

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CROSSFLOW TURBINE

type: BVS/T1

- with manually operated flow regulator
- Rotor diameter: 400 mm
- Nozzle width: 50 to 400 mm

$$\text{Flow: } Q \approx Q_s \cdot x \sqrt{H_n}$$

where: Q_s = specific discharge = 0.30 l/s

x = nozzle width (mm)

H_n = net head (m)

$$\text{Rated speed: } N \approx n_s \cdot \sqrt{H_n}$$

$$n_s \approx \underline{98.5 \text{ RPM}}$$

Calculation of nozzle width:

$$x \text{ [mm]} = \frac{Q \text{ [l/s]}}{Q_s \cdot \sqrt{H_n} \text{ [m]}}$$

$$P \text{ [kW]} = \frac{Q \cdot H_n}{102} \cdot \eta \quad (\eta = 0.7 \text{ at full opening})$$

SKAT

SKAT
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CF Turbine BY5/T1

Hints for the use of the drawing set:

- Drawing are divided into sub-assembly and assembly groups. Parts-lists and (sub)-assembly drawings bear an identical number code, followed by drawings of individual parts with the same code and serial number.
- Assembly groups T1-10.0 and T1-11.0 refer to the gate operation by hydraulic cylinder only.
- Drawings 01.1/1-3, 01.2, 01.3, 01.4 are required only for execution with draft-tube.
- Reinforcing disk (drwg. 04.4) and inlet rib (drwg. 08.9) are optional depending on head and turbine width. This must be determined by a separate stress calculation (on request done by SKAT).
- Permissible shaft loading requires to be checked for $P > 10$ kW and $H < 7$ m and also $P > 20$ kW and $H < 14$ m.
- Assembly groups 05.0 and 07.0 (bearing housings) may be replaced by commercially available standard bearing housings. However, height of shaft axis has to be taken into account.
- Code "x" refers to the variable nozzle width. All drawings with x-related measurements have to be completed by adding the chosen x. Example: $x=400$ as calculated. For drawing 01.5 : $x + 412 = 400 + 412 = \underline{812}$ mm.
- On some drawings not all standard sizes could be included on a single drawing. Example: For $x = 400$, drawing 01.1/3 is required where measurements for y, z and k are found. Drawings 01.1/1 and 01.1/2 are not required for this turbine size.

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de Cooperación al Desarrollo, Universidad de Sankt-Gallen

POS	NO.OF ITEM	ITEMS	DRAWING NUMBER	SPECIFICATION	REMARKS
1	1	FOUNDATION FRAME	T1-01.0		SUB. ASSEMBLY
2	1	SUPPORT ASSEMBLY	T1-02.0		" "
3	1	BAFFLE HOUSING	T1-03.0		" "
4	1	ROTOR ASSEMBLY	T1-04.0		" "
* 5	2	MAIN BEARING ASSEMBLY	T1-05.0		" "
6	1	REGULATOR WING ASSEMBLY	T1-06.0		" "
* 7	2	R.W BEARING HOUSING ASSEMBLY	T1-07.0		" "
8	1	INLET ASSEMBLY	T1-08.0		" "
9	1	REGULATOR MECHANISM ASSEMBLY	T1-09.0		" "
12	2	STUFFING BOX	T1-12.1		
13	2	STUFFING BOX LID	T1-12.2		
14	2	STUFFING BOX GASKET	T1-12.3		
15	2	OIL SEAL			
16	2	OIL SEAL HOUSING	T1-12.4		
17	2	LOCK SPRING	T1-12.5		
18	2	OIL SEAL HOUSING GASKET	T1-12.6		
19	2	COVER SHEET	T1-12.7		
20	1	COVER SHEET GASKET	T1-12.8		
21	2	SEALING PLATE 'A'	T1-12.9		
22	2	SEALING PLATE 'B'	T1-12.10		
23	1	SEALING FLAP GASKET	T1-12.11		
24	1	BAFFLE PLATE GASKET	T1-12.12		
25	1	SUPPORTING STRIP	T1-01.5		
26	1	FOUNDATION FRAME GASKET	T1-12.13		
27	2	GLAND PACKING			
28	18	TAPER PIN			
29	2	GREASE CUP			
30	X	NUT/BOLT .HEX W 1/2" X 1 1/2"			
31	X	" " " W 3/8" X 3/4"			
32	12-2	—/ " " W 1/4" X 5/8"			
33	2	" " " W 3/4" X 1 1/2"			
34	4	" " " W 3/4" X 2"			
35	4	" " " W 1/2" X 2"			
37	4	" " " W 1/4" X 5/8"			
36	1	ADAPTER	T1-14.0		SUB. ASSEMBLY

SEE
PART LIST
T1-13.0

* STANDARD BEARING HOUSING
MAY BE USED INSTEAD.

Revised 10.8.82

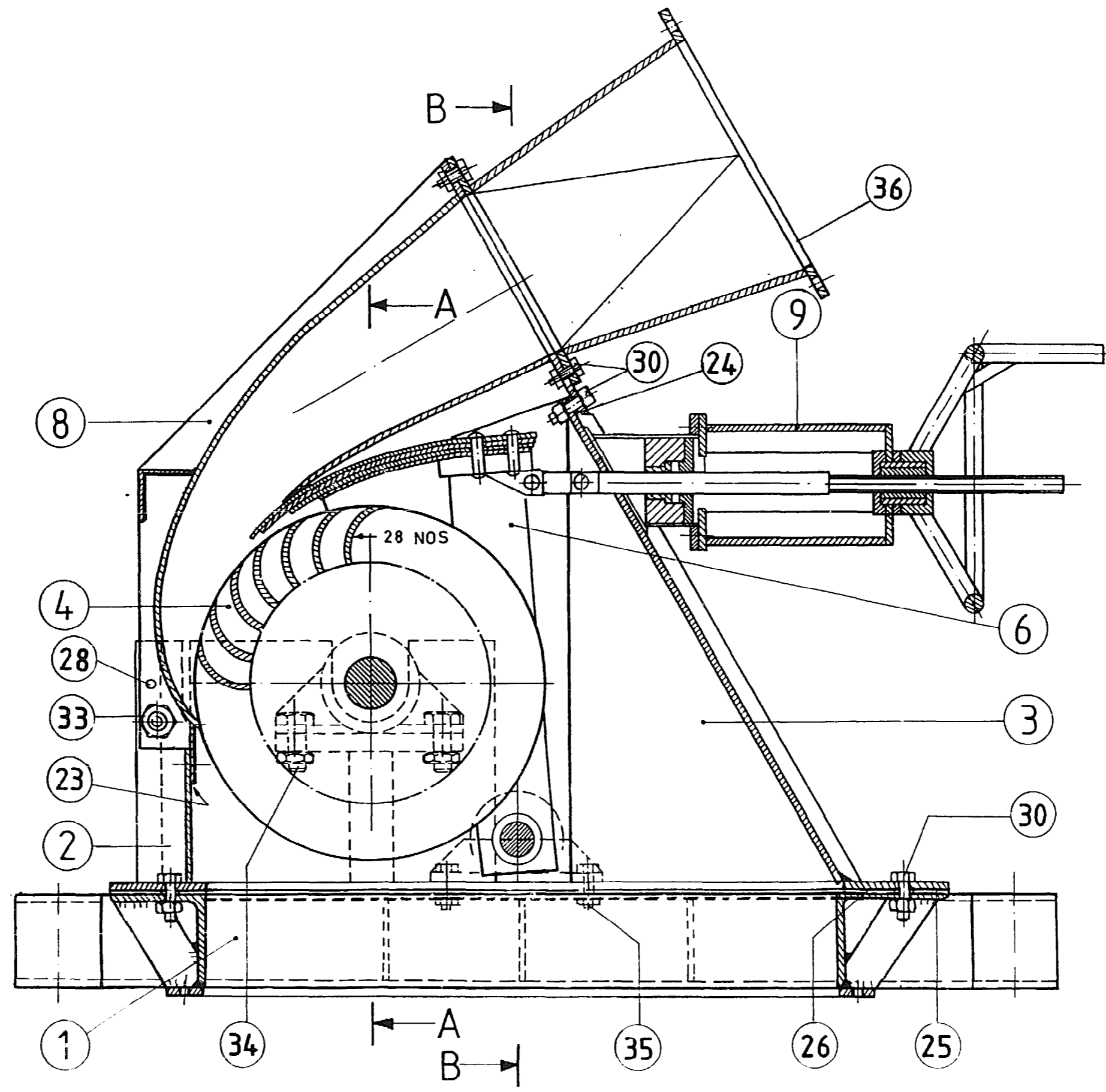
PART LIST

TURBINE ASSEMBLY

WITH HAND REGULATOR

00.1-1/00.2/00.3

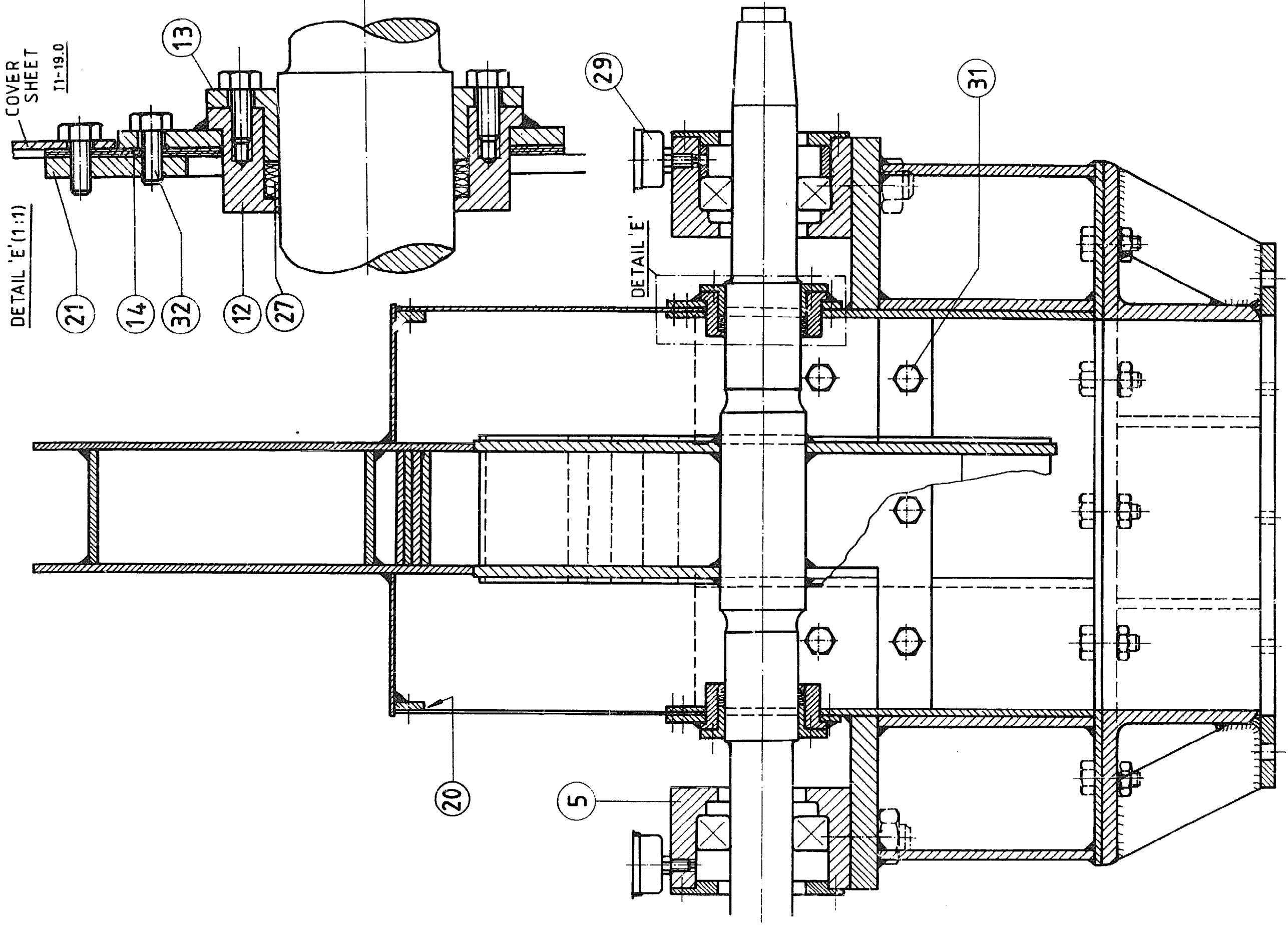
Alt Revised 29.7.92



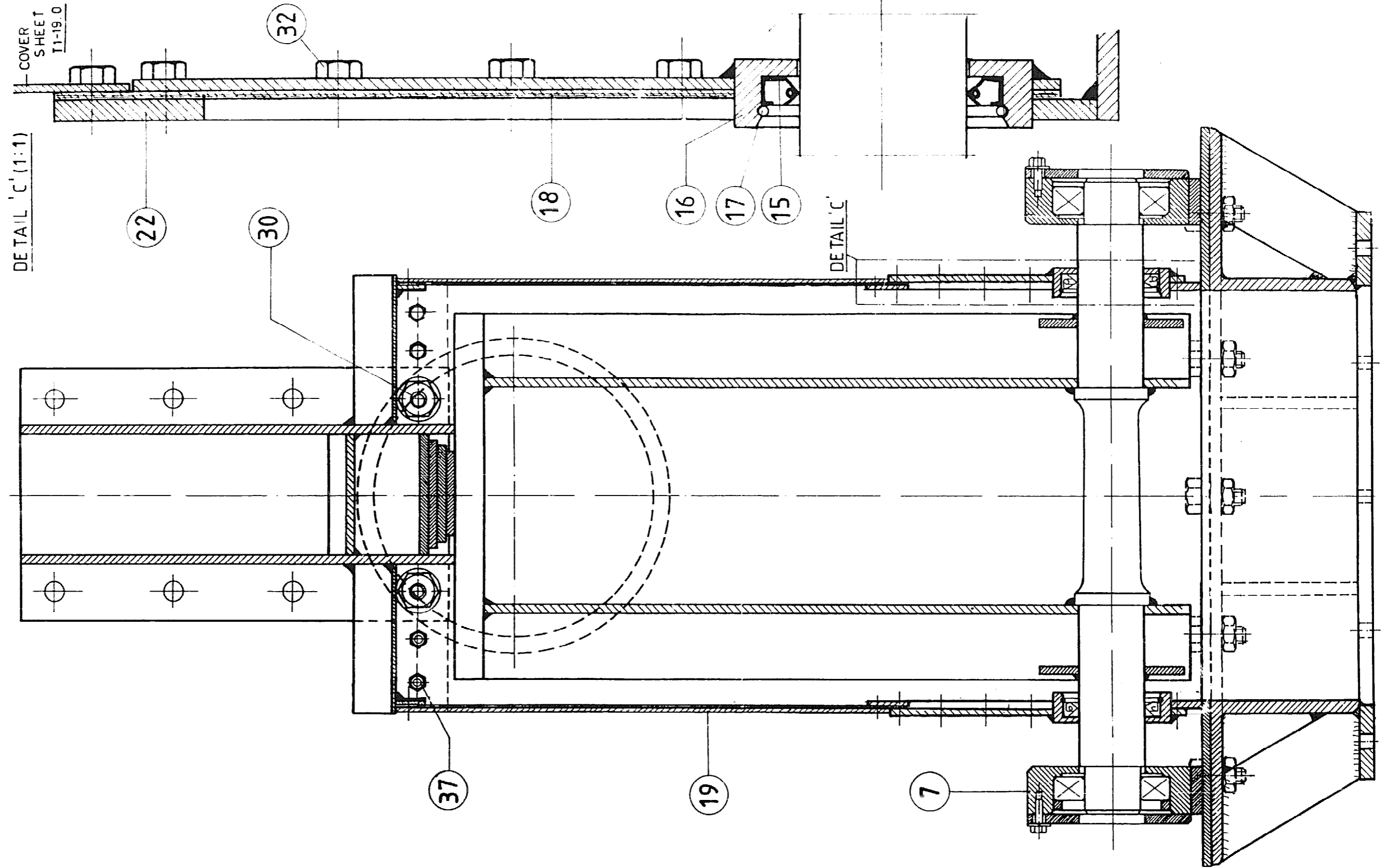
CF TURBINE ASSEMBLY 1:5
WITH HAND REGULATOR

T1-001-1

Revised 29.2.81.



Revised 29.7.82



SECTION B-B 1:2.5 (1:1)

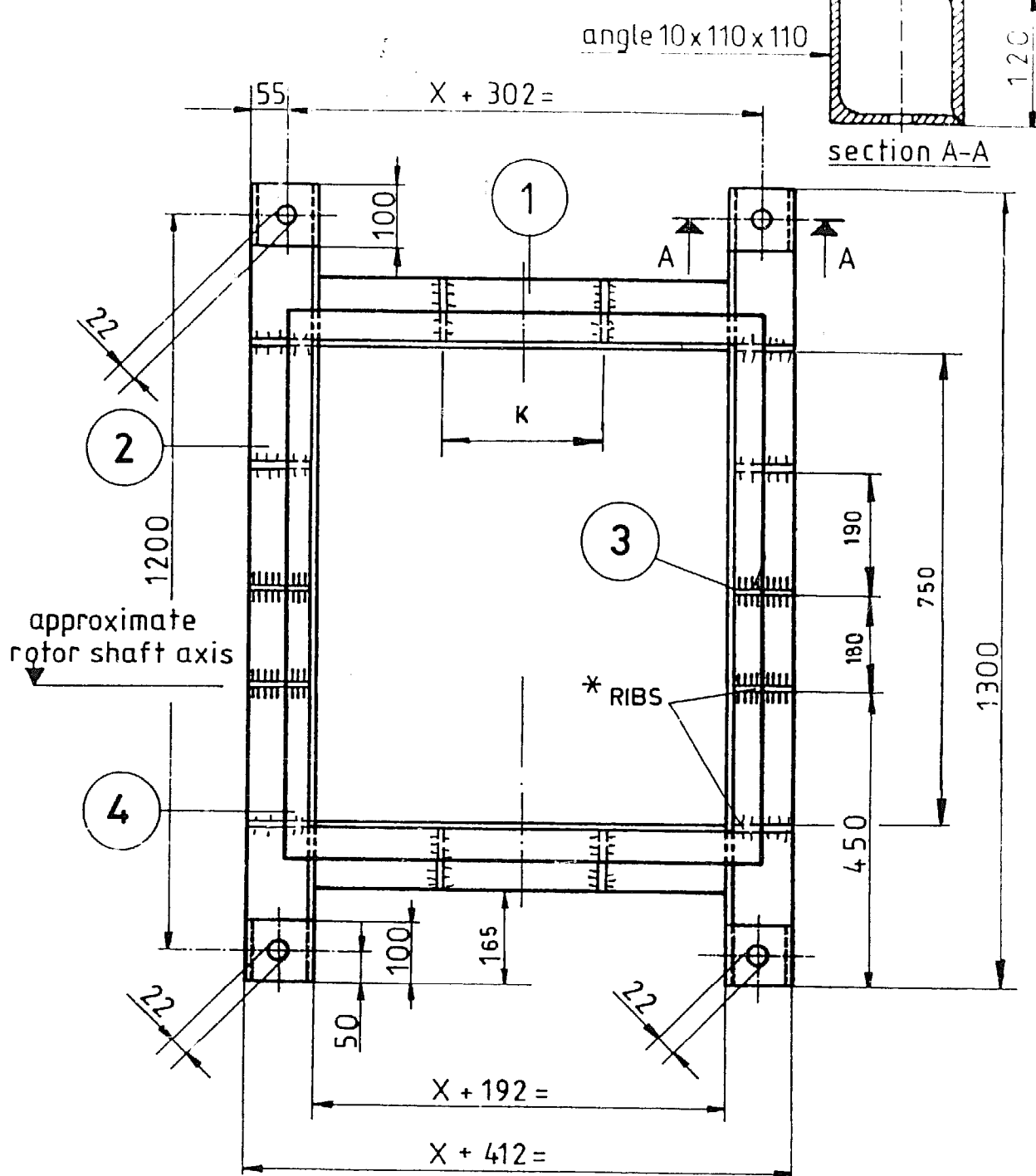
T1-00.3

POS	NO. OF ITEMS	ITEM	DRAWING NO.	SPECIFICATIONS	REMARKS
1	2	M.S. ANGLE 110 X 110 X 10 LENGTH: X +	T1-01.0		
2	2	M.S. ANGLE 110 X 110 X 10 LENGTH:	T1-01.0		
3	14	RIB OUT OF M.S. FLAT 8 X 50	T1-01.2		
4	2	DRAFT TUBE FLANGE	T1-01.1/1-4		
5	1	DRAFT TUBE	T1-01.3		
	2	DRAFT TUBE SUPPORT	T1-01.4		USED IN INST -ALLATION ONLY.
—	4	SUPPORTING STRIPS	T1-01.5		USED IN FINAL ASSEMBLY ONLY. DRG. NO. T1-00.1-1

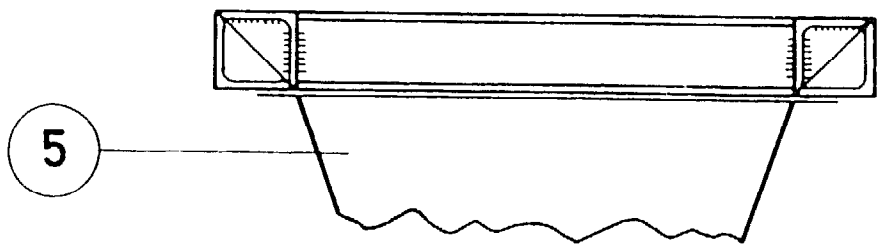
Revised 2.7.81

↑
CONSISTING OF

FOUNDATION FRAME



*weld after joining draft tube flange



SEE DRAWING NO. T1-01.1/1 TO T1-01.1/3 FOR THE VALUE OF 'K'

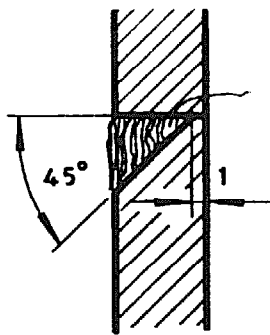
scale 1:10

Revised 27.2.92

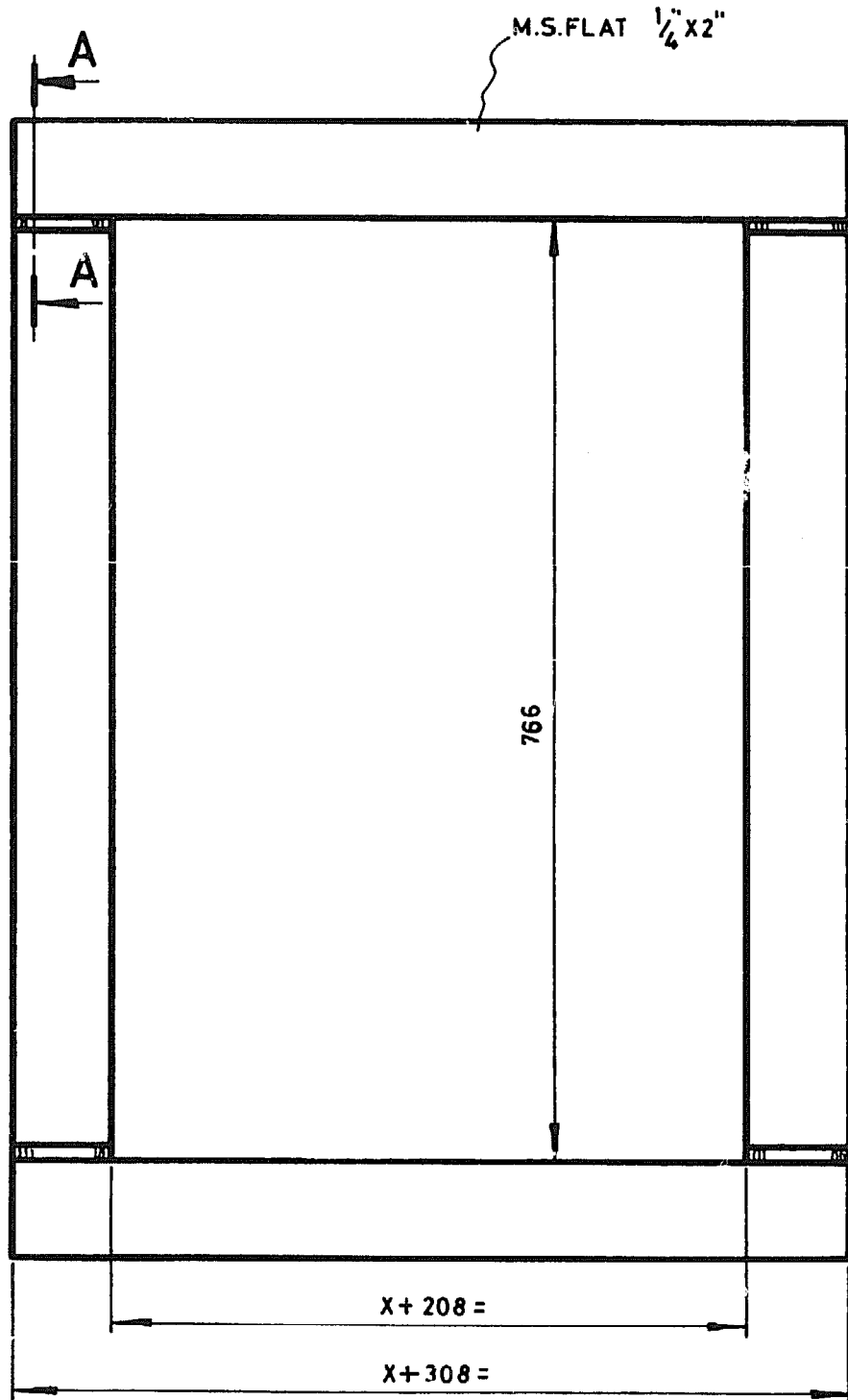
FOUNDATION FRAME

T1-01.0

SECTION A-A (2:1)



TACK WELD ONLY. FULL WELDING TO BE DONE IN ASSEMBLY WITH T1-01.0

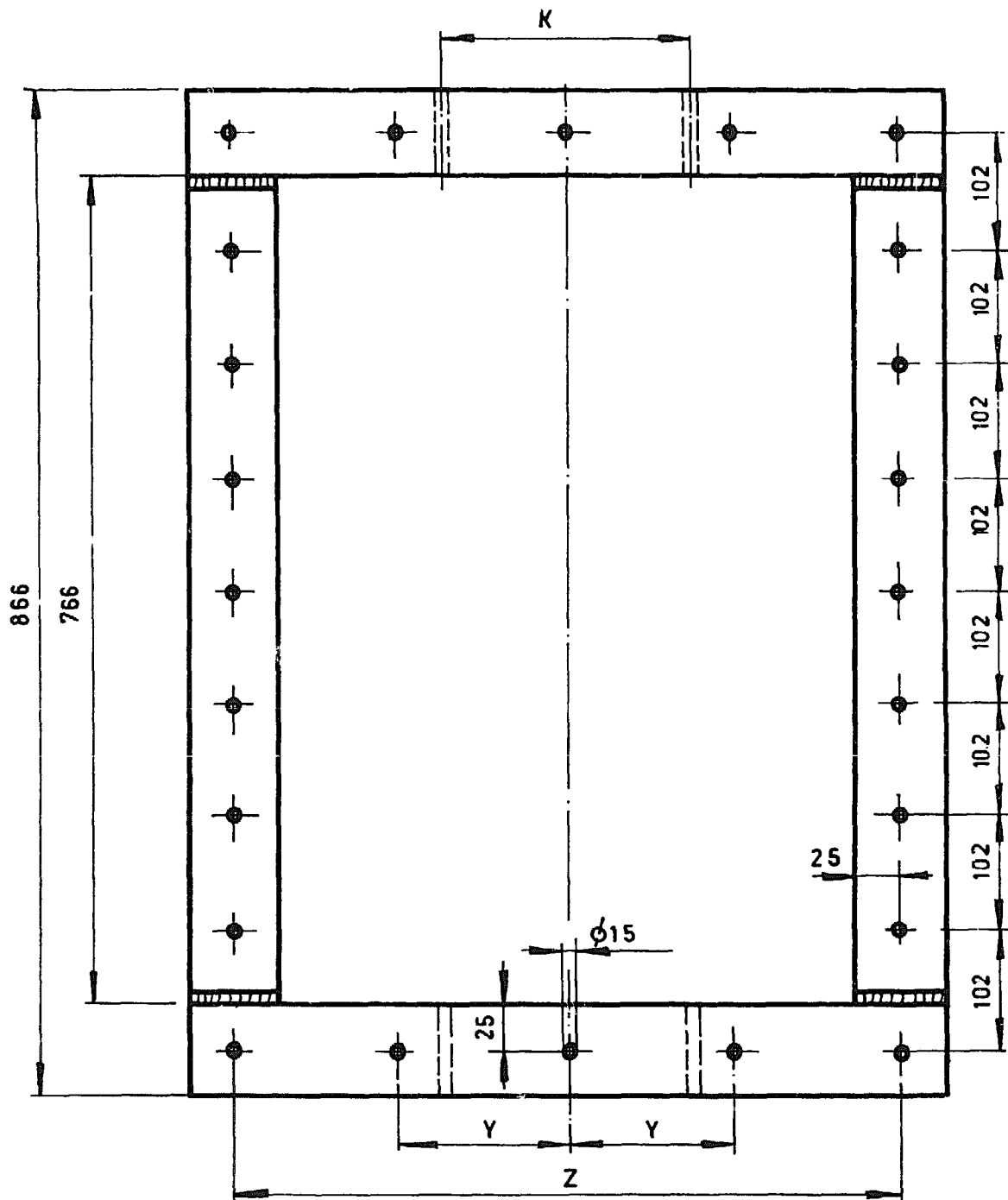


DRILLING ACCORDING TO DRAWING T1-01.1/1 - 1/4

Revised 27.7.82

DRAFTTUBE FLANGE

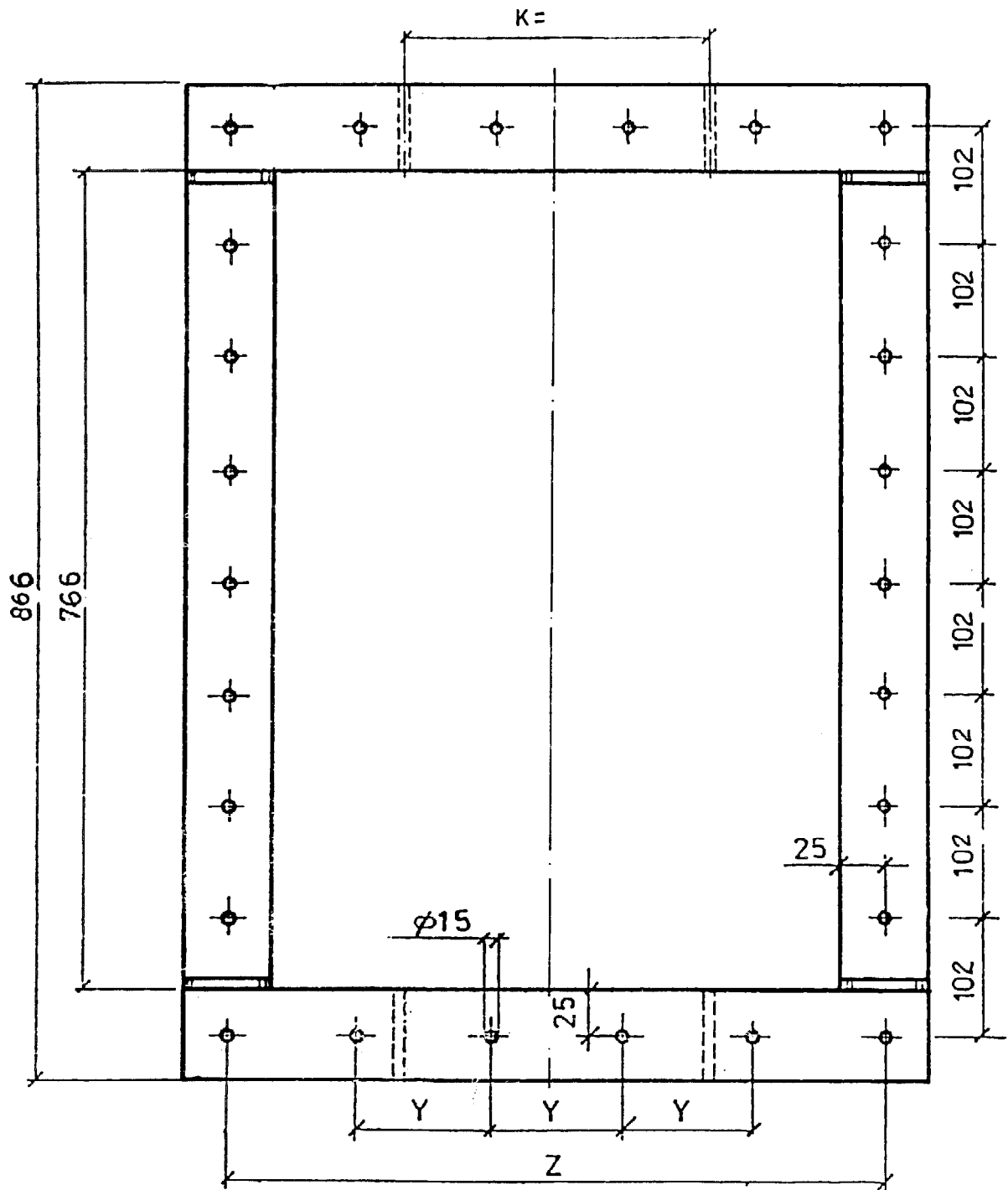
T1-01,1



	X 70	X 100	X 150
Y	80	92	110
Z	328	358	408
K	90	130	170

Revised 23.7.82

DRAFTTUBE FLANGE (X100,X150) T1-01,1/1 X 70

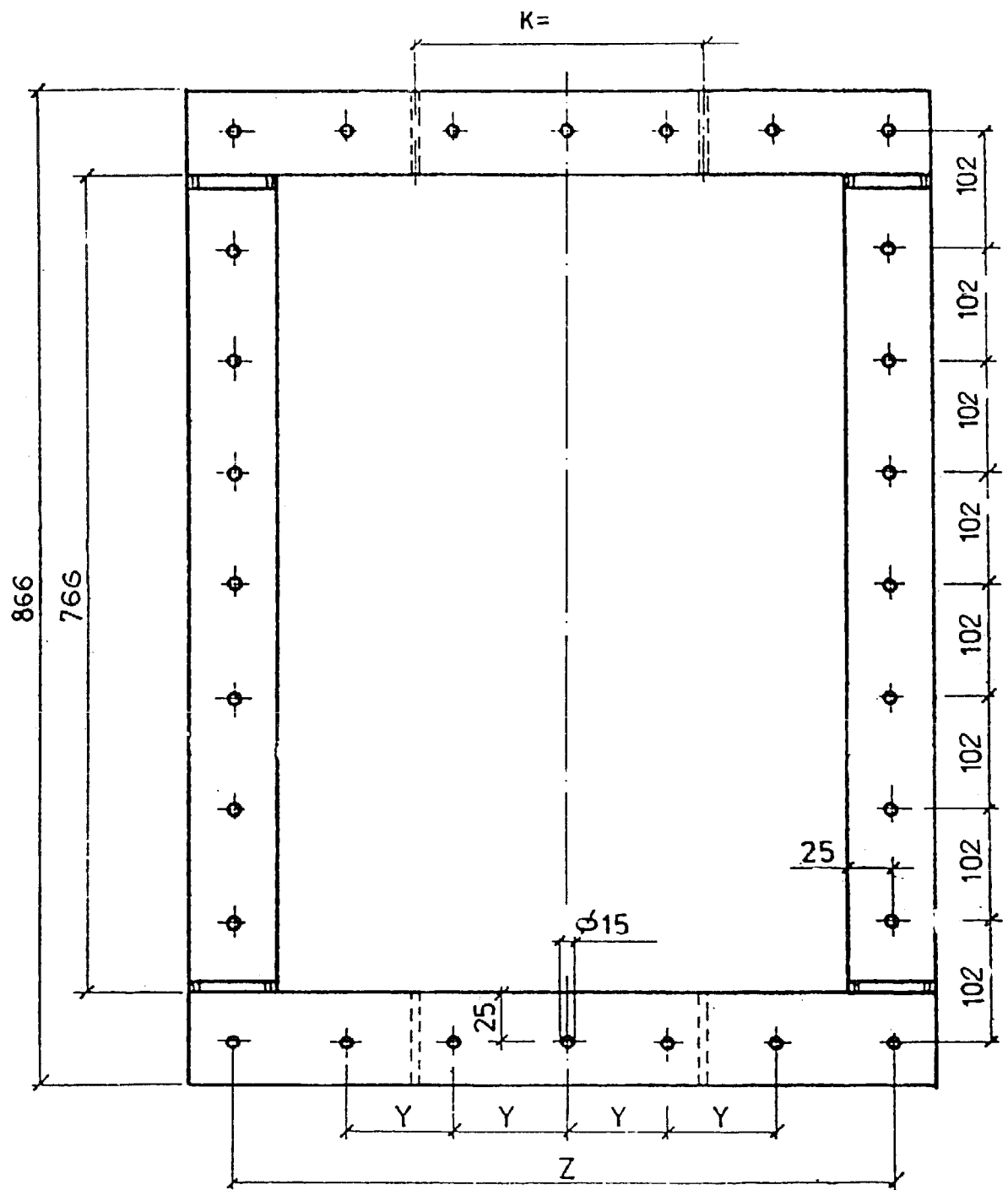
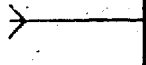


	X180	X200	X220
Y	90	94	98
Z	438	458	478
K	186	196	206

Revised 21.2.82

DRAFTTUBE FLANGE (X180, X200, X220)

T1-01.1/2

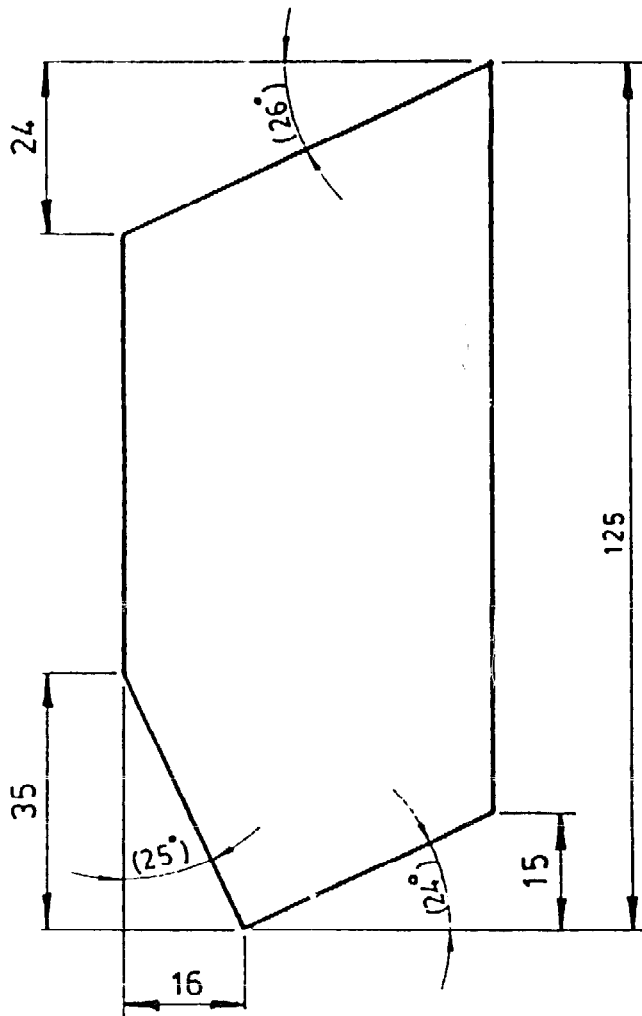


Revised 27.7.82-84

	X 300	X 360	X 400
Y	95	105	112
Z	558	618	658
K	250	284	296

DRAFTTUBE FLANGE (X300, X360, X400)

T1-01.1/3



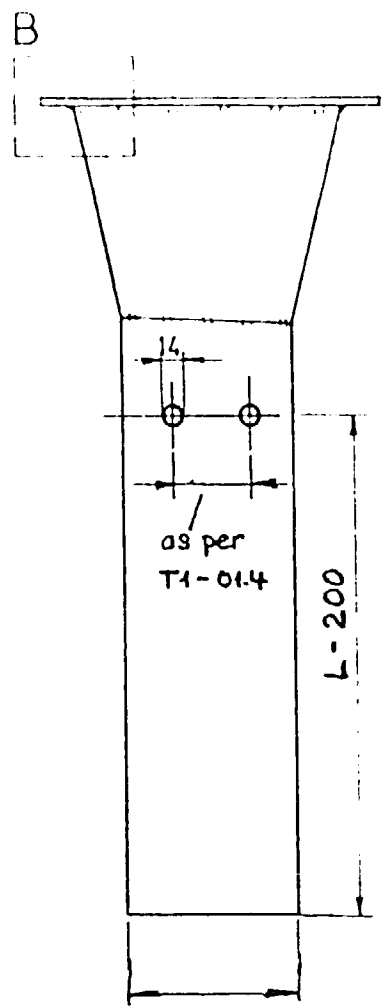
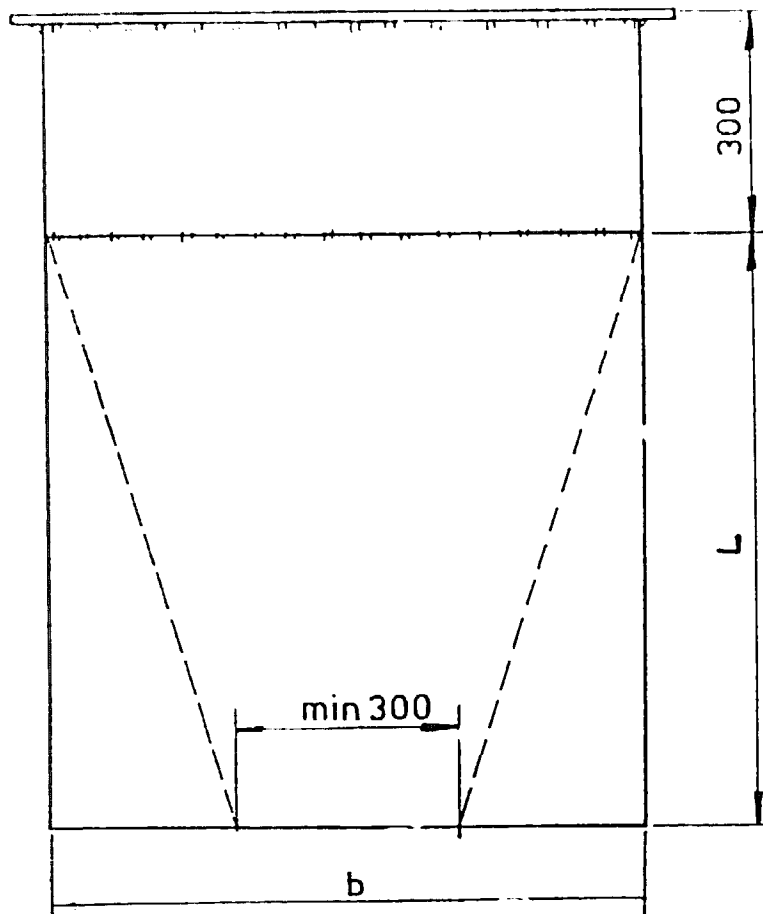
M.S. FLAT 6 X 50

14 .NOS

Revised 27.1.02 A

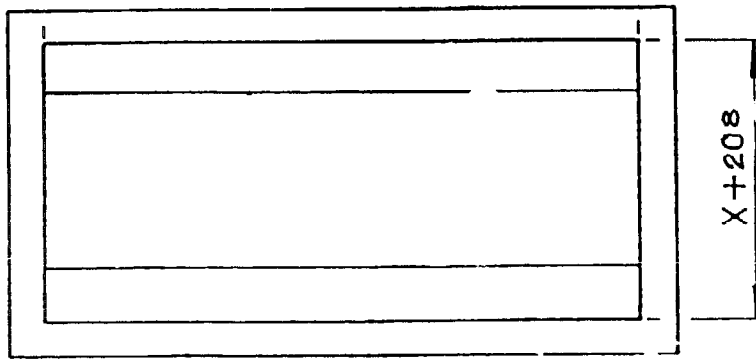
RIB
1:1

T1-01.2



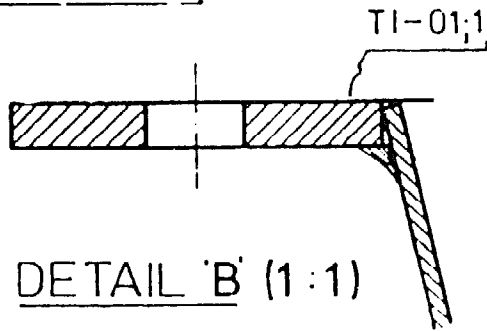
$$\text{width (dm)} = \frac{Q (l/s)}{10 \cdot b (\text{dm})}$$

790
(SHEET WIDTH)



MS. SHEET 2.5 mm

.NOS



DETAIL 'B' (1:1)

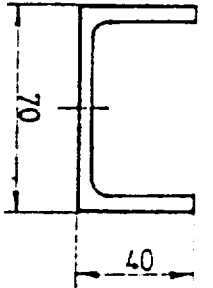
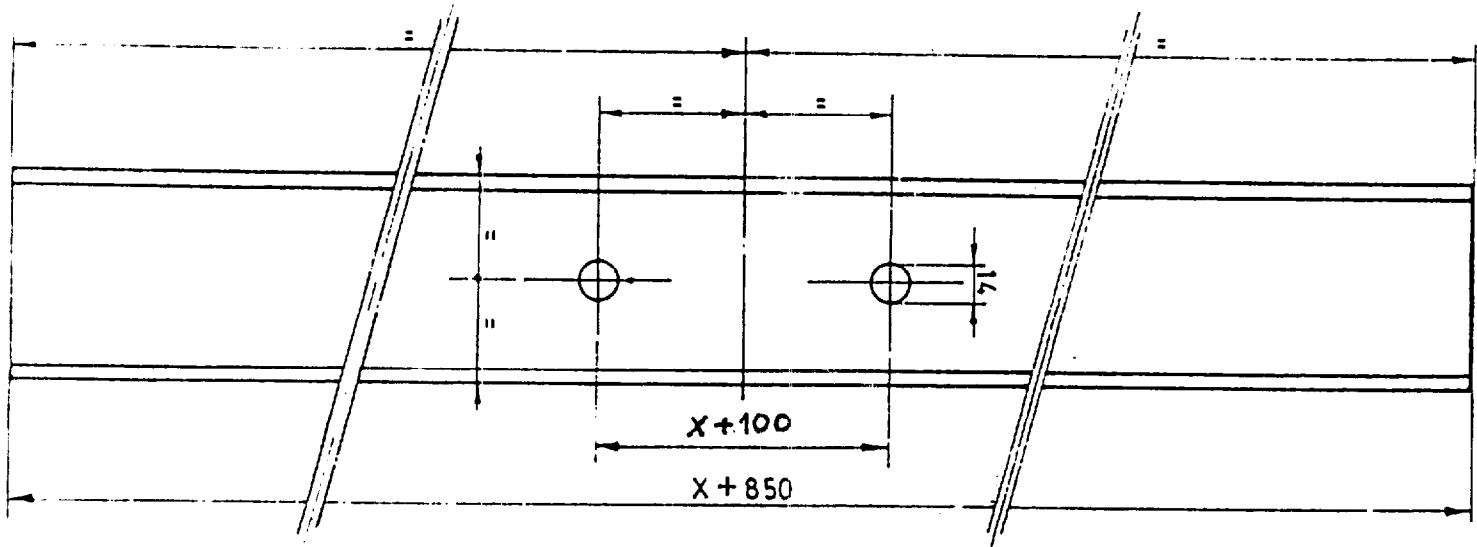
Revised 2.3.82

DRAFT TUBE

T1-01.3

Revised 22.2.82

DRAFT TUBE SUPPORT

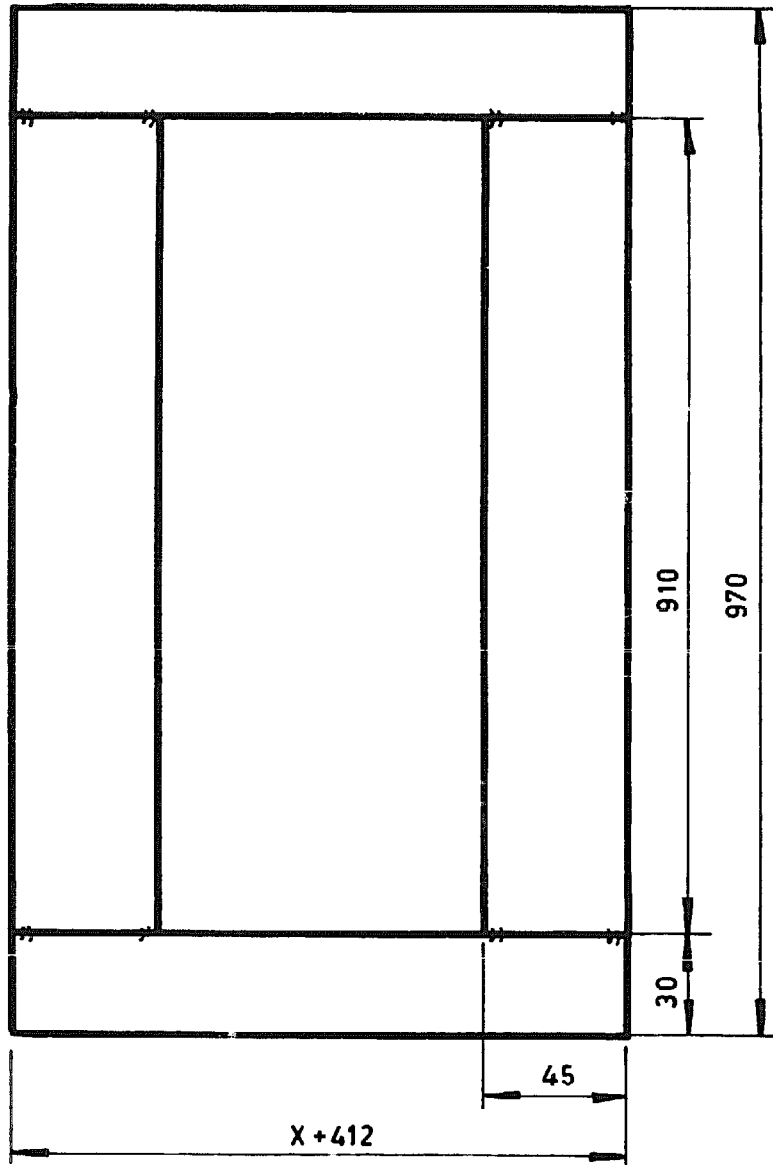


U CHANNEL 75 X 40
2. NOS.

T1 - 01.4

SCALE 1:25

MOUNT FLUSH WITH OUTSIDE EDGES OF
SUPPORT ASSEMBLY AND BAFFLE HOUSING
ASSEMBLY ON BASE FRAME DURING FINAL
ASSEMBLY. SPOT WELD AFTER ASSEMBLY.



3.15 MM SHEET : 2 STRIPS 45 x 910
2 STRIPS 30 x X+412

Revised 28.9.21 A

SUPPORTING STRIPS

T1- 01,5

POS	NO.OF ITEMS	ITEM	DRAWING NO.	SPECIFICATIONS	REMARKS
1	1	SUPPORT BASE	T1-02.1	M.S.Plate 6mm	—
2	1	SUPPORT FRONT	T1-02.2		Sub assay
3	2	SUPPORT MEMBER	T1-02.3	M.S.Plate 25mm U.Chan.100 X 50	—
4	2	SUPPORT PANEL	T1-02.4	M.S.Plate 6mm	—
5	2	SEALING PLATE	T1-02.5	M.S.Plate 6mm	—

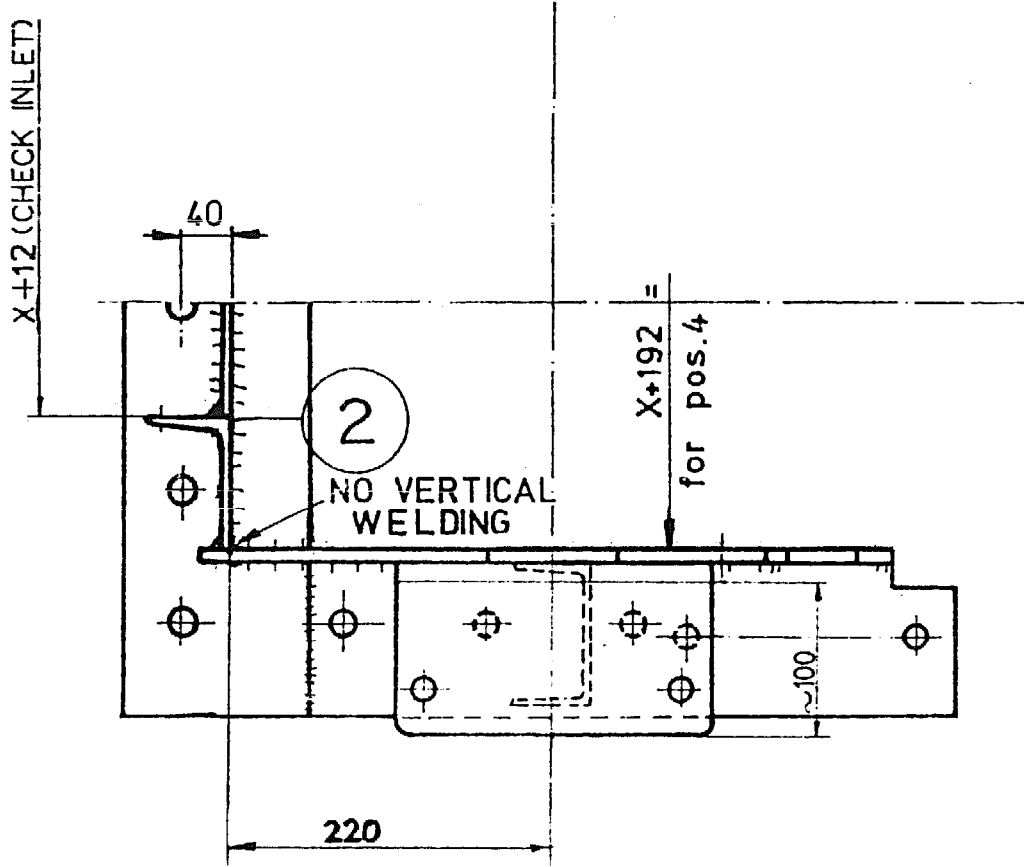
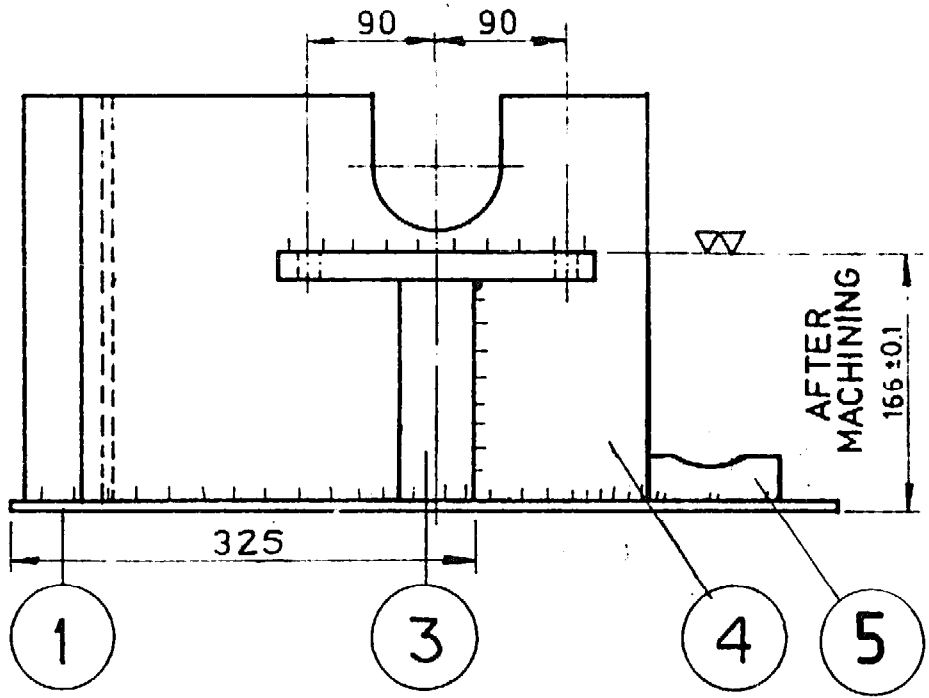
↑
CONSISTING OF

SUPPORT ASSEMBLY

PARTS LIST

T1-02.0

Revised 27.7.82

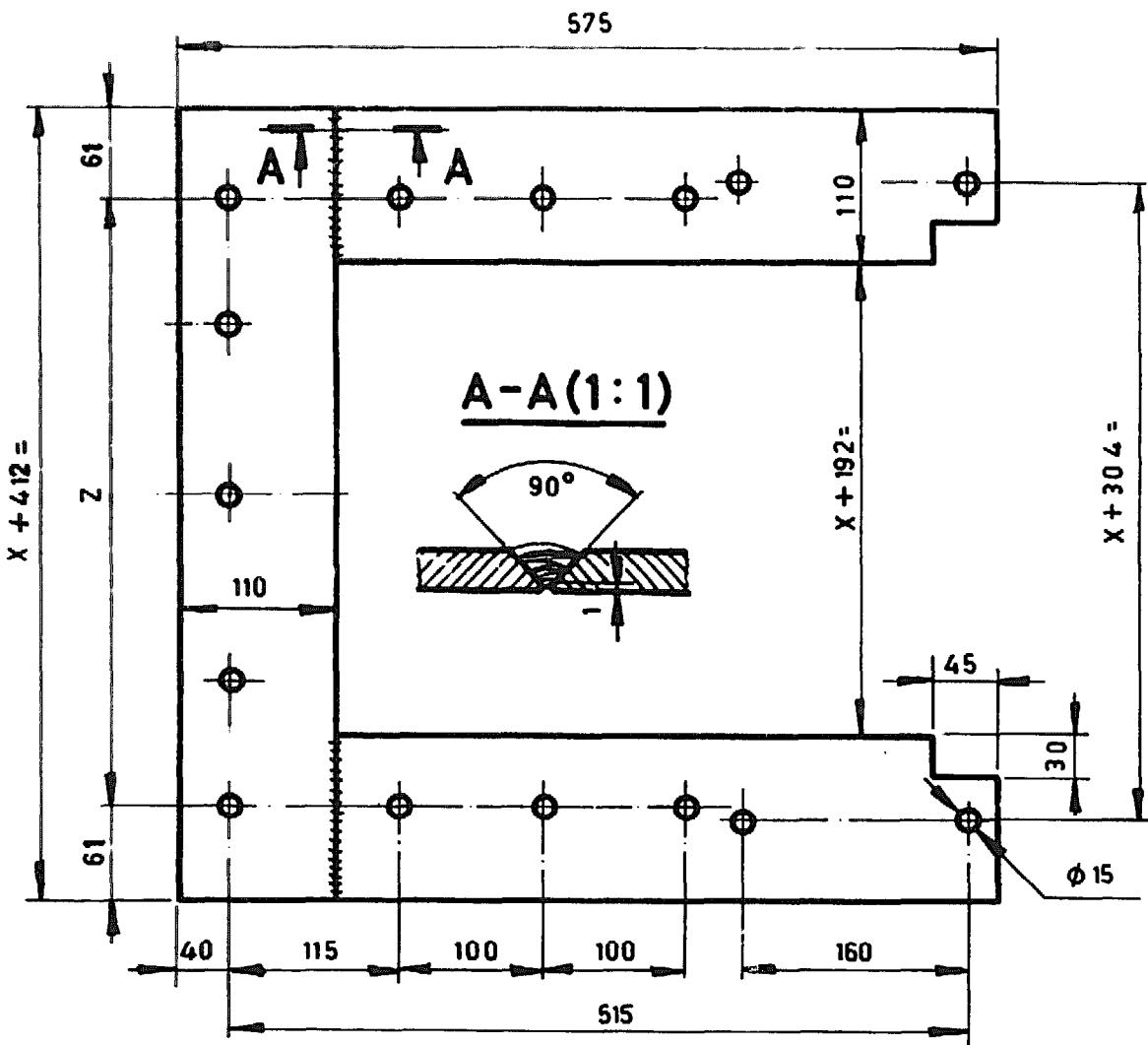


Revised 29.7.82 *AM*

SUPPORT ASSEMBLY

T1-02.0

SCALE 1:5



HOLE CENTERS

6 MM SHEET
1PC

	Z										
X 70	90	+	90	+	90	+	90				
X 100	98	+	97	+	97	+	98				
X 150	88	+	88	+	88	+	88				
X 180	94	+	94	+	94	+	94				
X 200	98	+	98	+	98	+	98				
X 220	102	+	102	+	102	+	102				
X 300	100	+	100	+	95	+	95	+	100	+	100
X 360	109	+	108	+	108	+	108	+	108	+	109
X 400	105	+	125	+	115	+	115	+	125	+	105

Revised 29.7.82 H

SUPPORT BASE

T1-02,1

1:5

POS	NO. OF ITEMS	ITEM	DRAWING NO.	SPECIFICATIONS	REMARKS
1	1	M.S. PLATE 6 X 150 LENGTH: X + 12	T1-02.2		
2	2	M.S. ANGLE 60 X 90 X 6 LENGTH: 280	T1-02.2		

Revised 29.7.82. adf

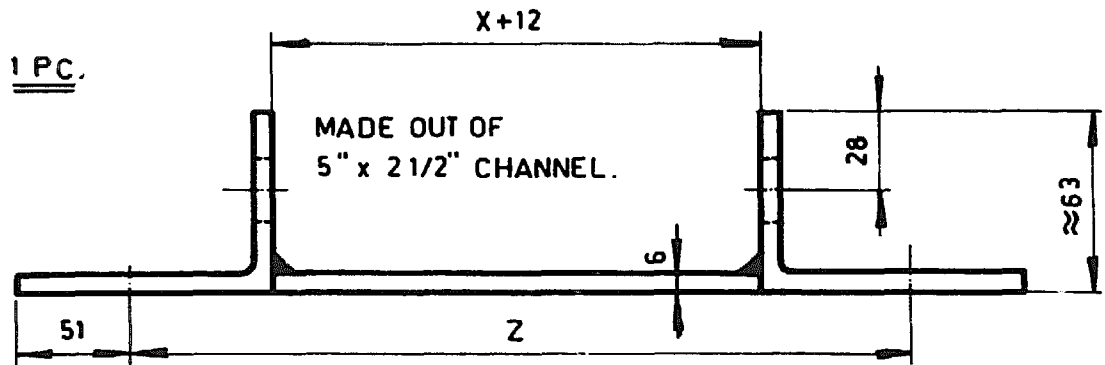
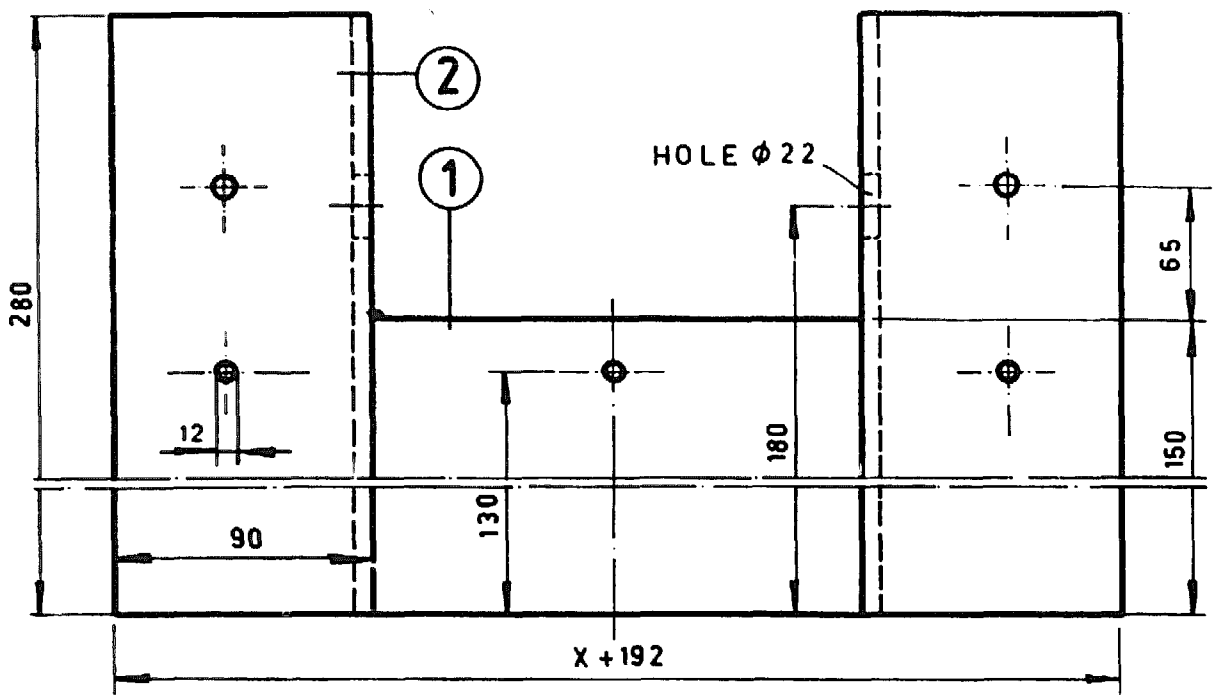


CONSISTING OF

SUPPORT FRONT

PARTS LIST

T1-02.2



- HOLE ($\phi 22$) SHOULD BE DRILLED BEFORE WELDING.

- DRILL HOLES ($\phi 12$) AFTER WELDING.

1 PC

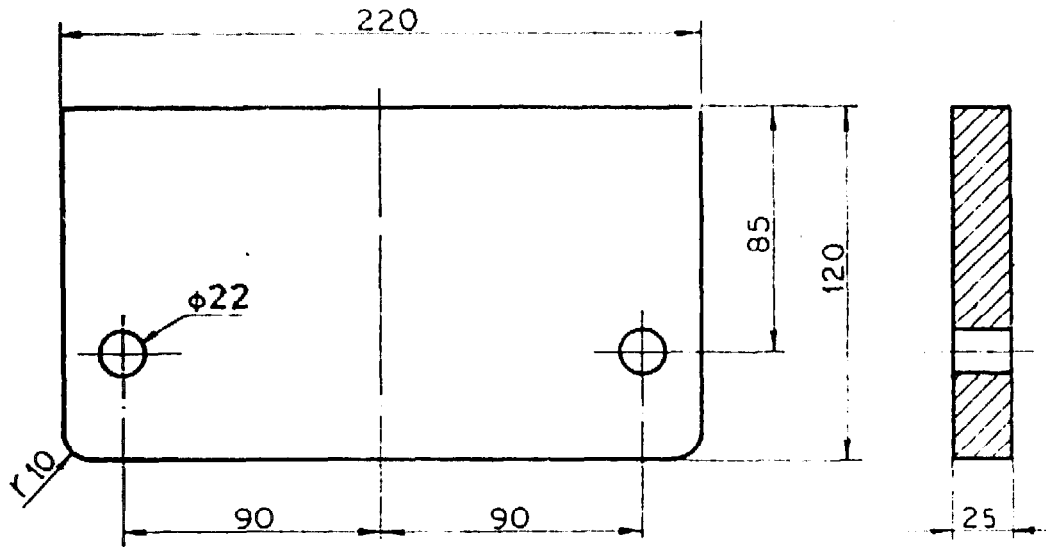
	Z						HOLE CENTERS	
X 70	+	80	+	80	+	80	+	
X 100	+	95	+	95	+	95	+	
X 150	+	80	+	80	+	80	+	
X 180	+	90	+	90	+	90	+	
X 200	+	97	+	96	+	97	+	
X 220	+	78	+	77	+	77	+	78
X 300	+	98	+	97	+	97	+	98
X 360	+	90	+	90	+	90	+	90
X 400	+	98	+	98	+	98	+	98

Revised 29.7.54. 44

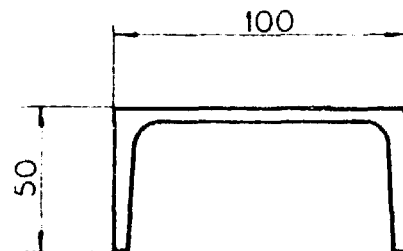
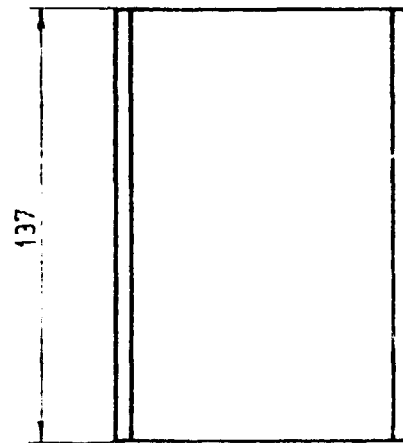
SUPPORT FRONT

T1-02.2

1 : 2.5



2 PIECES
M.S. PLATE 25mm



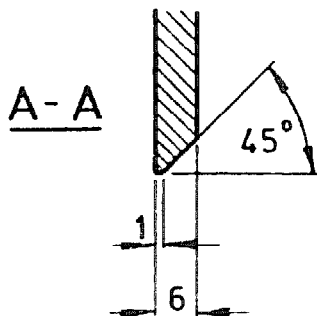
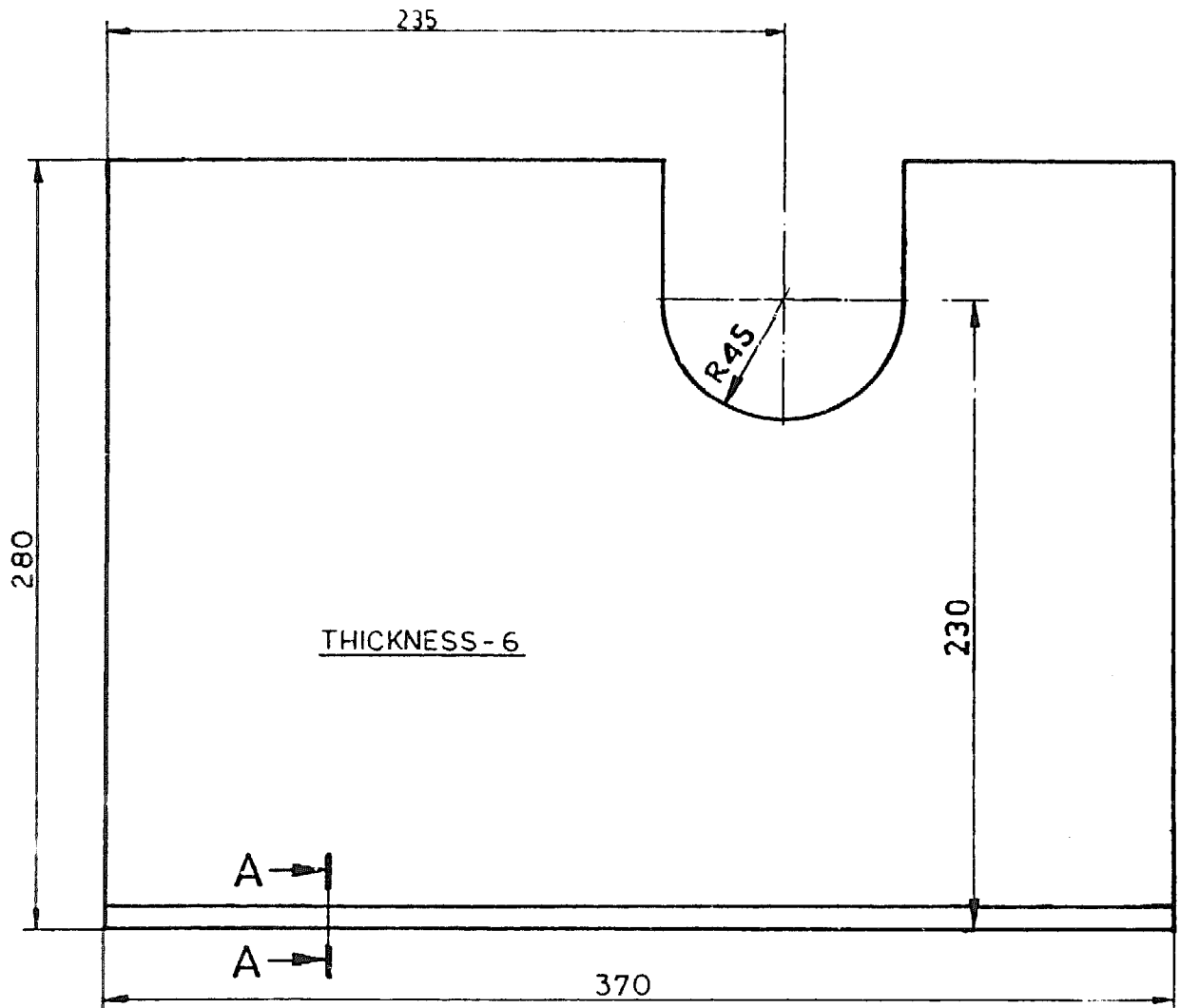
2 PIECES
U CHANNEL 4" X 2"

Revised 29.9.82 AJ

SUPPORT MEMBER

T1-02.3

SCALE 1:2.5



2 PIECES

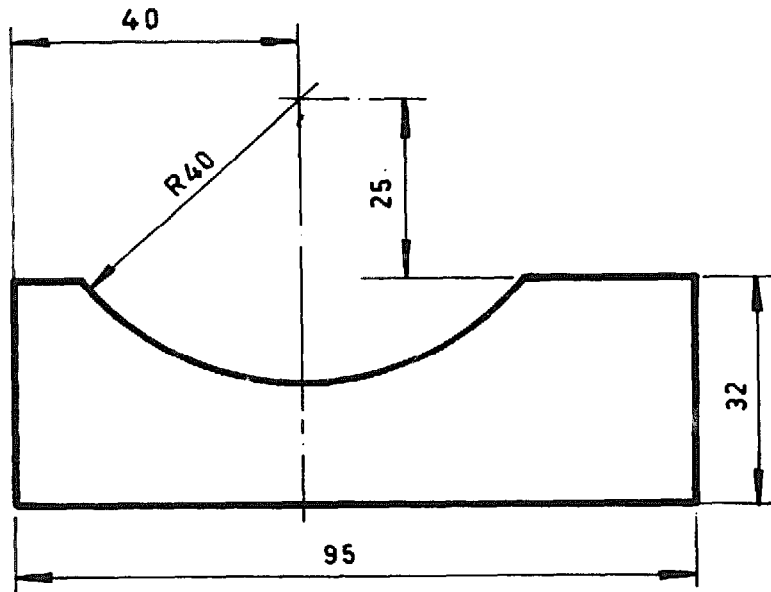
NB: MAKE CHAMFER ON THE OTHER SIDE OF NEXT SHEET.

Revised 29.7.81/df

SUPPORT PANEL

T1-02.4

SCALE 1:2,5



6. MM FLAT
2. NOS

Revised 29.7.82 of

SEALING PLATE

T1-02,5

1:1

POS.	NO OF ITEMS	ITEM	DRAWING NO	SPECIFICATIONS	REMARKS
1	1	BAFFLE HOUSING BASE	T1-03.1	MS Plate 6mm	
2	2	BAFFLE HOUSING PANEL	T1-03.2	M.S. Plate 6mm	
3	1	BAFFLE HOUSING TOP	T1-03.3	M.S. Plate 6mm	

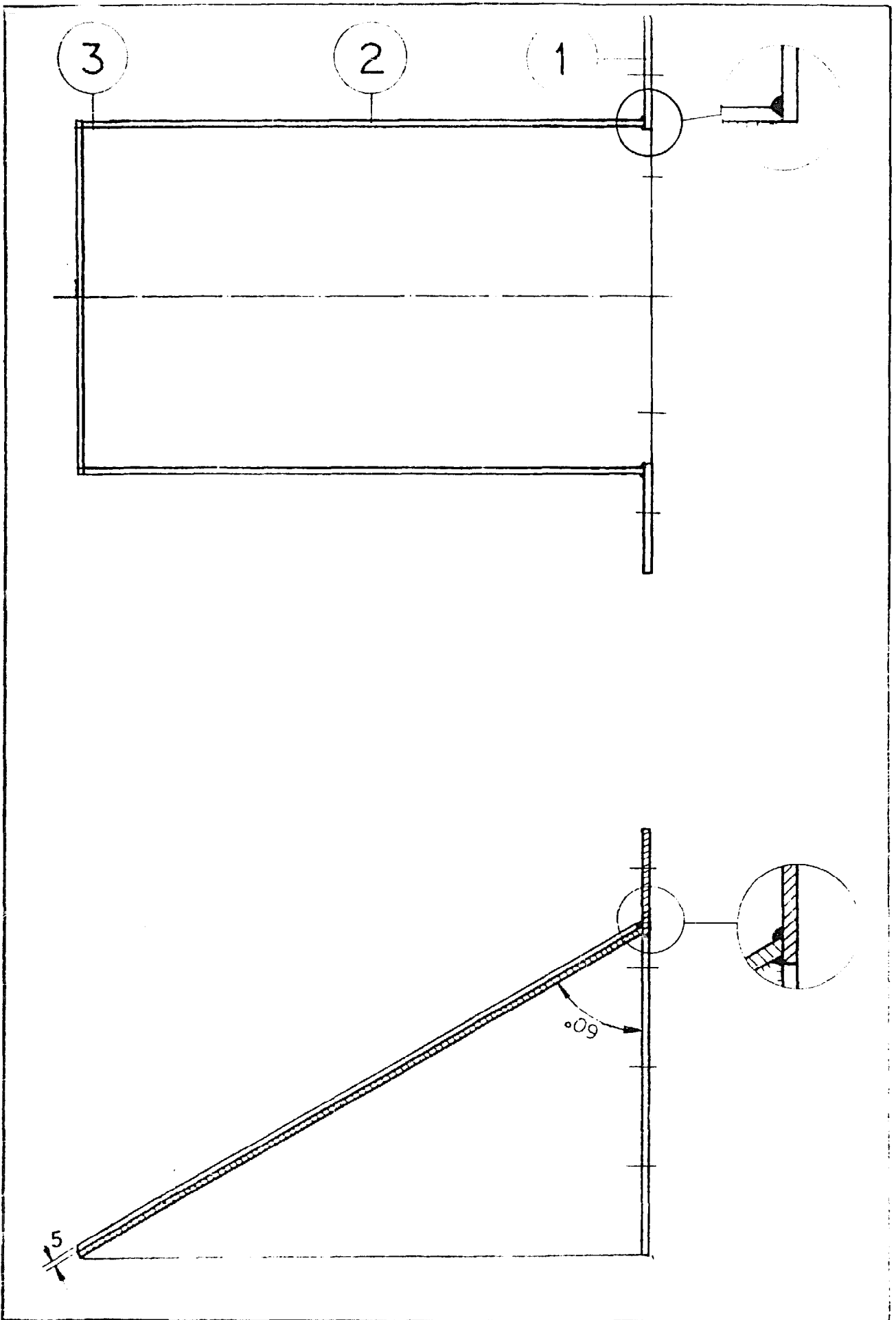
Revised. 29.7.82 M

↑
CONSISTING OF

BAFFLE HOUSING ASSEMBLY

PARTS LIST

T1-03.0

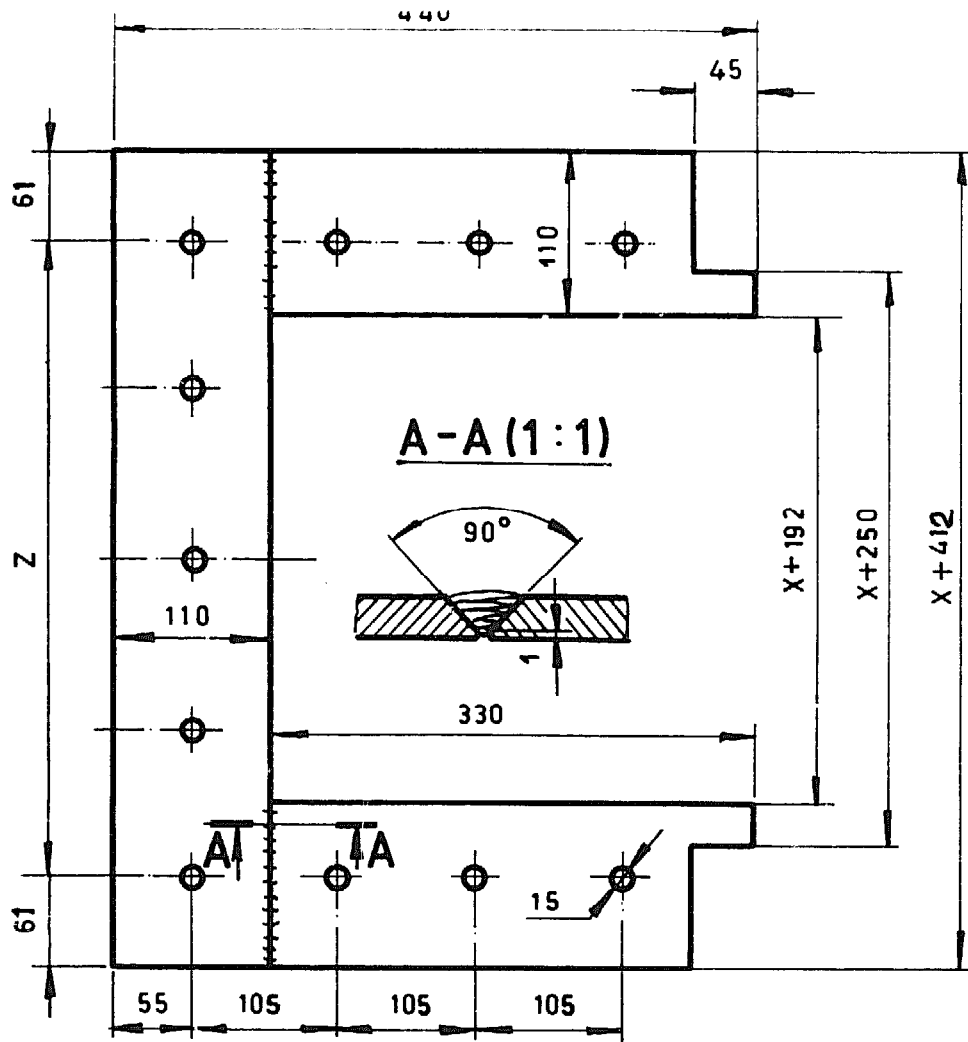


Revised 29.7.92 ad

BAFFLE HOUSING ASS.

T1-030

SCALE 1:5



	HOLE CENTERS												
	Z												
X 70	+	90	+	90	+	90	+	90	+				
X 100	+	98	+	97	+	97	+	98	+				
X 150	+	88	+	88	+	88	+	88	+				
X 180	+	94	+	94	+	94	+	94	+				
X 200	+	98	+	98	+	98	+	98	+				
X 220	+	102	+	102	+	102	+	102	+				
X 300	+	100	+	100	+	95	+	95	+	100	+	100	+
X 360	+	109	+	108	+	108	+	108	+	108	+	109	+
X 400	+	105	+	125	+	115	+	115	+	125	+	105	+

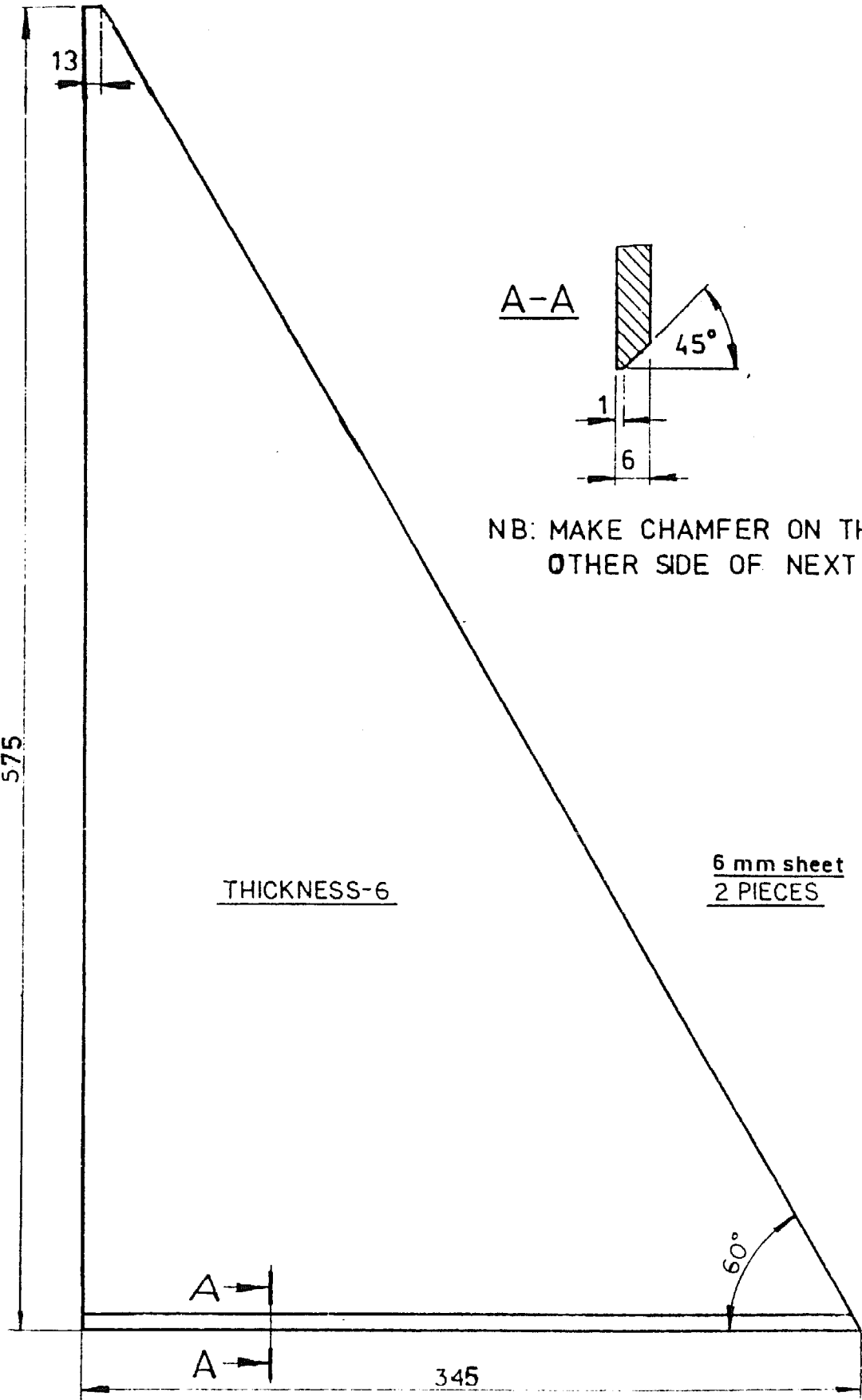
Revised 29.7.82 ad.

BAFFLE HOUSING BASE

T1-03.1

1:5

Revised 29.7.92 JPL

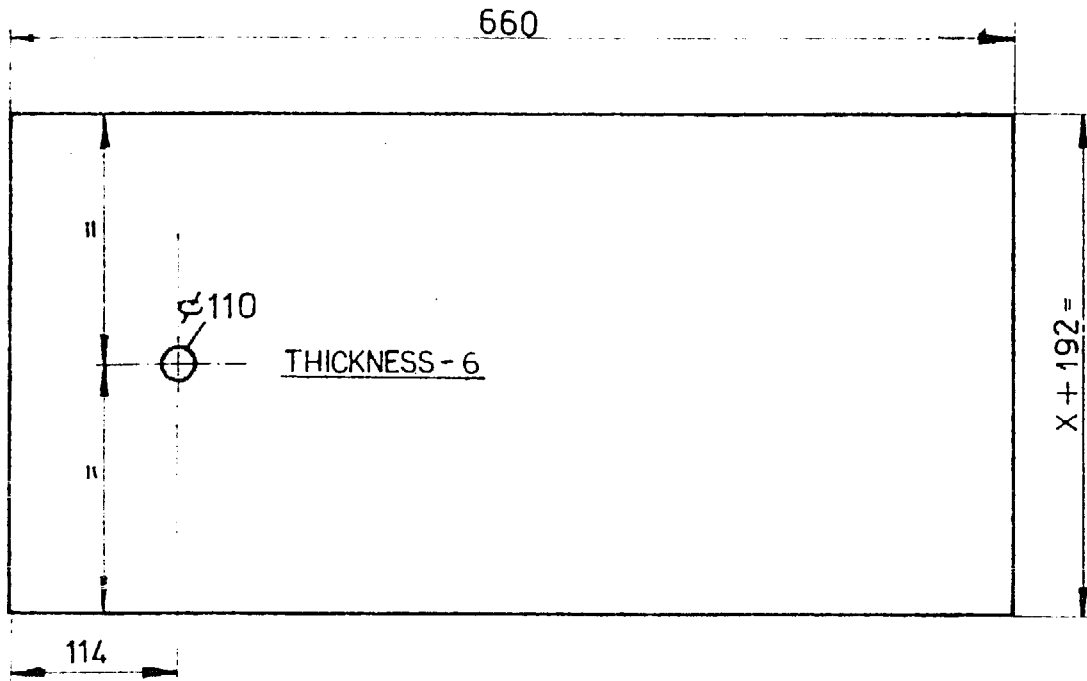


NB: MAKE CHAMFER ON THE OTHER SIDE OF NEXT SHEET.

BAFFLE HOUSING PANEL

T1-03.2

SCALE 1:2.5



6 mm sheet

1 PC

Revised 29.7.92 by

BAFFLE HOUSING TOP

T1-033

SCALE 1:5

POS	NO. OF ITEMS	ITEM	DRAWING NO.	SPECIFICATIONS	REMARKS
1	1	ROTOR SHAFT	T1-04.1	M.S. Rod ϕ 64	
2	2	ROTOR DISK	T1-04.2	M.S. Plate 8mm	
3	28	ROTOR BLADE	T1-04.3	2.5 MM SHEET	
4*	1	ROTOR INTERMEDIATE DISK	T1-04.4	M.S. Plate 6mm	
<p>*ONLY REQUIRED FOR TYPES 220, 300, 360 AND 400 FOR TYPE 200 WITH HEAD ABOVE 8mm AND FOR TYPE 180 WITH HEAD ABOVE 11m</p>					

Revised 29.7.82 Add.

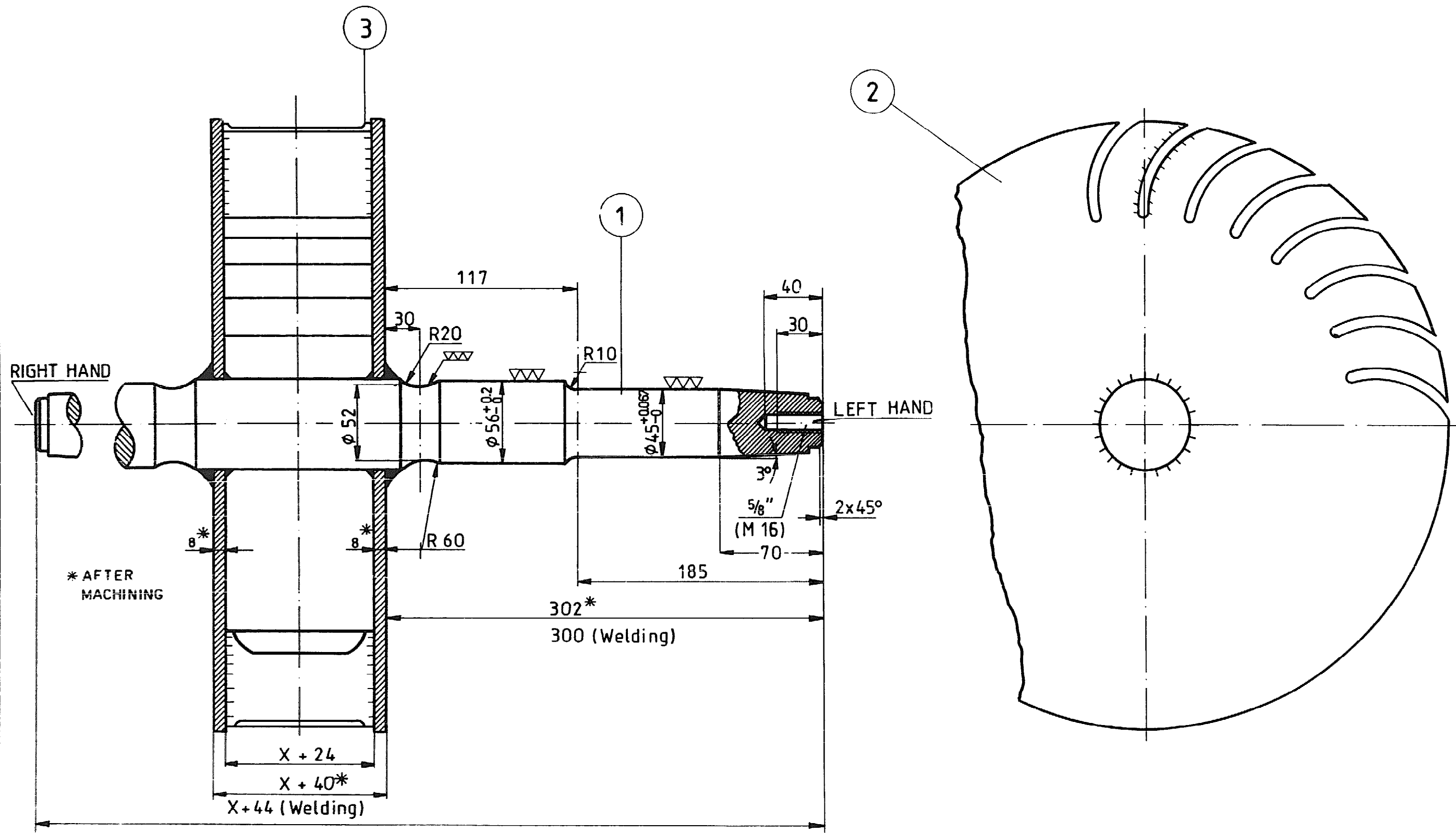


↑ CONSISTING OF

ROTOR SHAFT ASSEMBLY

PARTS LIST

T1-04.0



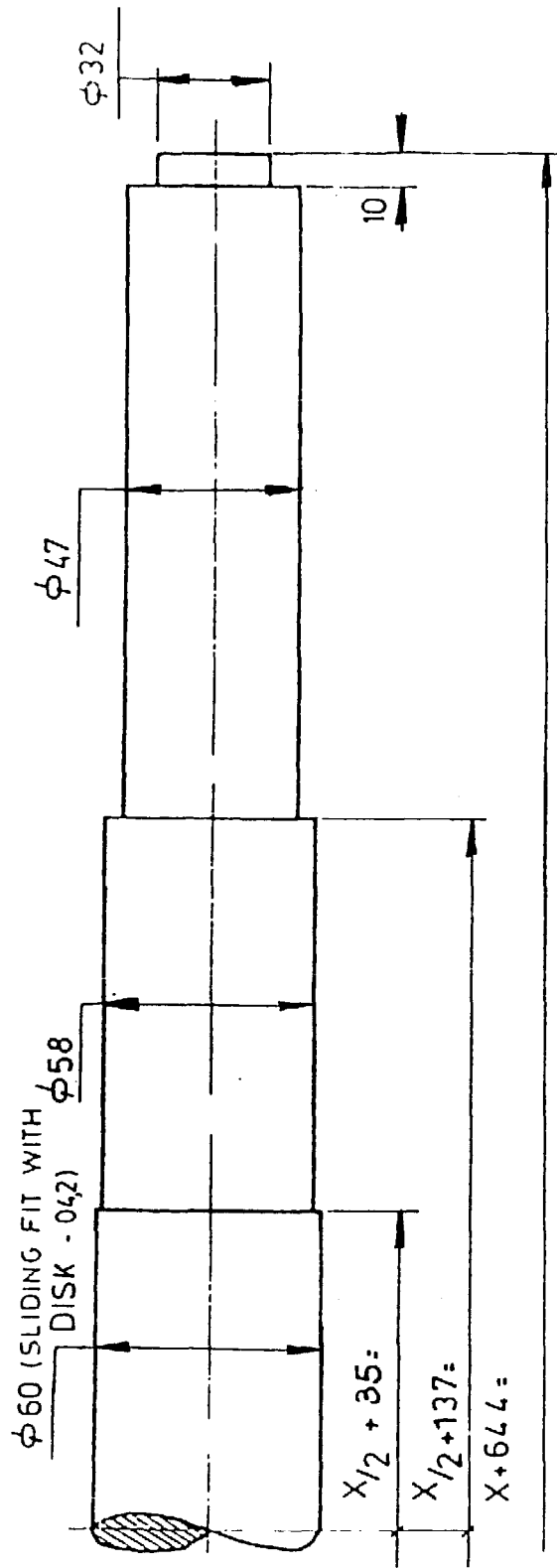
Revised 24.7.04

ROTOR ASSEMBLY

T1-04.0

SCALE 1 : 2.5

Revised 9.8.82 *ML*

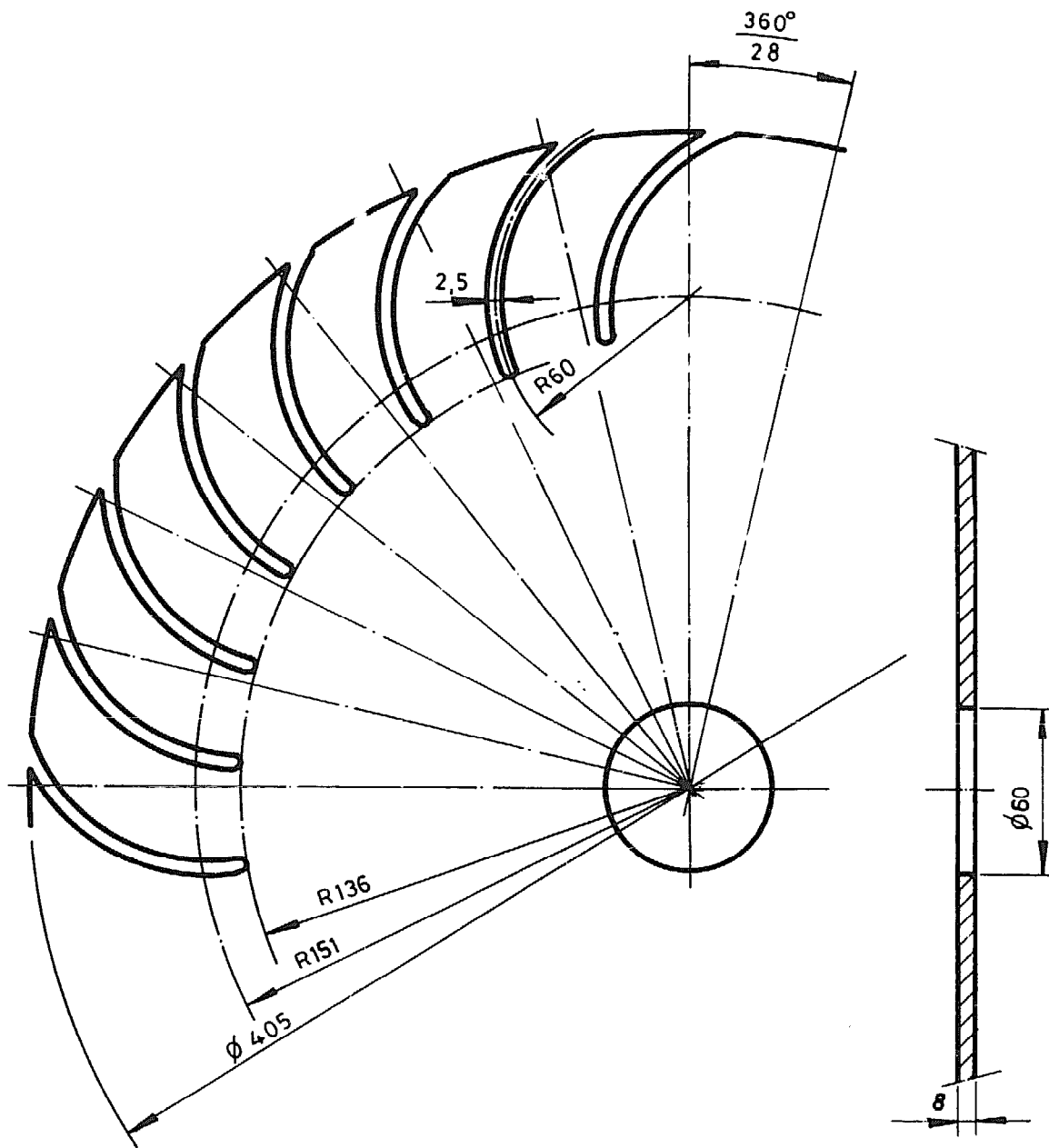


(PREMACHINED)

ROTOR SHAFT

SCALE 1:2

T1-04.1



2.PCS

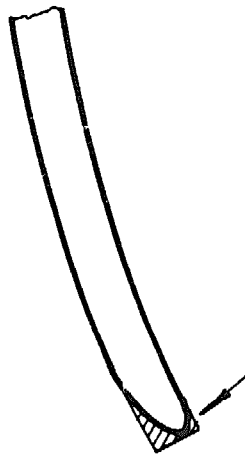
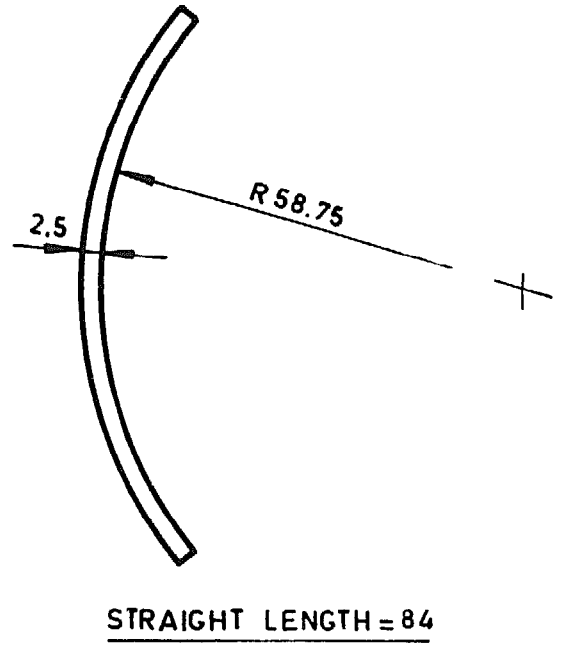
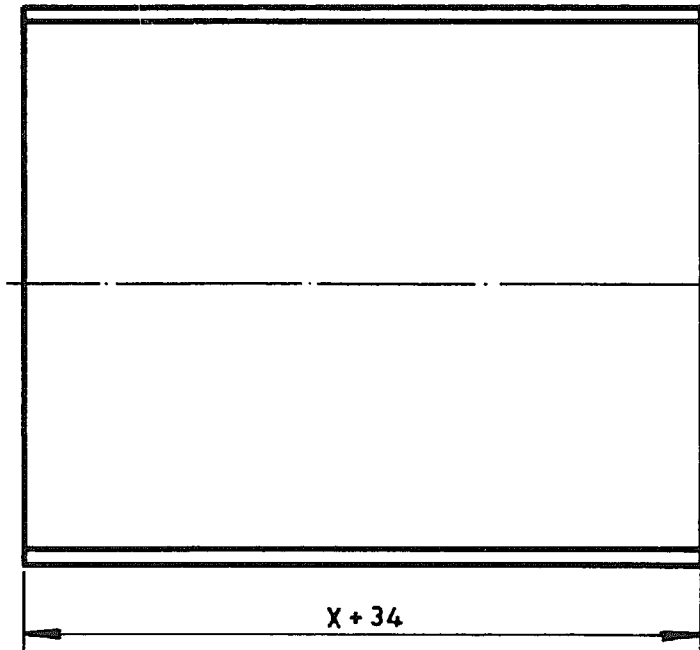
NOTE: $\frac{360^\circ}{28}$ ANGLE SHOULD BE MEASURED BY MILLING MACHINE.

Revised 29.7.82

ROTOR DISK

T1-04.2

SCALE 1:2



M.S SHEET
28 PCS

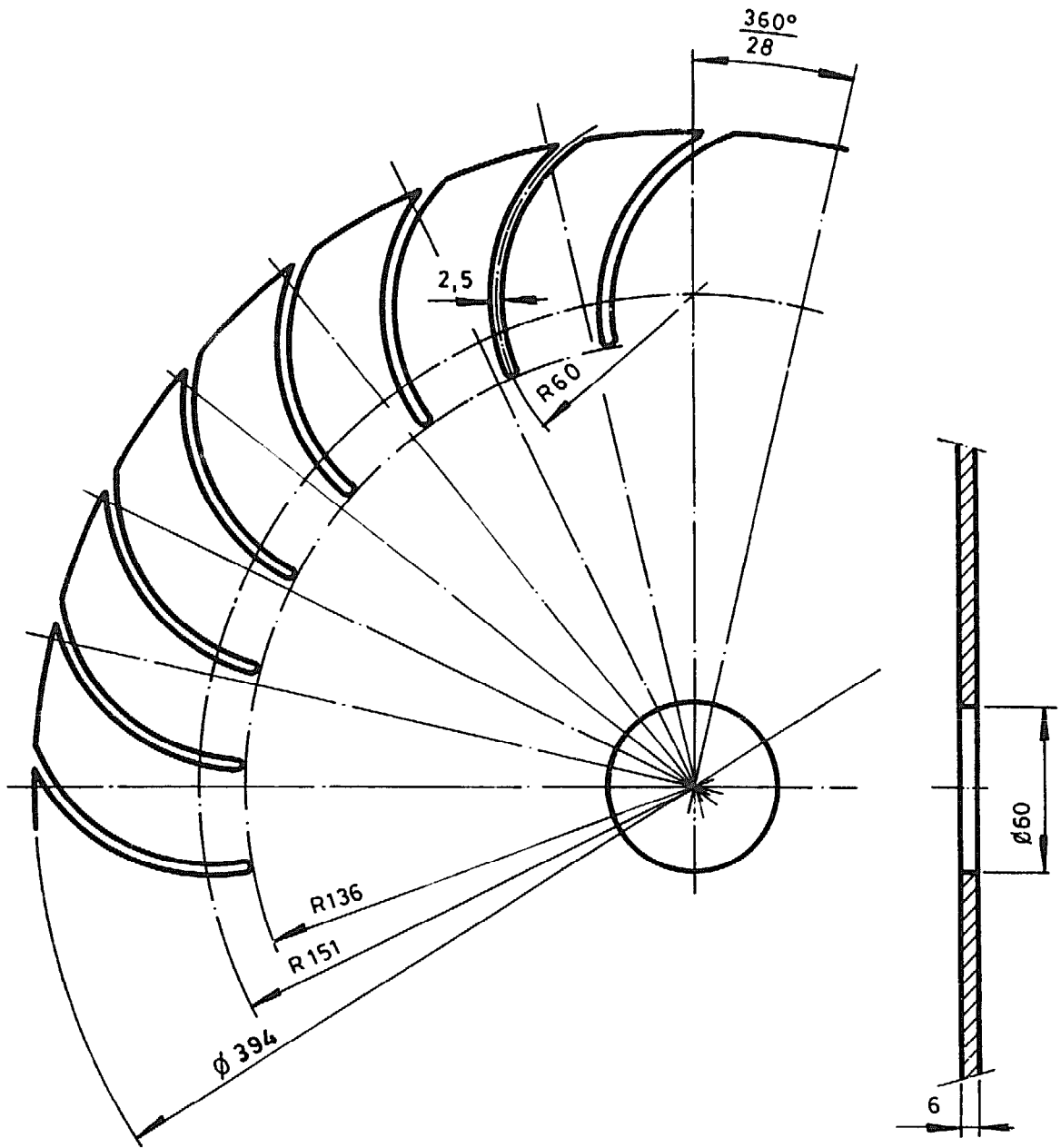
EDGE PROFILE (2.5 : 1)
MAKE ON ONLY ONE EDGE
OF THE BLADE.

Revised 9.8.82

ROTOR BLADE

1:1 (2.5:1)

T1-04,3



NOTE: $\frac{360^\circ}{28}$ ANGLE SHOULD BE MEASURED BY MILLING MACHINE.

-USE ACCORDING TO STRENGTH REQUIREMENTS
AS PER DIAGRAM.

REVISED 29.7.82.44.

ROTOR INTERMEDIATE DISK

T1-04.4

SCALE 1:2

POS	NO OF ITEMS	ITEM	DRAWING NO.	SPECIFICATIONS	REMARKS
1	2	BEARING HOUSING LID	T1 05.1	M.S. ROD ϕ 12.7	
2	1	SPACER RING	T1 05.2	BLACK PIPE 30	
3	2	SELF ALIGNING ROLL BEARING		FAG 22210	
4	2	MOUNTING SLEEVE		FAG KM10	
5	8	HEXAGON HEAD BOLT		W 1/4" X 5/8"	
6	2	BEARING HOUSING ASSEMBLY	T1 05.6		



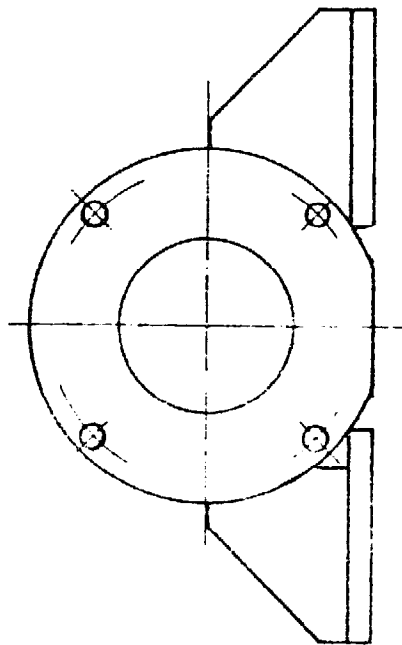
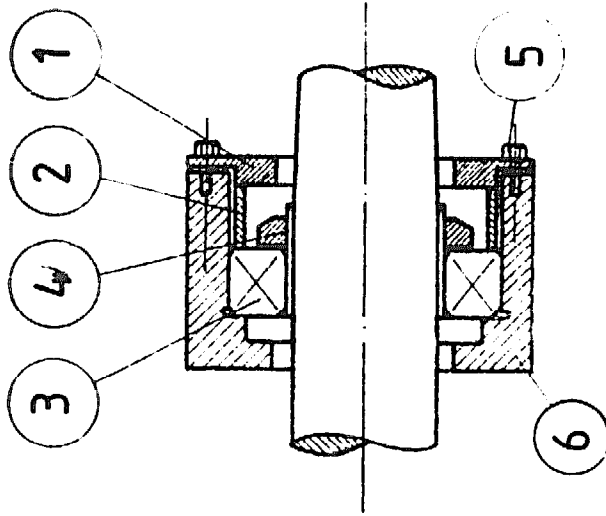
CONSISTING OF

MAIN BEARING ASSEMBLY

PARTS LIST

T1-05.0

As Revised 22.2.84

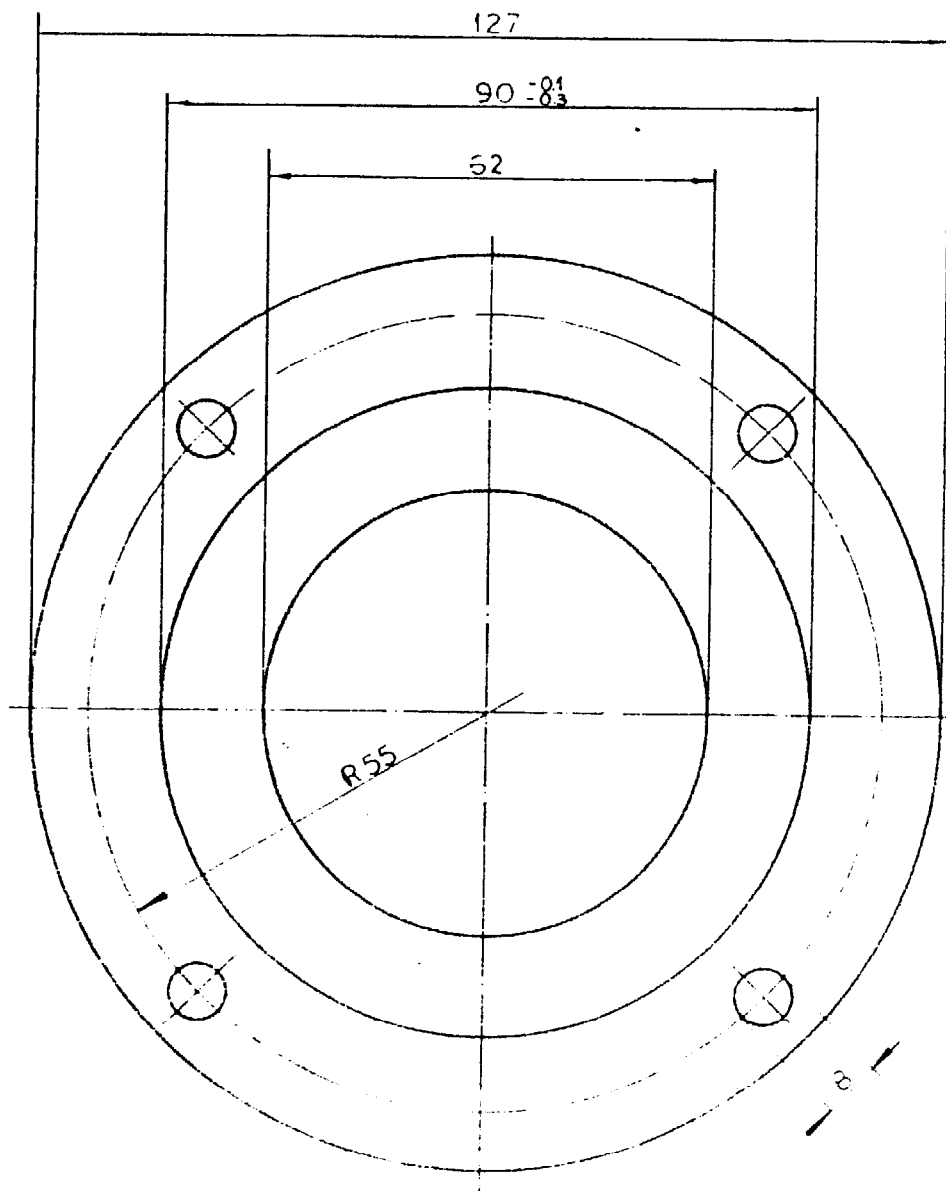
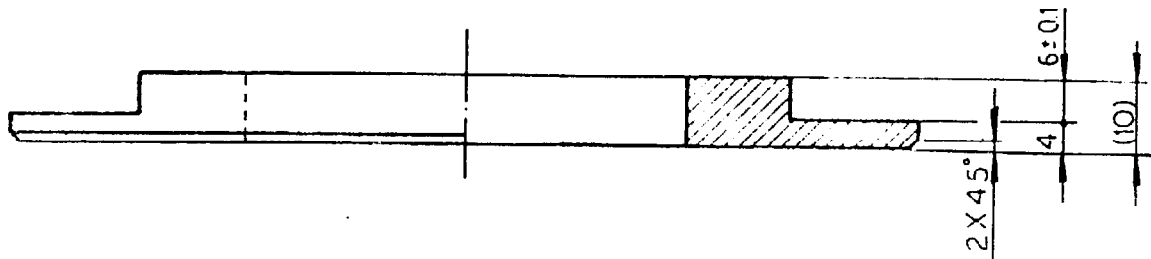


Revised 12-7-52 H

MAIN BEARING ASSEMBLY

SCALE 1:2.5

T1-05.0



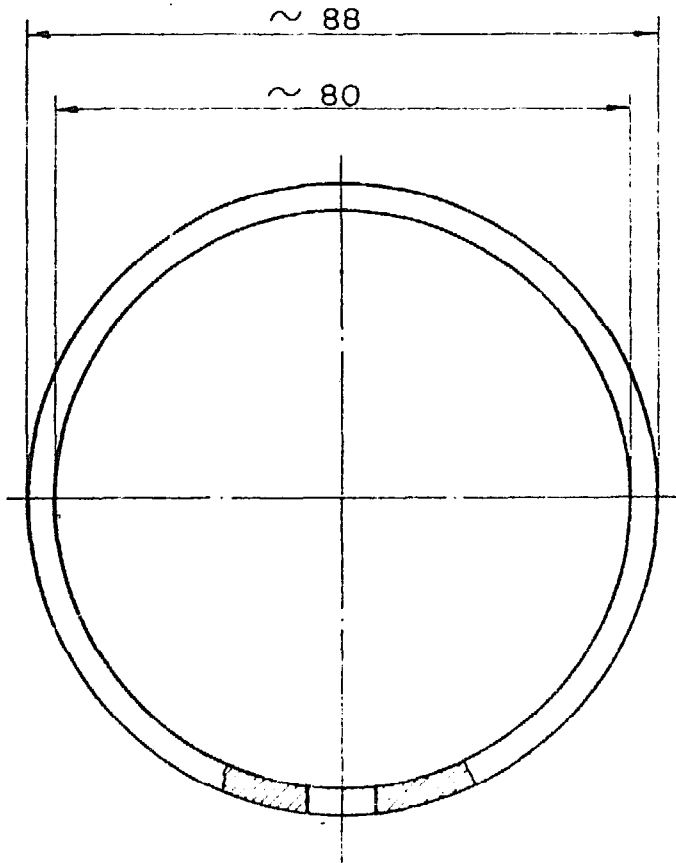
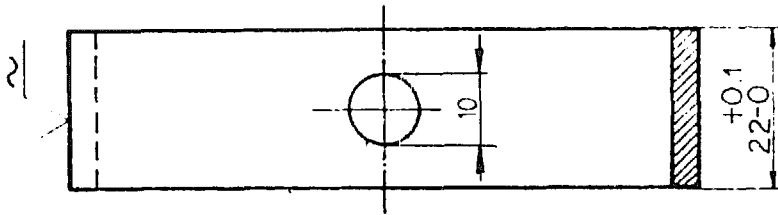
REVISED 2-1-9-54

2-NOS

BEARING HOUSING LID

T1-05.1

SCALE 1:1



Rev 02.2.0.09

1-No.
BLACK PIPE

SPACER RING

T1-05.2

SCALE 1:1

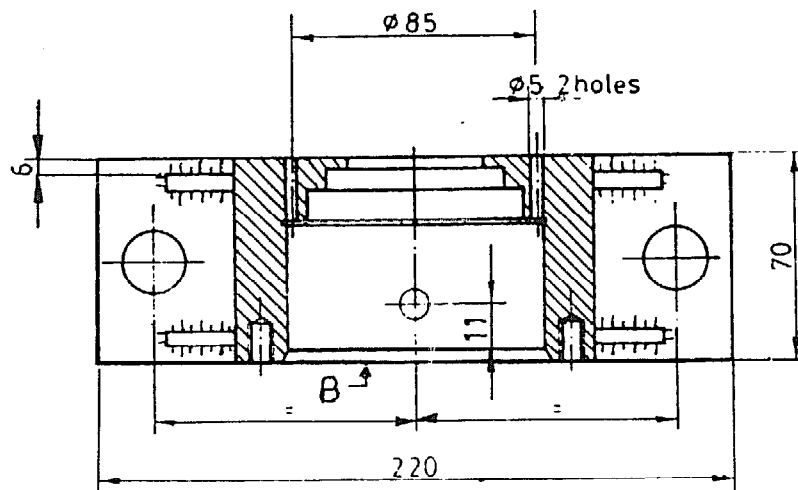
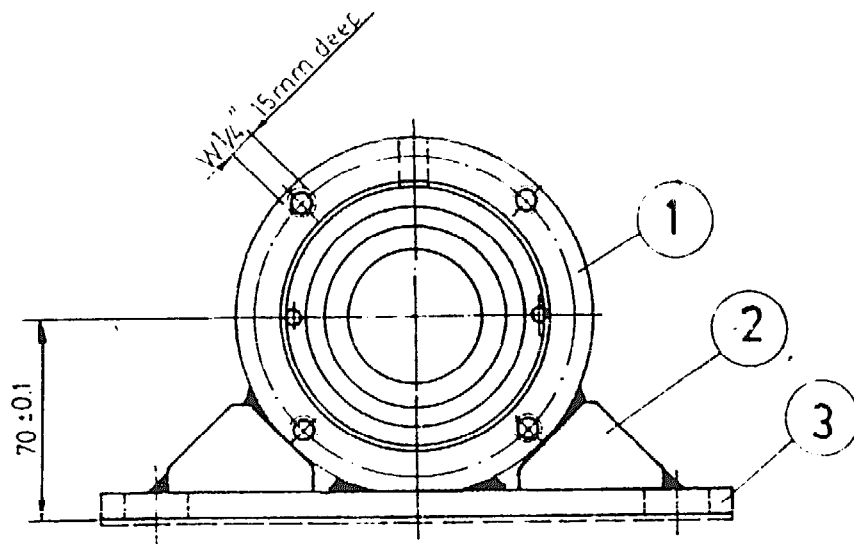
POS	NO. OF ITEMS	ITEM	DRAWING NO.	SPECIFICATIONS	REMARKS
1	2	BEARING BODY	T1 - 05.6	MS.Rod ϕ 127	
2	8	BEARING BRACE	T1 - 05.2	MS.Flat 6 X 50	
3	4	BEARING BASE	T1 - 05.3	MS. Plate 12X75	



↑ CONSISTING OF

MAIN BEARING HOUSING ASSEMBLY

Revised 22.2.2012



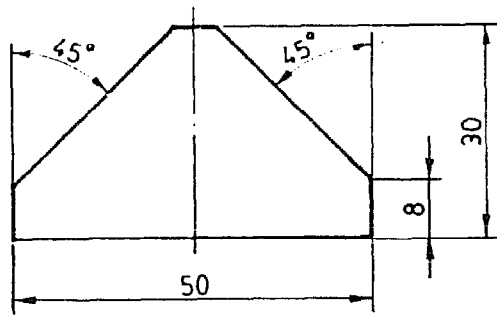
- 1 WELD THE BASE PLATE AND BRACES TO PART 05 6
- 2 MILL SUPPORTING SURFACE RECTANGULAR TO SIDE "B" TO A CENTRE HEIGHT OF 70±0.1
- 3 DRILL HOLES OF $\phi 5$ MAKE THREADS $1/4"$ (USE JIG) AND MAKE THREAD FOR GREASE CUP

BEARING HOUSING ASSEMBLY

T1-05.6

SCALE 1:2.5

REVISED 27.1.72



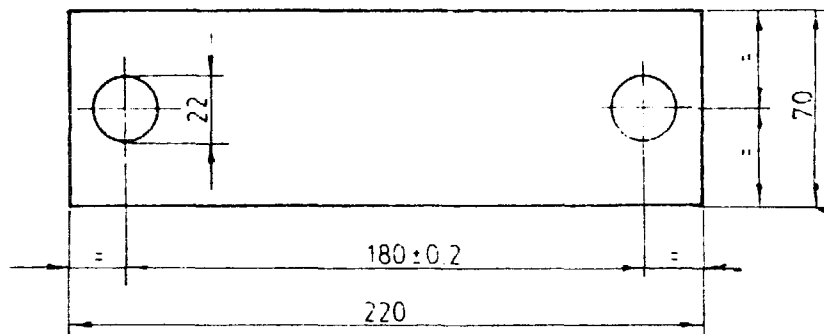
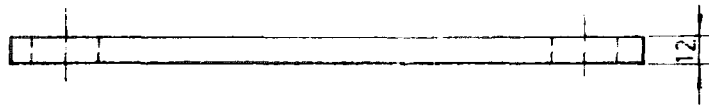
8-NOS.
M.S.FLAT 1/4"X 2"

Lenied 27-7-82

BEARING BRACE

T1-05.6/2

SCALE 1:1



2-105

Rev. 22.1.2.2.4

BEARING BASE

T1-05.6/3

SCALE 1:2.5

POS	NO. OF ITEMS	ITEM	DRAWING NO.	SPECIFICATIONS	REMARKS
1	1	REGULATOR WING SHAFT	T1 - 06.1	M.S.Rod ϕ 50	SUB.ASSEMBLY
2	1	REGULATOR WING CROSS BAR	T1 - 06.2	M.S.Plate 20mm	
3	2	REGULATOR WING ARM	T1 - 06.3	_____	
4	1	REGULATOR WING BLADE	T1 - 06.4	_____	
5	X	ROUND HEAD RIVET	T1 - 06.5	ϕ 12 X 60	
*6	1	REINFORCING PLATE	T1 - 06.6	M.S.Plate 10mm	
		* ONLY REQUIRED FOR HEADS ABOVE 10 m.			



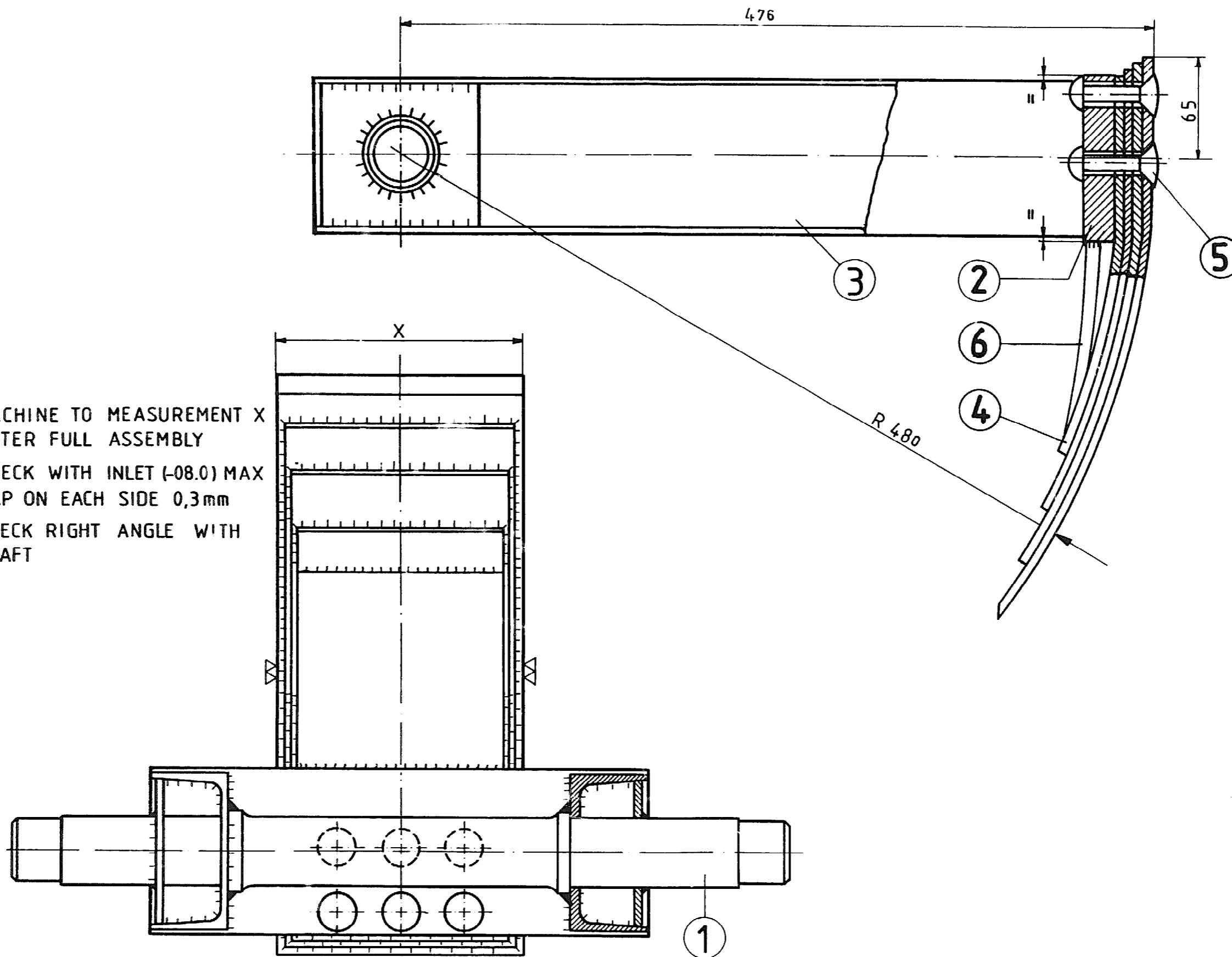
CONSISTING OF

REGULATOR WING ASSEMBLY

PARTS LIST

T1-06.0

Rev. 2001 29.7.82. Hf.



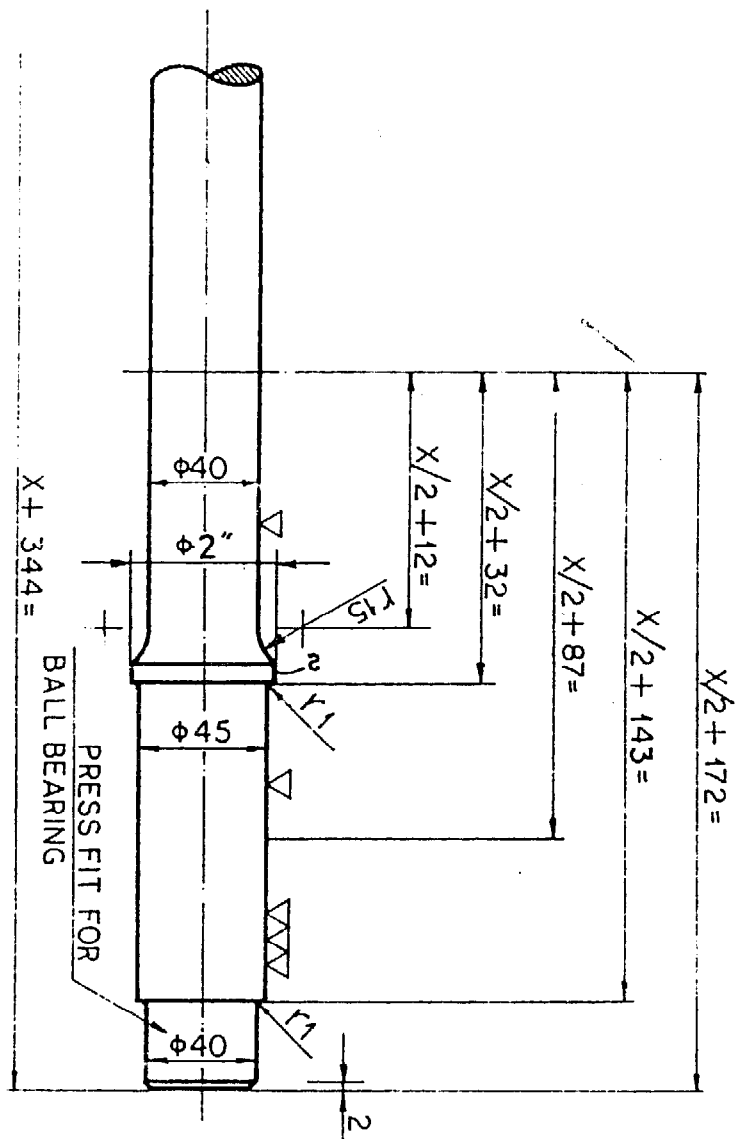
MACHINE TO MEASUREMENT X
 AFTER FULL ASSEMBLY
 -CHECK WITH INLET (-08.0) MAX
 GAP ON EACH SIDE 0,3mm
 -CHECK RIGHT ANGLE WITH
 SHAFT

29.7.82

REGULATOR WING ASSEMBLY T1-06.0

SCALE 1 : 2.5

Revised 19.7.82

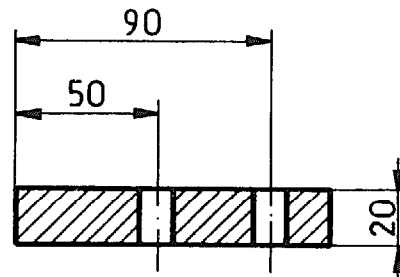
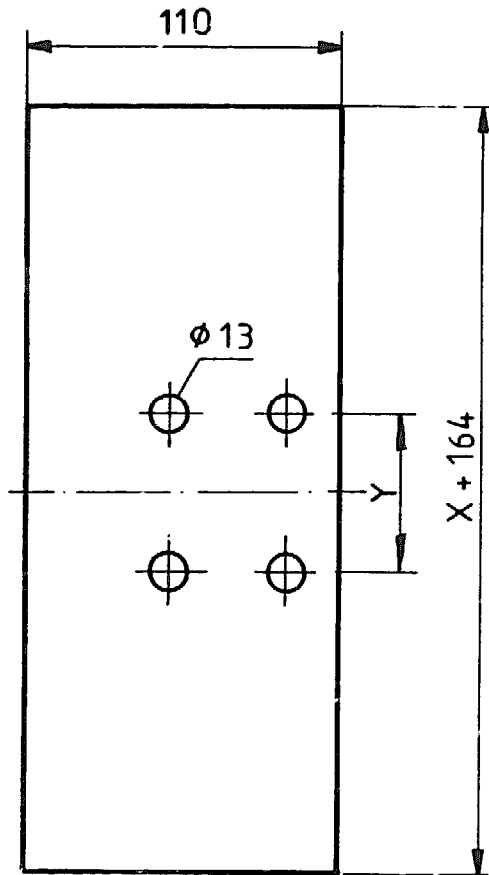


REGULATOR WING SHAFT

T1-06.1

SCALE 1:2.5

	X 70	X 100
Y	32	56

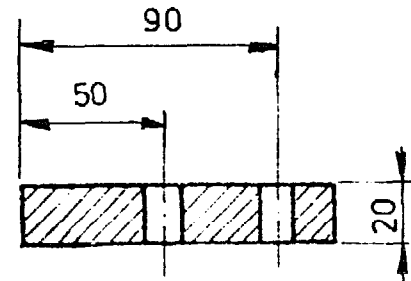
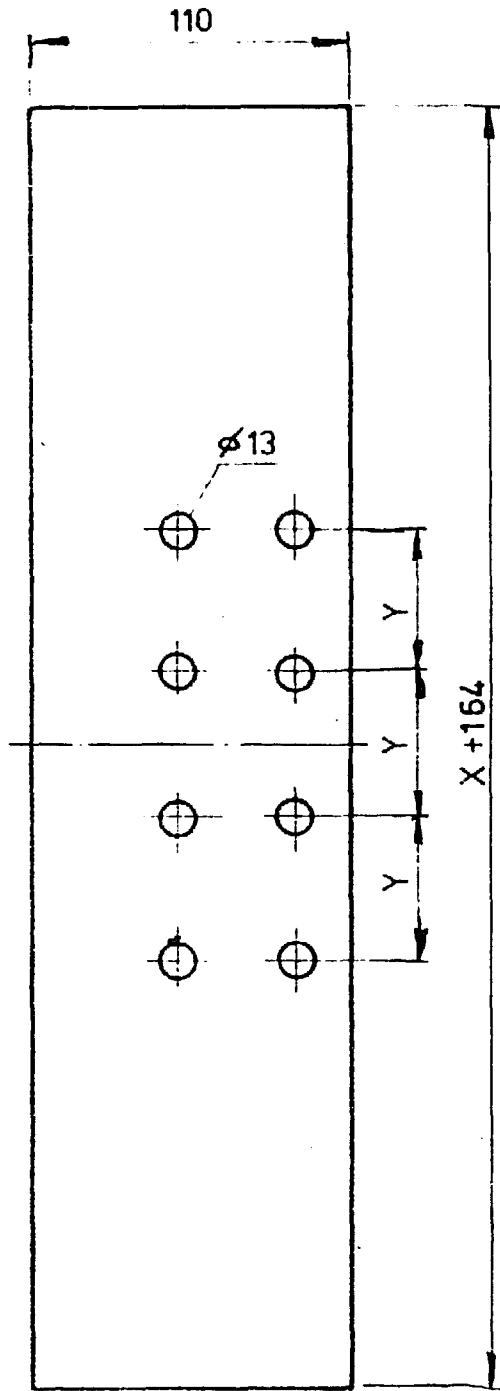


Revizor 29.7.82. d.f.

REGULATOR WING CROSS BAR
X 70, X 100

T1-06.2/1

	150	X 180	X 200	X 220
Y	35	40	51	57

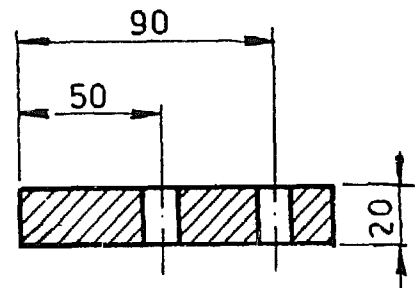
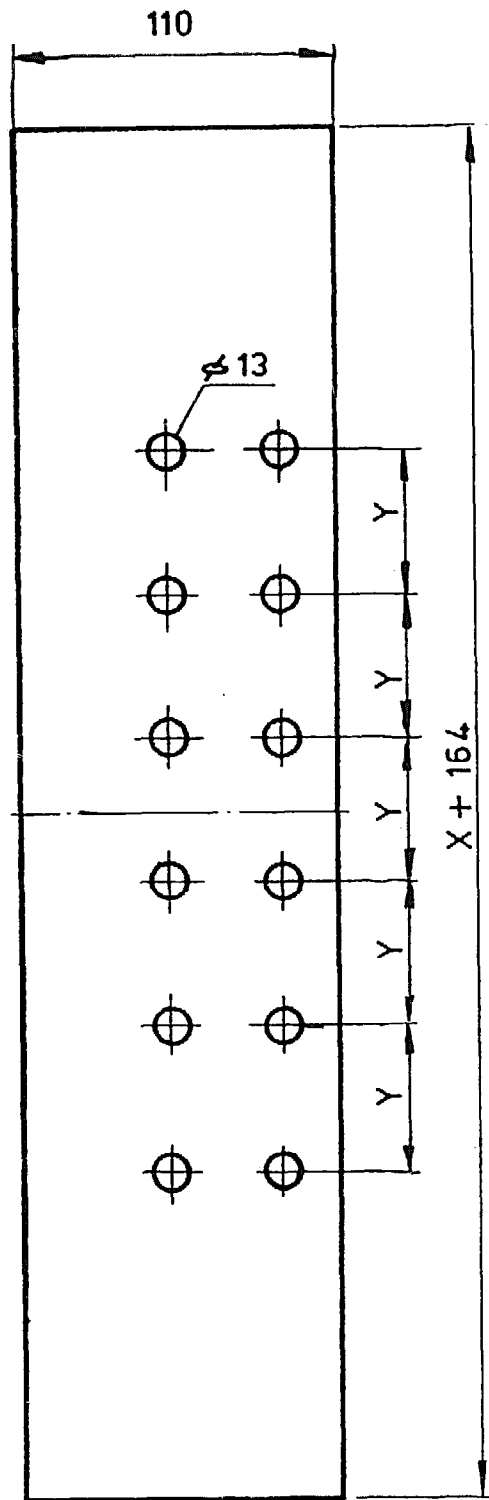


Revised 29.7.82 H.

REGULATOR WING CROSS BAR
X 150, X 180, X 200 X 220

T1-06.2/2

	X 300	X 360	X 400
X	48	62	70



Revised 29.9.86 af.

REGULATOR WING CROSS BAR
X 300, X360, X 400

T1-06.2/3

POS	NO. OF ITEMS	ITEM	DRAWING NO.	SPECIFICATIONS	REMARKS
1	2	M.S.U. CHANNEL LENGTH 485	T1-06.3	100X50 X 6	A4
2	2	M.S. PLATE	T1-06.3	100 X 85	A4

Revised 29.7.72 Hf



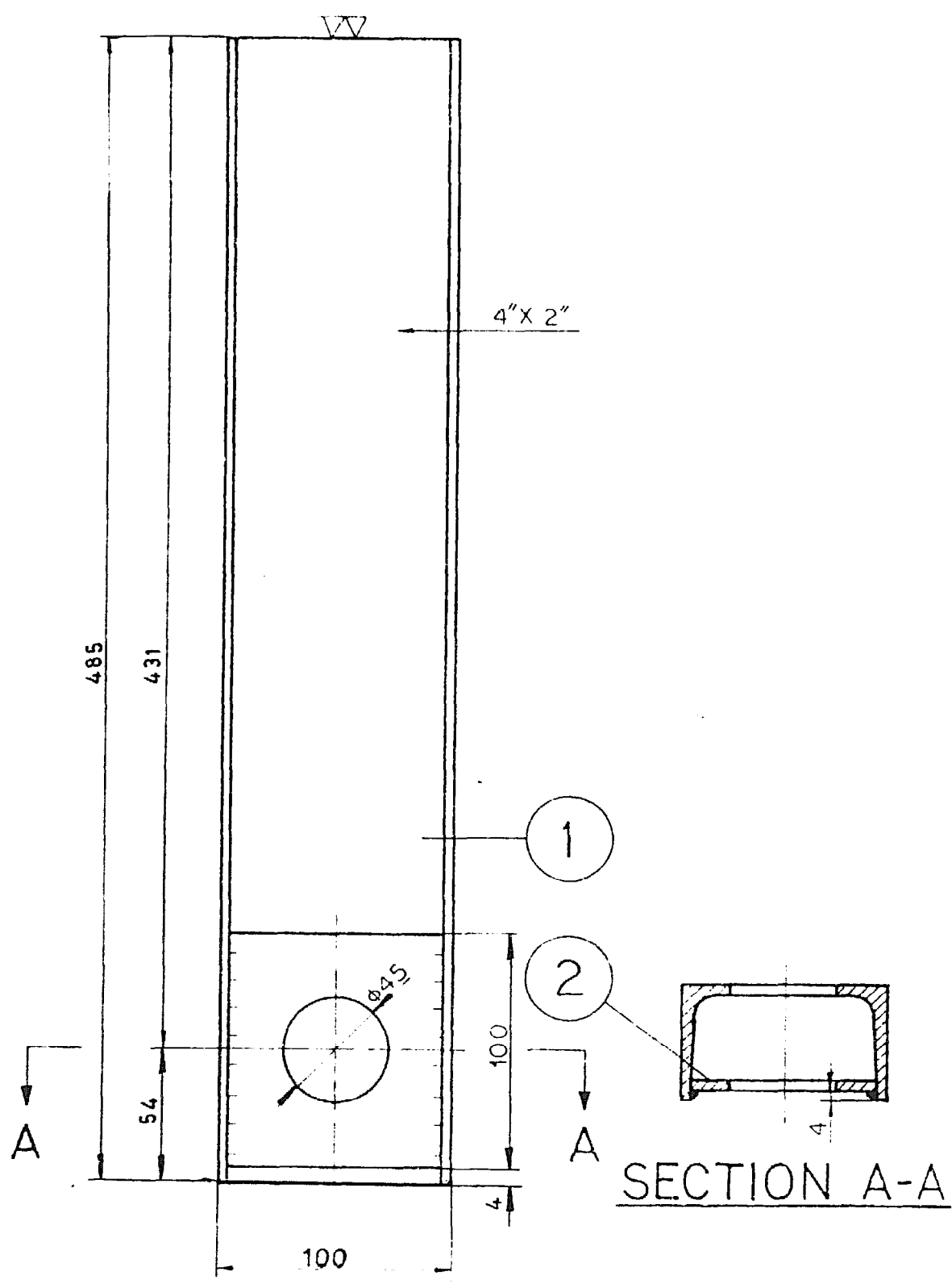
↑ CONSISTING OF

REGULATOR WING ARM

PARTS LIST

T1-06.3

Revised 29.7.82 ddy.



2 PIECES

REGULATOR WING ARM

T1-063

SCALE 1:2.5

POS	NO. OF ITEMS	ITEM	DRAWING	SPECIFICATIONS	REMARKS
1	1	M.S PLATE 6mm	T1-06 4	(X-5)X 394	A4
2	1	" " "	"	(X-8)X 346	"
3	1	" " "	"	(X-16)X 298	"
4	1	" " "	"	(X-24)X 243	"

Revised 29.7.82

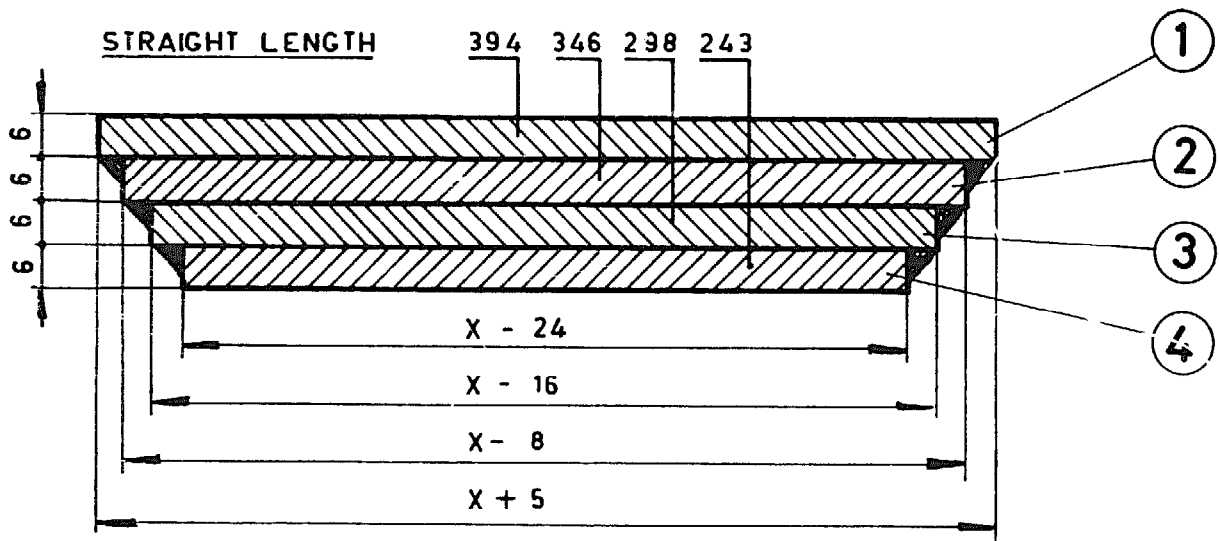
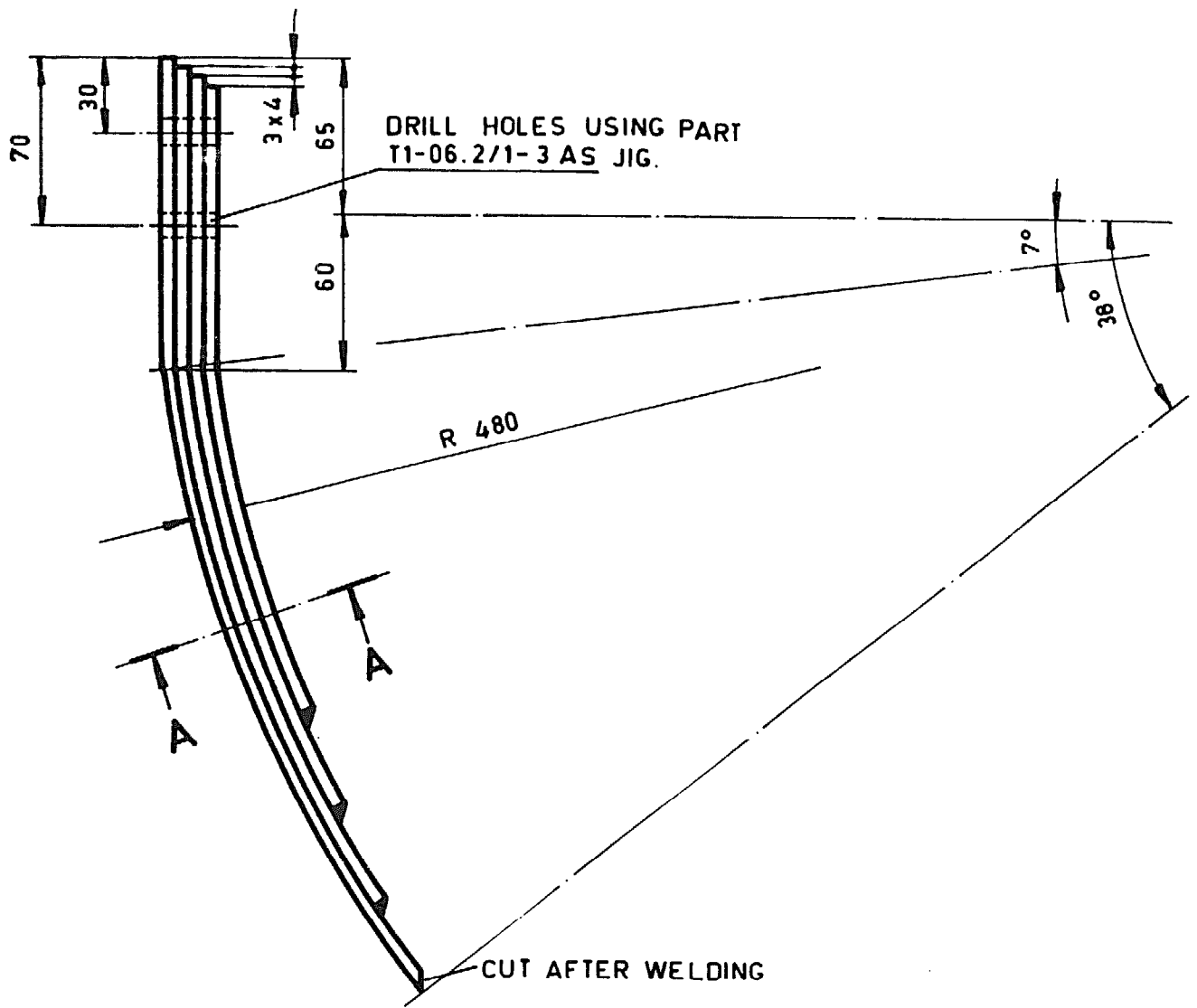


CONSISTING OF

REGULATOR WING

PARTS LIST

T1-06.4



Revised 29.7.82

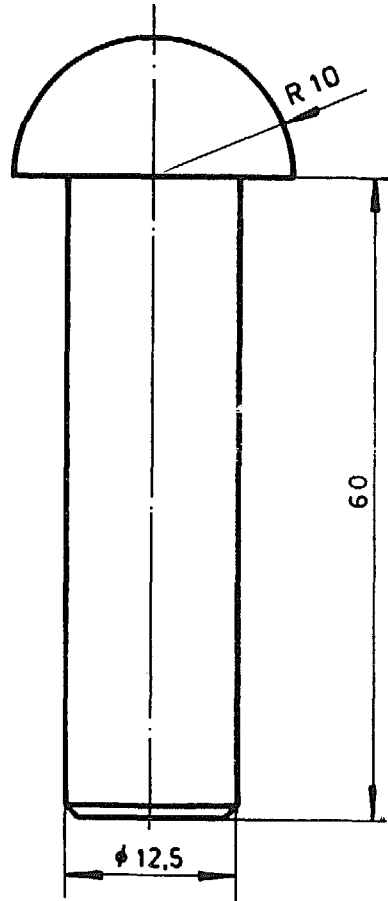
SECTION A-A (1:1)

1.PC

REGULATOR WING

T1-06.4

1:2.5 (1:1)

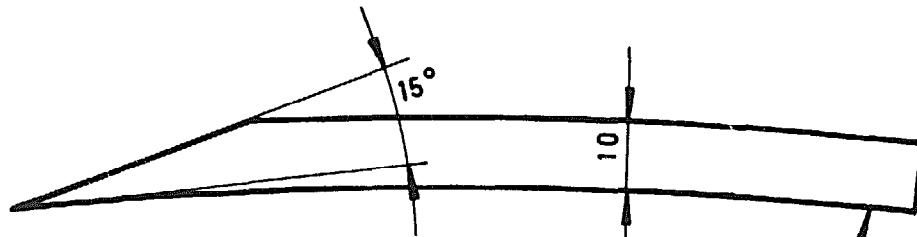


X 70	X 100	X 150	X 180	X 200	X 220	X 300	X 360	X 400
4	4	8	8	8	8	12	12	12

HALF ROUND HEAD RIVET

T1-06,5

2:1



STRAIGHT LENGTH = 127

WIDTH = X

1.PC.

WELD THIS PART DURING
ASSEMBLY WITH ROTOR.

REINFORCING PLATE

T1-06,6

1:1

POS	NO. OF ITEMS	ITEM	DRAWING NO.	SPECIFICATIONS	REMARKS
1	2	HOUSING BASE PLATE	T1-07.1	M.S. Flat 8 X 35	
2	2	BEARING HOUSING	T1-07.2	M.S. Rod ϕ 115	
3	2	HOUSING LID	T1-07.3	M.S. Rod ϕ 115	
4	1	SPACER RING	T1-07.4	Black pipe 75	
5	2	BALL BEARING		SKF 6280	
6	6	HEXAGONAL BOLT		$W\frac{1}{4} \times 5/8$	

Consolid 22.2.85

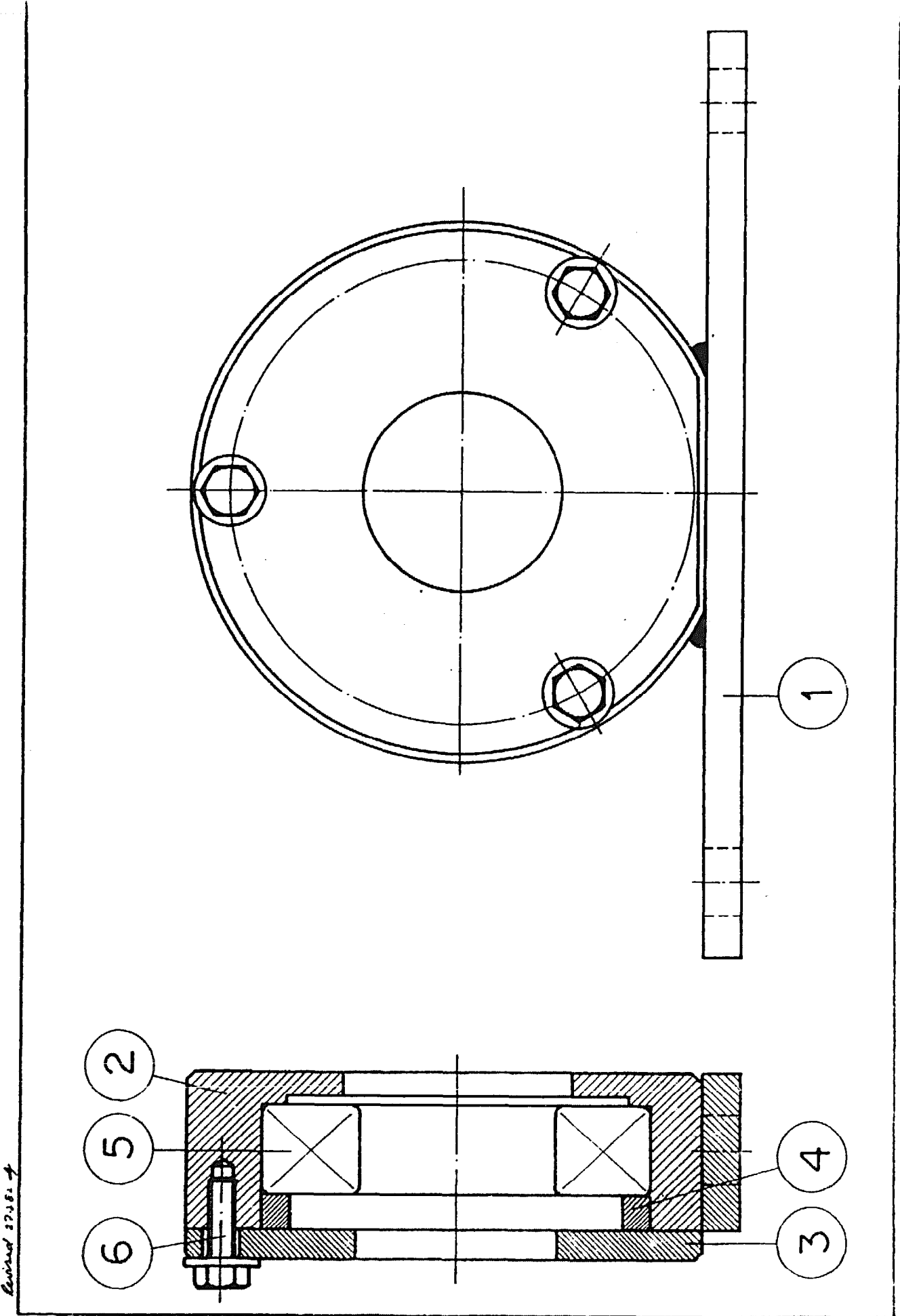


CONSISTING OF

R.W. BEARING HOUSING ASSEMBLY

PARTS LIST

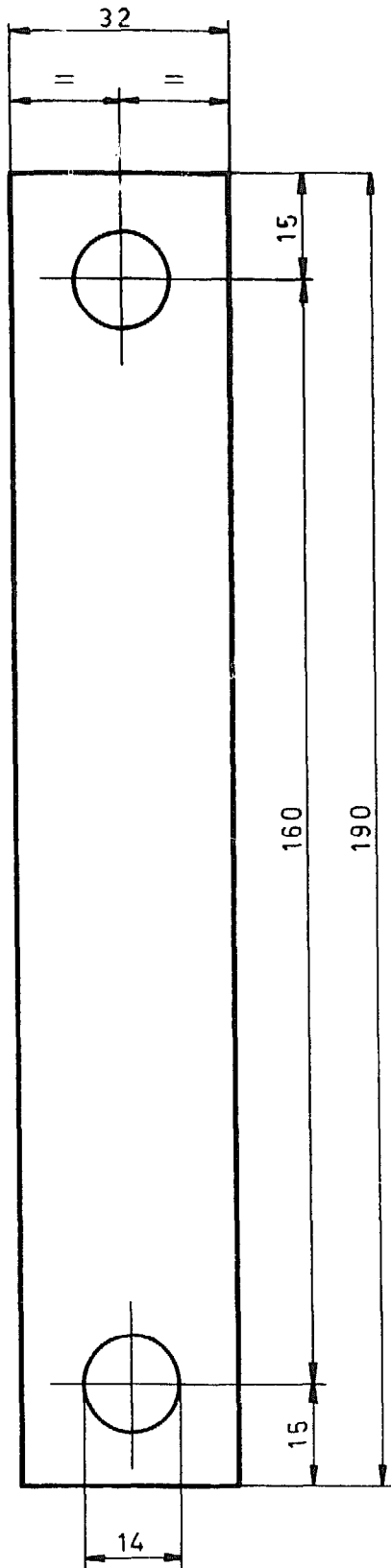
T1-07.0



Revised 12/18/64

R.W. BEARING HOUSING ASSEMBLY T1-07.0

SCALE 1:1



THICKNESS 8 MM

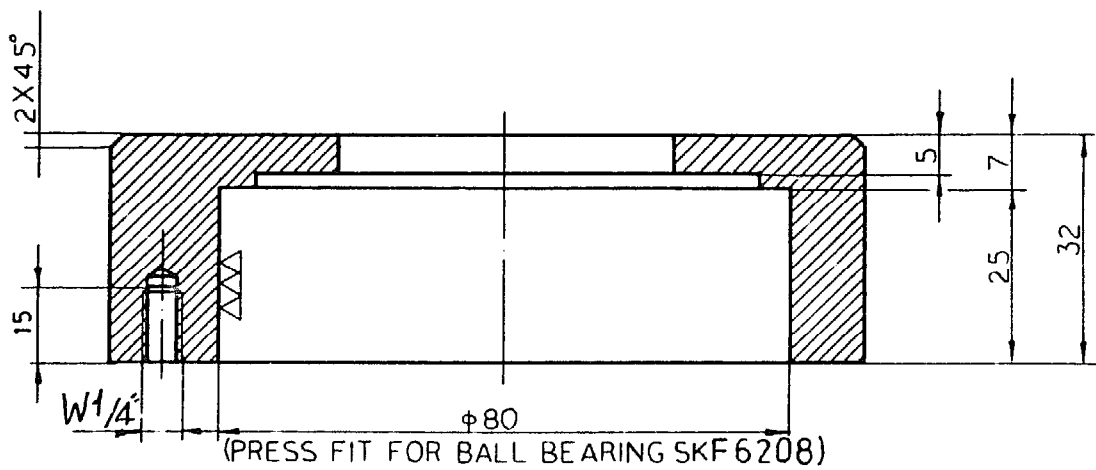
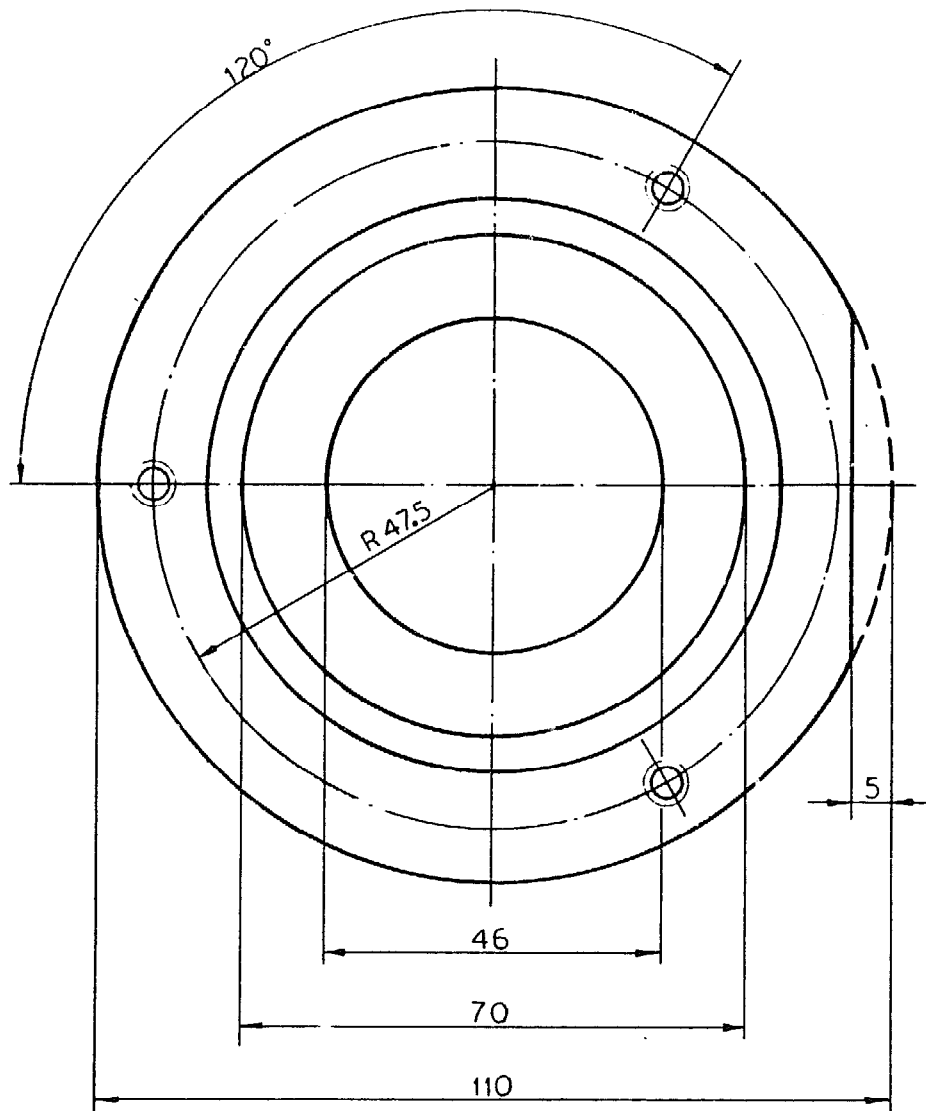
2 PIECES

Revised 21.7.81 JF

HOUSING BASE PLATE

T1-07.1

SCALE 1:1



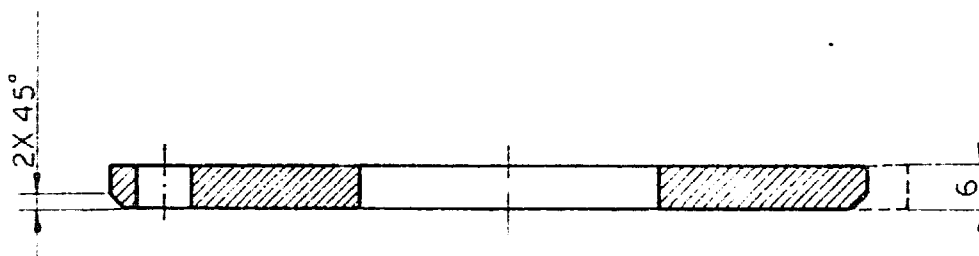
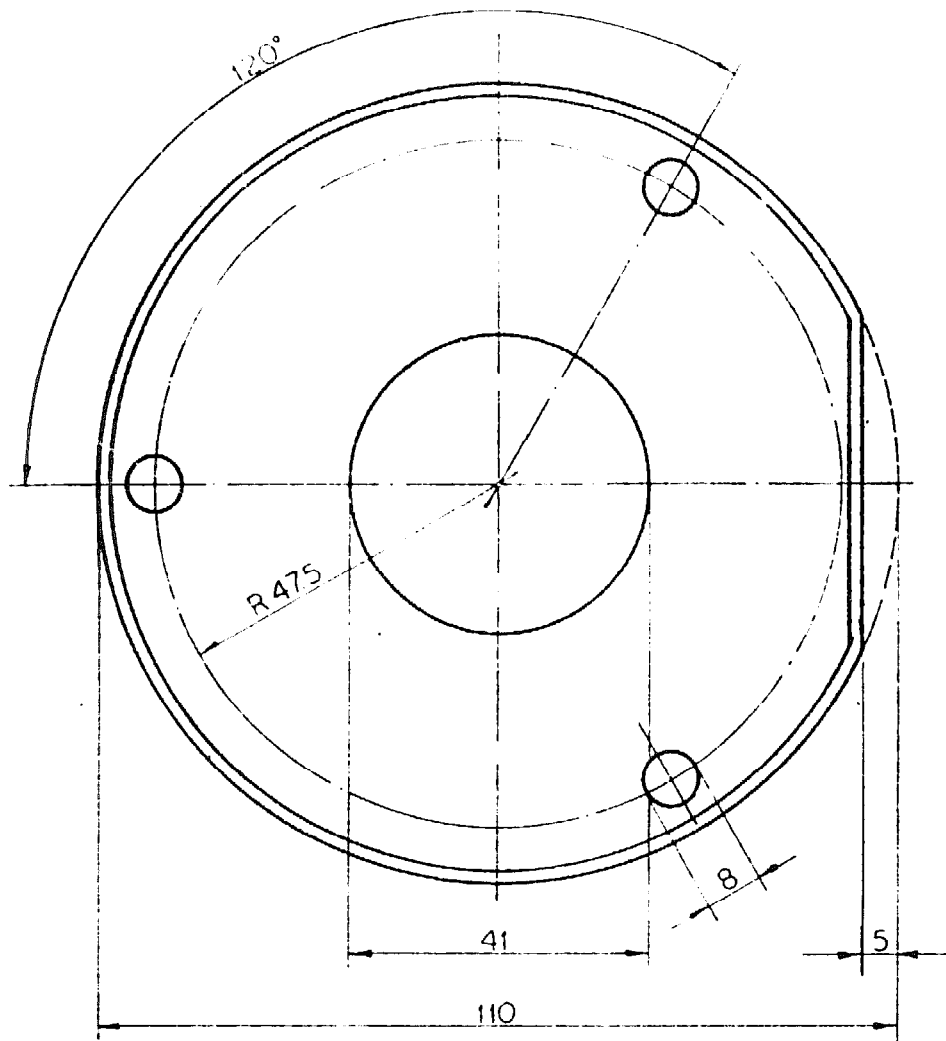
2 PIECES

Revised 27.7.81 AJ

BEARING HOUSING

T1-07.2

SCALE 1:1



2 PIECES

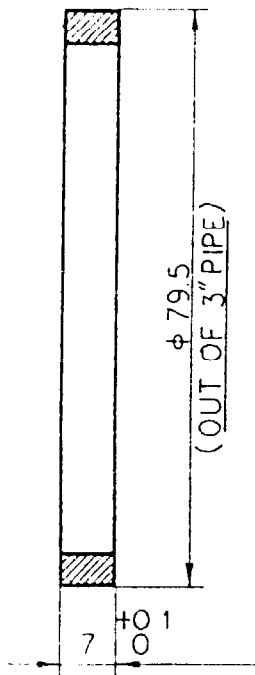
Revised 27.2.81 M

HOUSING LID

T1-073

SCALE 1:1

Revised 29.7.11.11



SPACER RING

SCALE 1:1

T1-074

POS	NOOF ITEMS	ITEM	DRAWING NO.	SPECIFICATIONS	REMARKS
1	1	INLET BOTTOM GUIDE	T1-08.1	MS.PLATE 6 MM	
2	1	INLET TOP GUIDE	T1-08.2	MS.PLATE 6MM	
3	2	INLET SIDE PANEL	T1-08.3	MS.PLATE 6MM	
4	2	COVER SHEET FRAME 'A'	T1-08.4	MS.SHEET/STRIP	
5	2	COVER SHEET FRAME 'B'	T1-08.5	MS.SHEET/STRIP	
6	1	STRENGTHENING ANGLE	T1-08,6	MS.ANGLE (64x64) <u>2 1/2" x 2 1/2"</u>	
7	1	SEALING FLAP	T1-08,7	MS.SHEET 3MM	
8	2	SEALING STRIP	T1-08,8	MS.SHEET 3MM	
9	X	INLET CENTRE RIB	T1-08.9	M.S.SHEET 6MM	
10	1	INLET SQUARE FLANGE	T1-08.10	MS.FLAT 40 x 10	SUB.ASSEMBLY
11		HEX. NUT	T1-08.11	W3/8"	SEE PART LIST T1-13.0 FOR NOS OF NUTS REQUIRED.
		* ONLY REQUIRED FOR TYPES X 220. 300. 360. 400 FOR TYPE 200 WITH HEAD ABOVE 8M AND FOR TYPE 180 WITH HEAD ABOVE 11M.			



CONSISTING OF

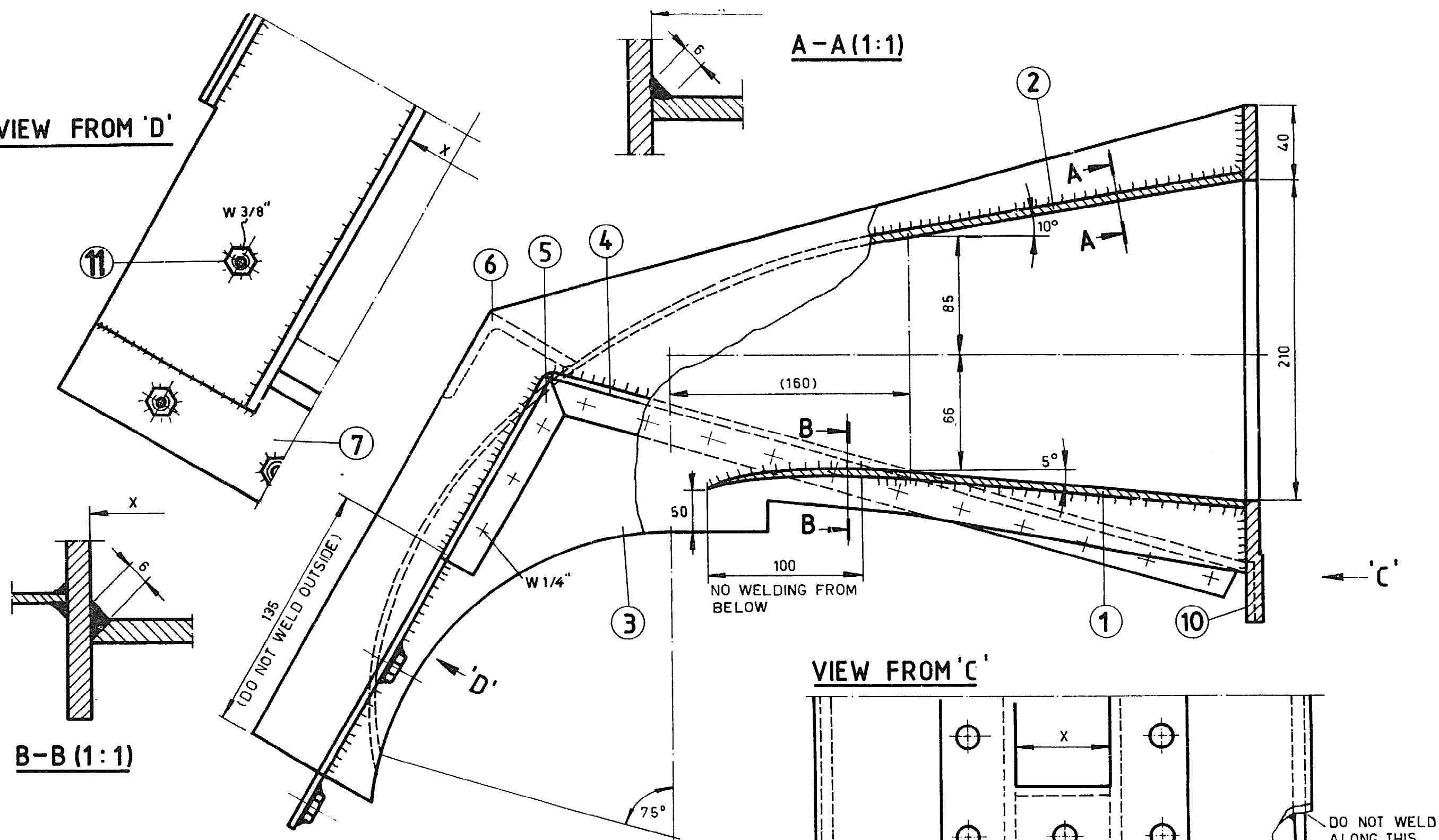
PARTS LIST

INLET ASSEMBLY

T1-08,0

Revised 2.1.7.14.01

VIEW FROM 'D'



B-B (1:1)

VIEW FROM 'C'

TO WELD W 3/8" NUT (POS.11)
 ASSEMBLE INLET ASSEMBLY IN POSITION WITH SUPPORT
 ASSEMBLY T1-02.0. USE HOLES IN SUPPORT FRONT T1-02.2
 AS GUIDE. DRILL HOLE THROUGH RESPECTIVE SHEET. INSERT
 BOLTS OR A PIECE OF ROD. MOUNT NUT. SELECT POSITION.
 WELD NUTS.

WELD POS. 7, 5, 4, 1
 DURING FINAL ASSEMBLY.

USE HOLES IN THIS ROW AS GUIDE TO DRILL
 HOLES ON BAFFLE HOUSING TOP T1-03.3.

DO NOT WELD
 ALONG THIS
 CORNER

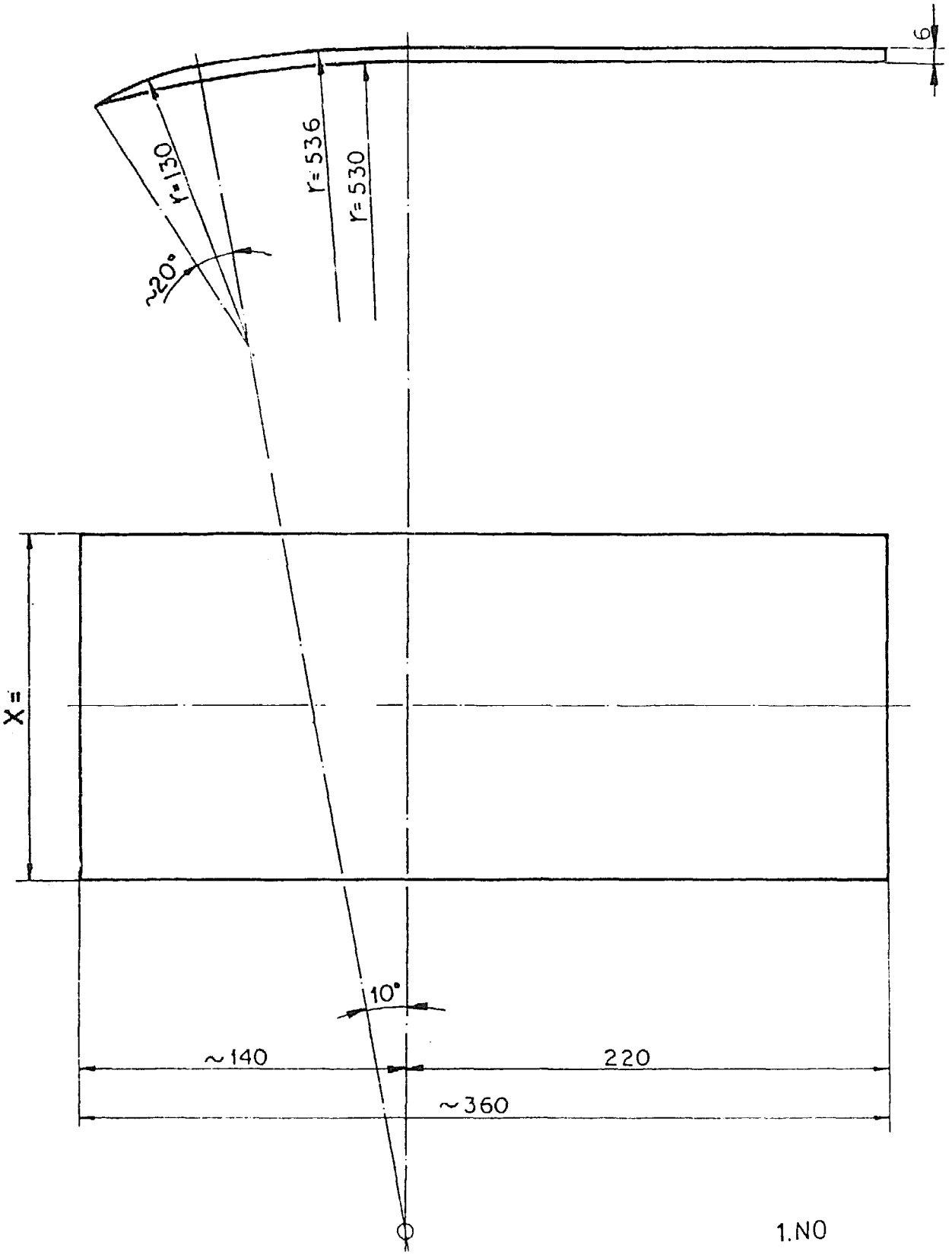
INLET ASSEMBLY

T1-08,0

1:2.5

Revised 23.7.82 M.

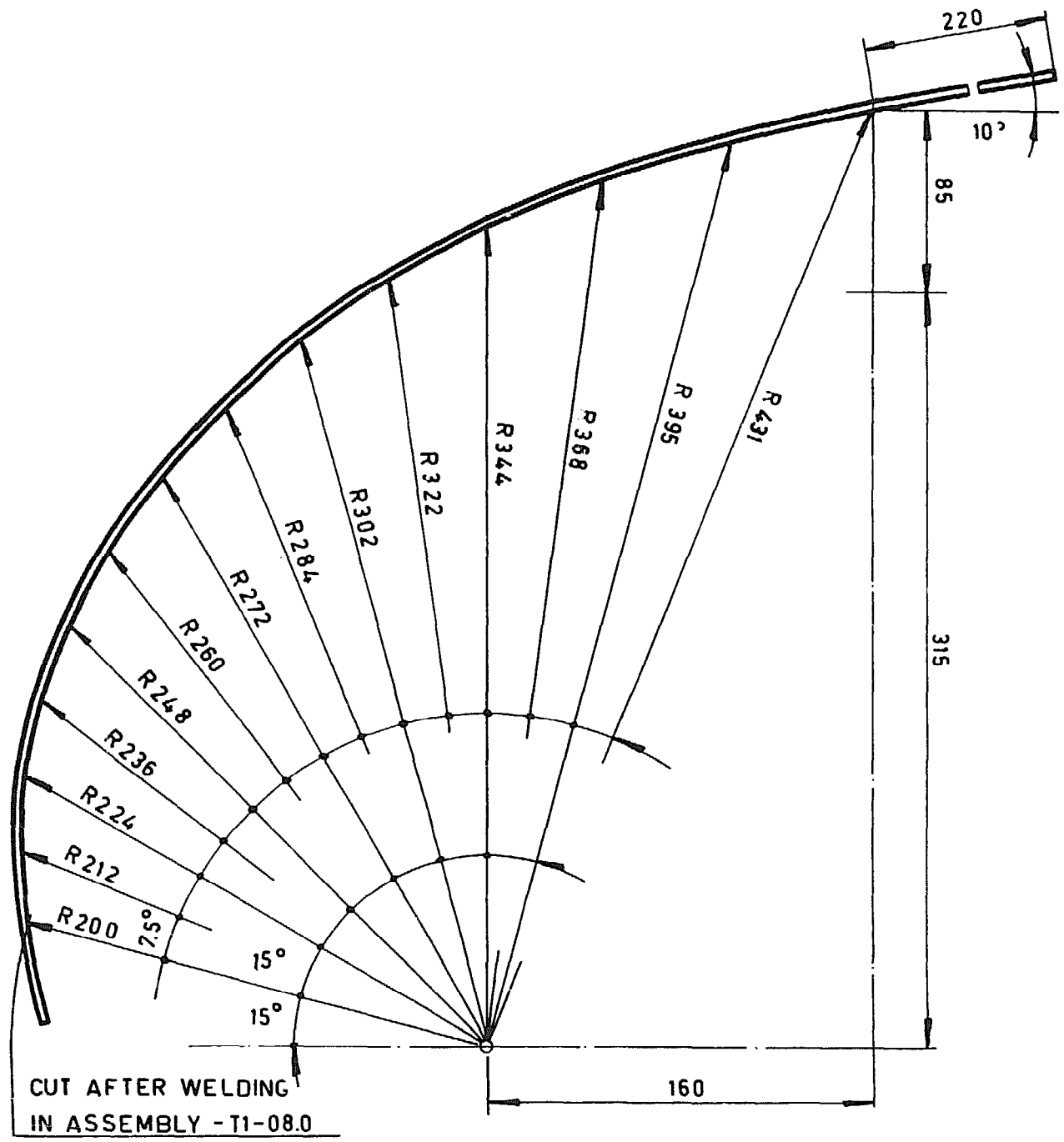
Revised 28.7.82



INLET BOTTOM GUIDE

T1-08,1

SCALE 1:2.5

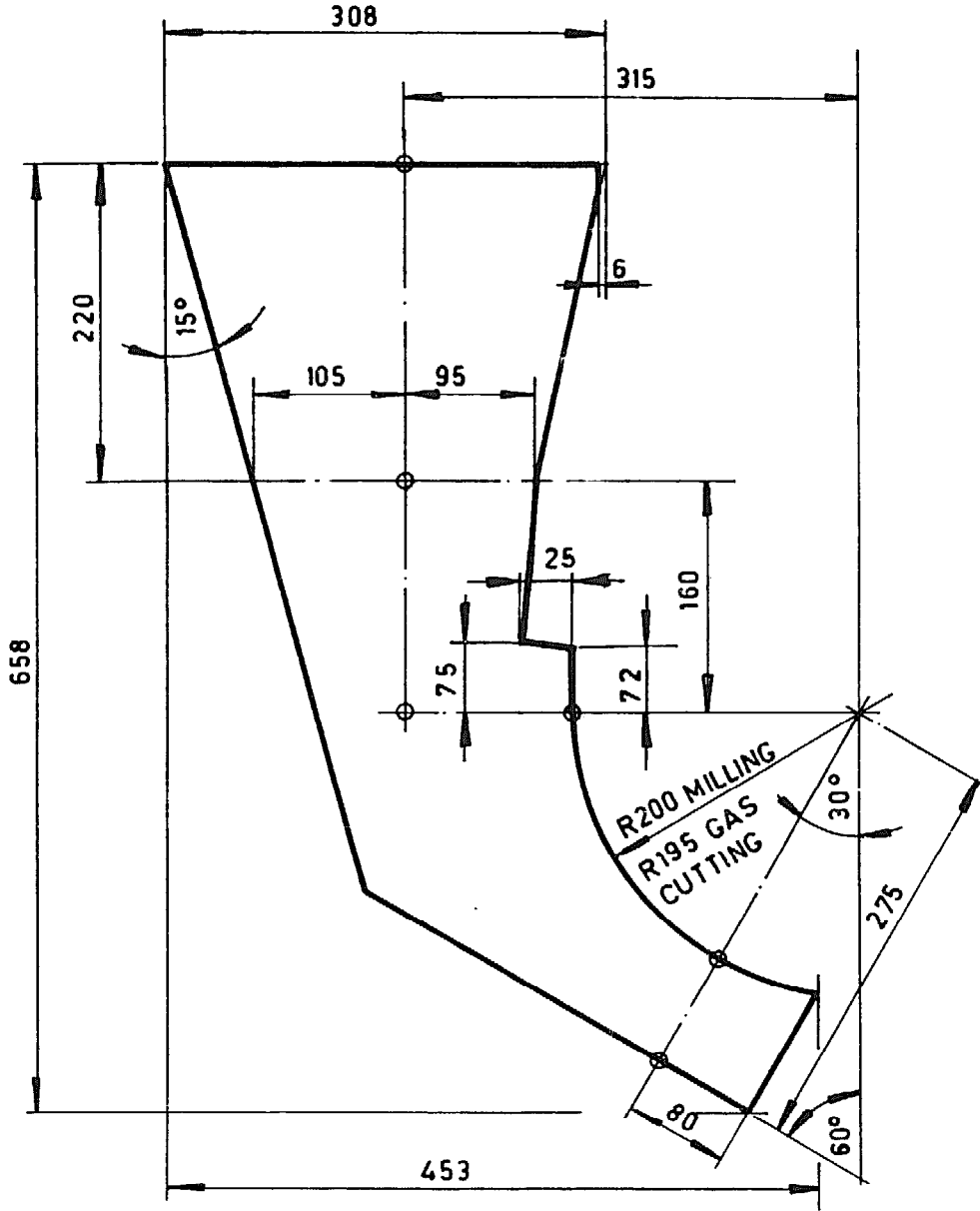


6 MM MS. PLATE
 WIDTH = X
 STRAIGHT LENGTH = 870
 1.PC

Revised 28.7.81 A4

INLET TOP GUIDE

T1-08,2



POINTS AND SYM-LINE
MUST BE VISIBLE ON THE PLATE.

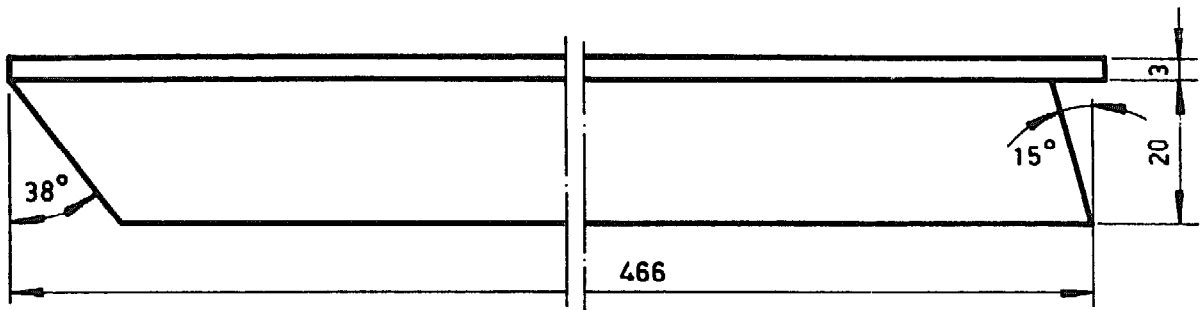
Revised 28.7.82 M

6 MM MS PLATE
2.PCS

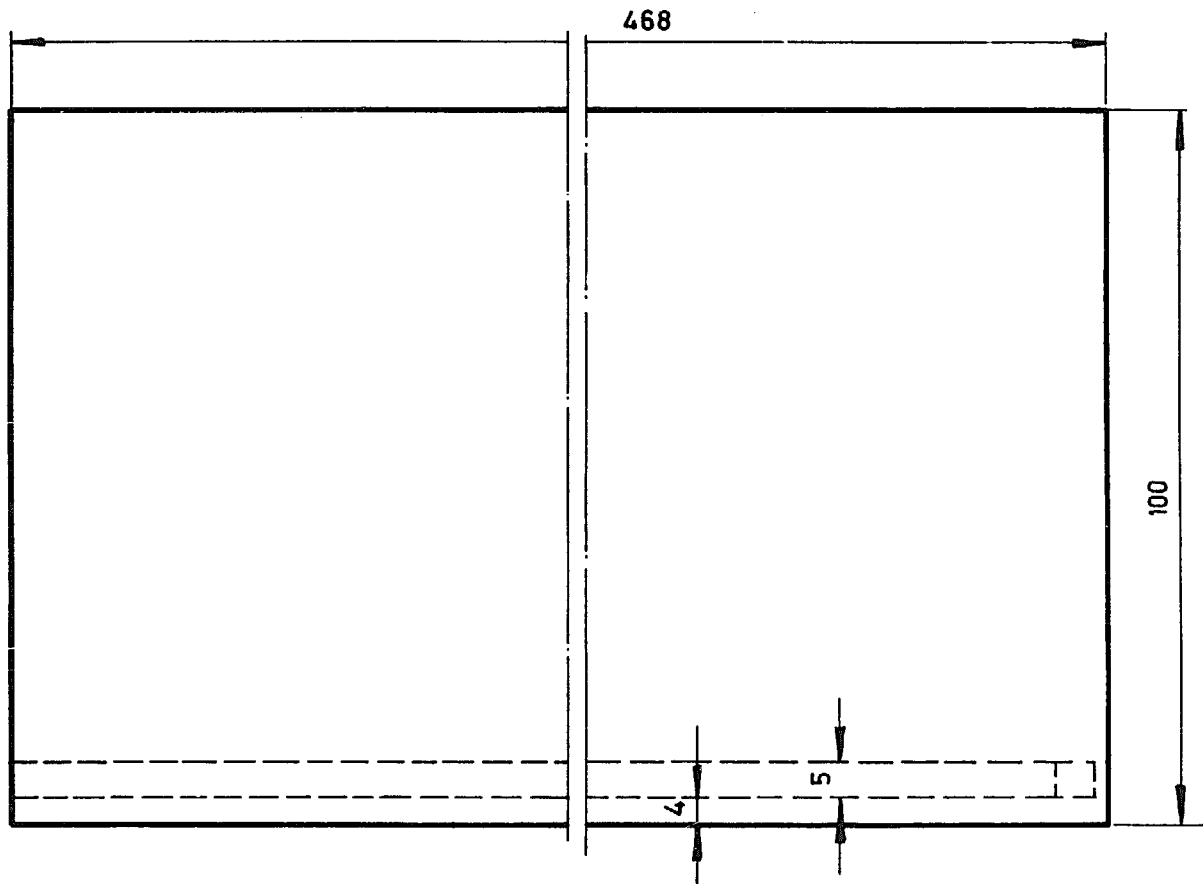
INLET SIDE PANEL

T1-08.3

1:5



2.PCS



-MAKE ONE SET AS PER DRAWING

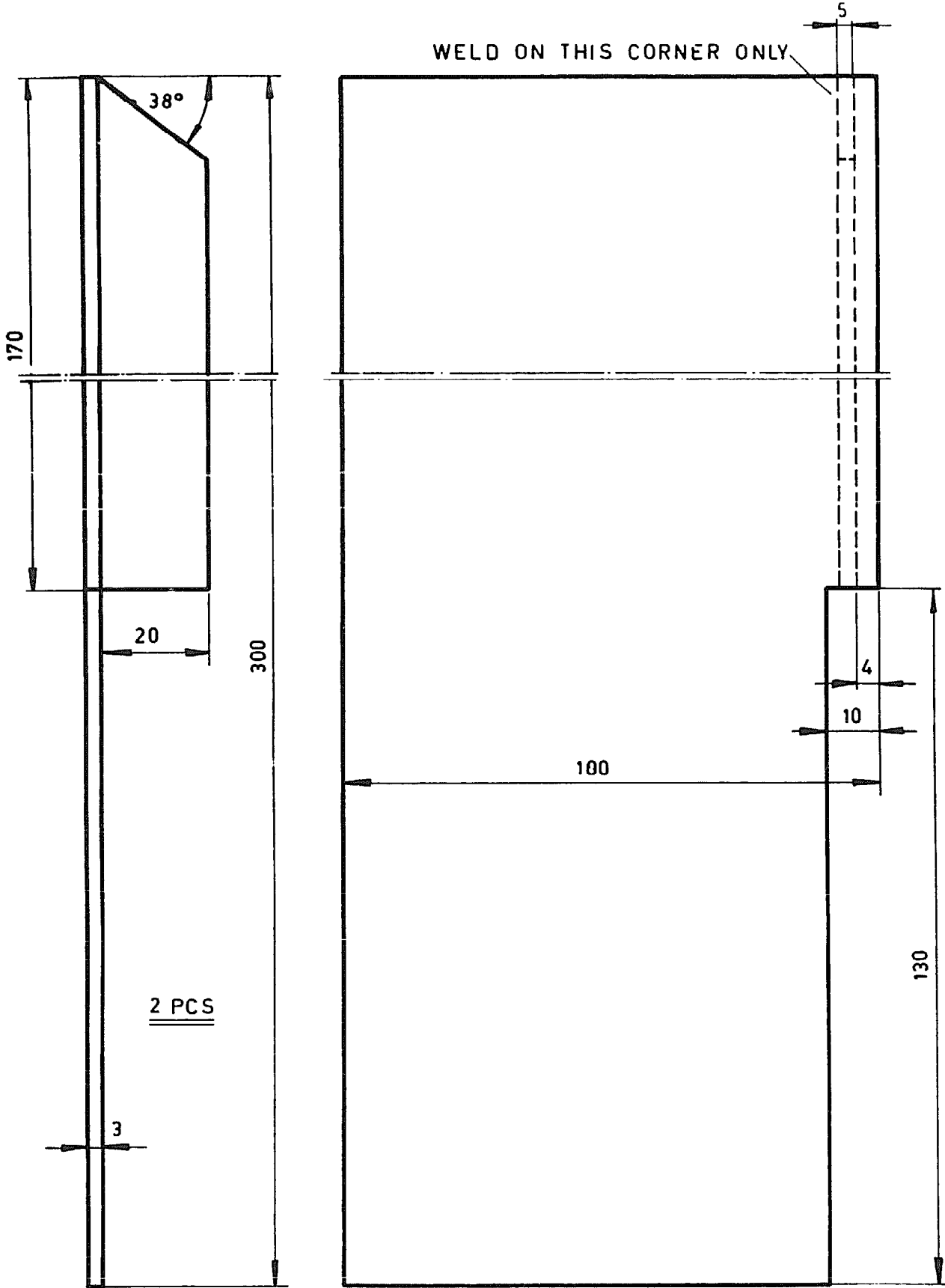
-ON THE NEXT SET, WELD 466x20x5 FLAT ON THE SAME SURFACE BUT NEAR OTHER EDGE. LEAVE MARGIN OF 4MM AS SHOWN.

Revised 20.7.82.4

COVER SHEET FRAME 'A'

T1-08,4

Revised 18.7.82

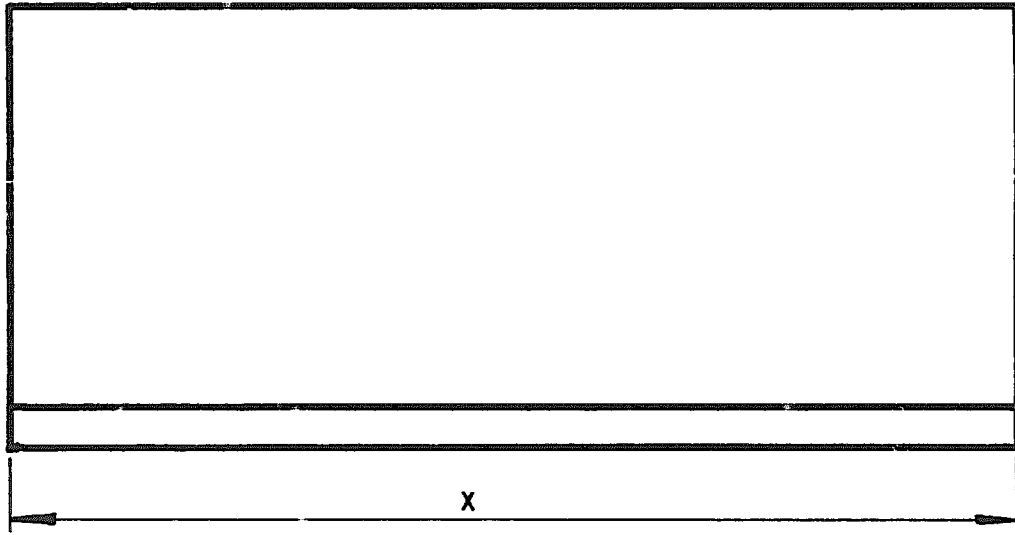


- MAKE ONE SET AS PER DRAWING AND SECOND SET MIRROR INVERTED.

COVER SHEET FRAME 'B'

T1-08,5

1:1



M.S. ANGLE 2 1/2" x 2 1/2" (64 x 64).

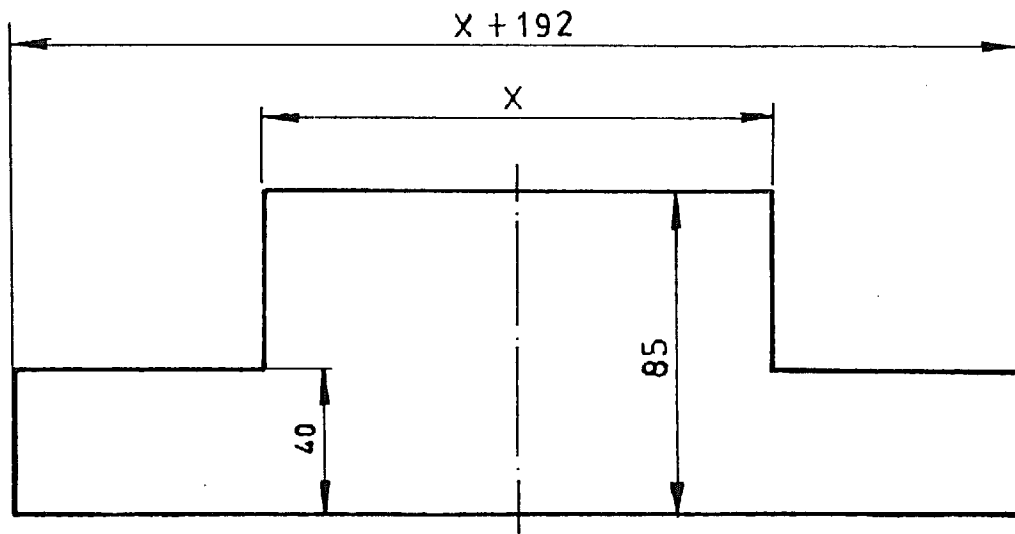
1.PC.

Revised 28.7.81

STRENGTHENING ANGLE

T1-08,6

1:1



3 MM. SHEET

1. NO

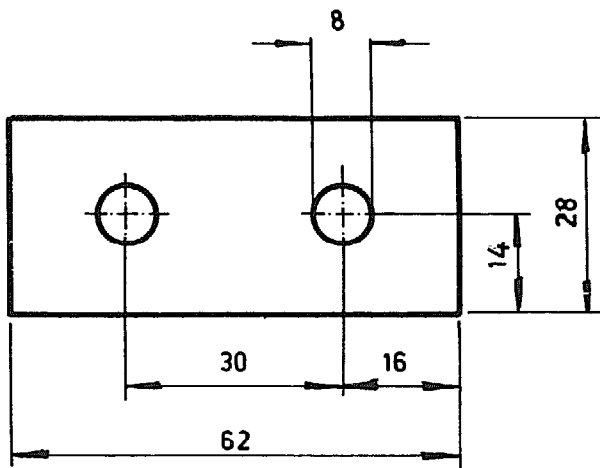
WELD TO INLET AFTER COMPLETE ASSEMBLY (-00.1)

Revised 28.7.82 Af

SEALING FLAP

T1-08,7

WELD THESE STRIPS TO INLET ASSEMBLY T1-08.0.
USE $\phi 8$ HOLES AS GUIDE TO DRILL HOLES REQUIRED
ON BAFFLE HOUSING ASSEMBLY.



3MM MS.SHEET

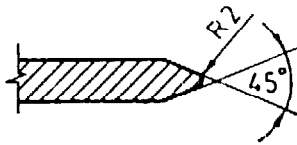
2.PCS

Revised 28.7.82 PL

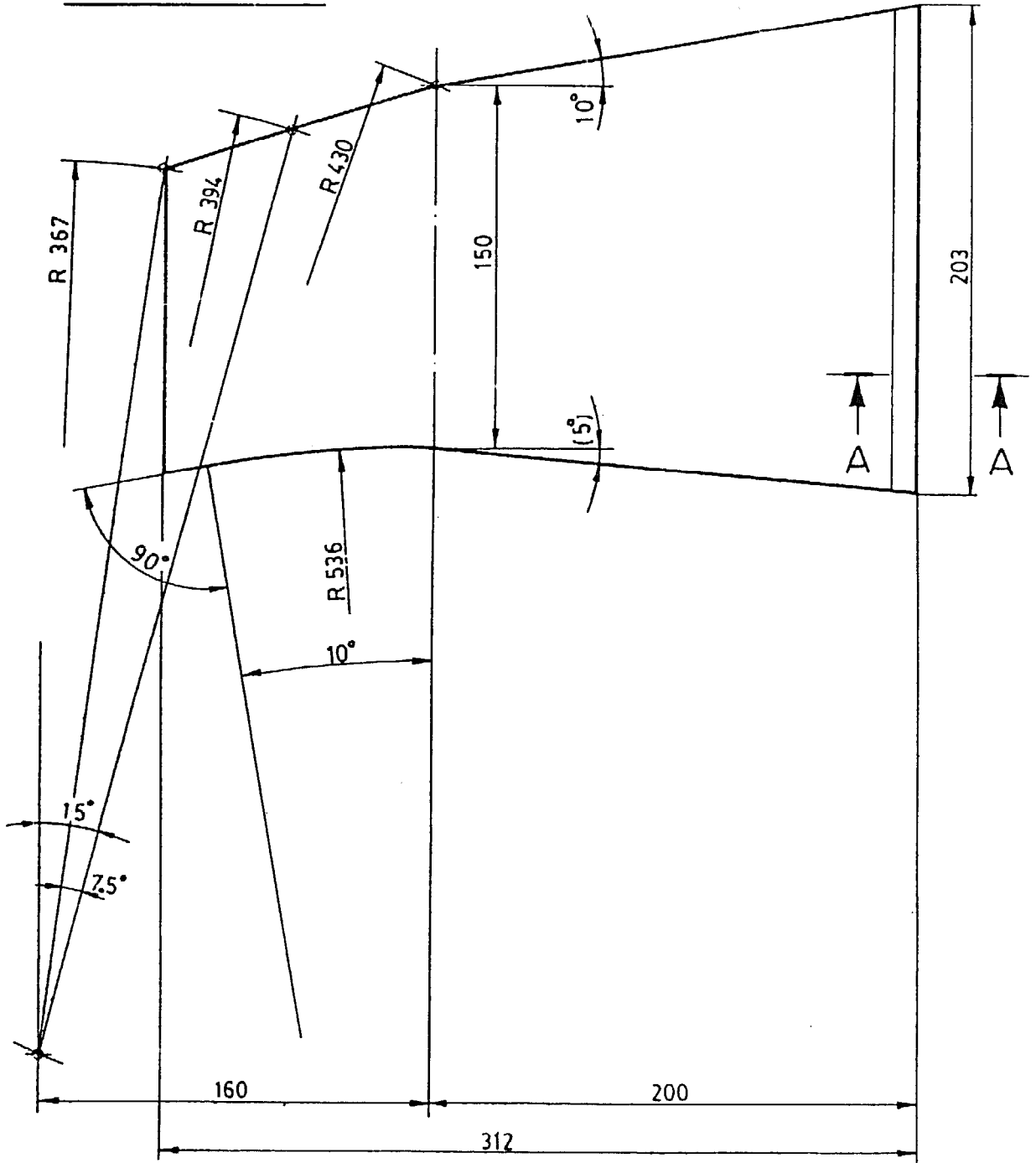
SEALING STRIP

T1-08,8

1:1



SECTION A-A



Revised 28.2.82. J.P.

MEASUREMENTS VERY APPROXIMATE ONLY.
ADJUST TO FIT IN INLET

1 PIECE
6mm M.S. Plate

INLET CENTRE RIB

T1-08.9

SCALE 1:25 1:1

POS	NO. OF ITEMS	ITEM	DRAWING NO.	SPECIFICATIONS	REMARKS
1	1	M.S. FLAT LENGTH: X + 80	T1 - 08.10	10 X 40	
2	2	M.S. FLAT LENGTH: X	T1 - 08.10	10 X 40	
3	2	M.S. FLAT LENGTH: 290	T1 - 08.10	10 X 40	
		FLANGE FOR X 70	T1 - 08.10/1		
		FLANGE FOR X 100, X 150, X 180	T1 - 08.10/2		
		FLANGE FOR X 200, X 220	T1 - 08.10/3		
		X 300, X 360, X 400	T1 - 08.10/4		

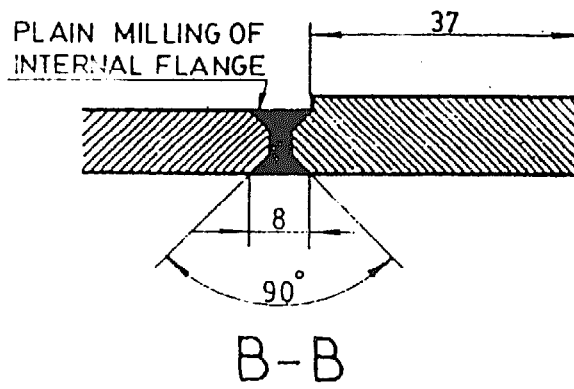
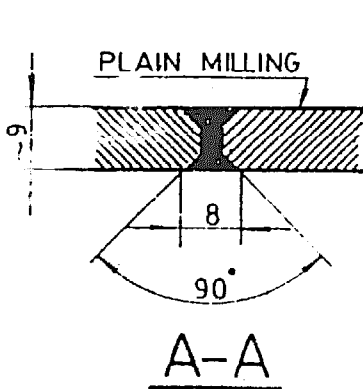
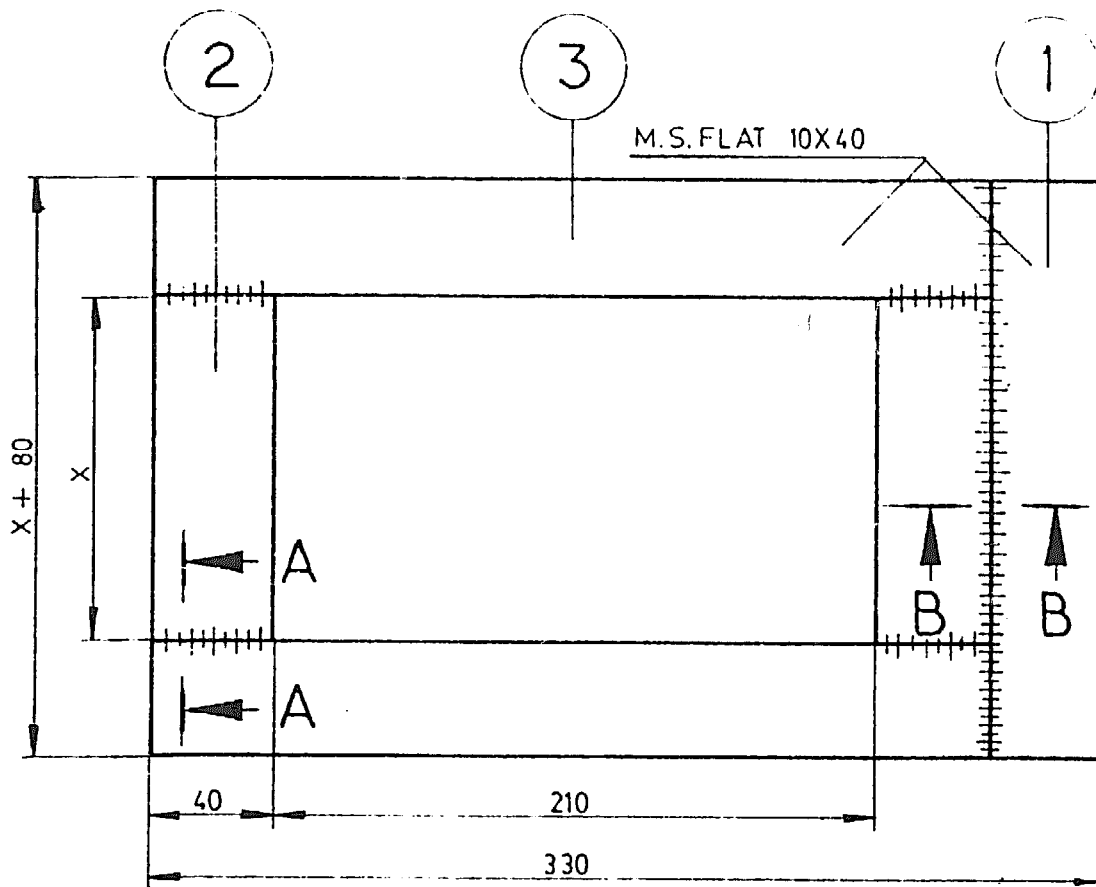
Rechecked 23.7.92 *[Signature]*

↑
CONSISTING OF

INLET SQUARE FLANGE

PARTS LIST

T1-08.10



NOTE . FOR DRILLING HOLES REFER TO DRG T1-08.5/1-3

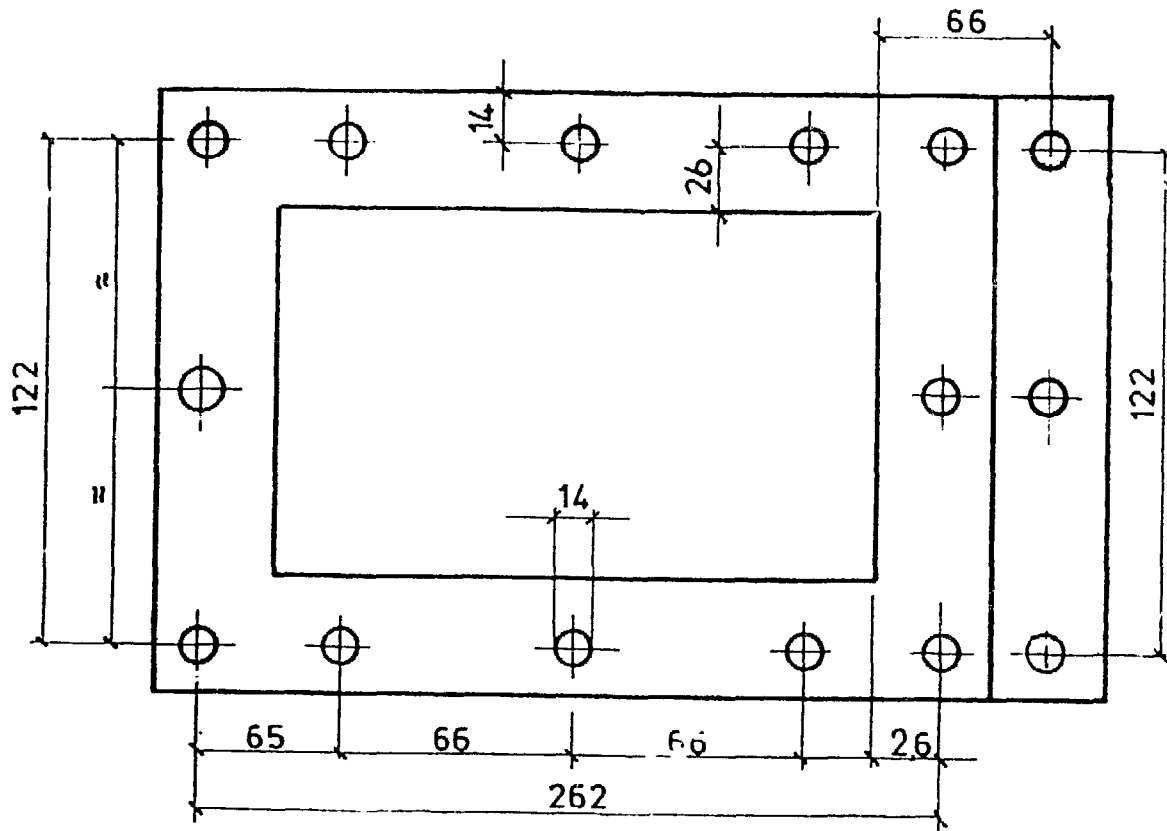
Revised 20.7.82

INLET SQUARE FLANGE

T1-08.10

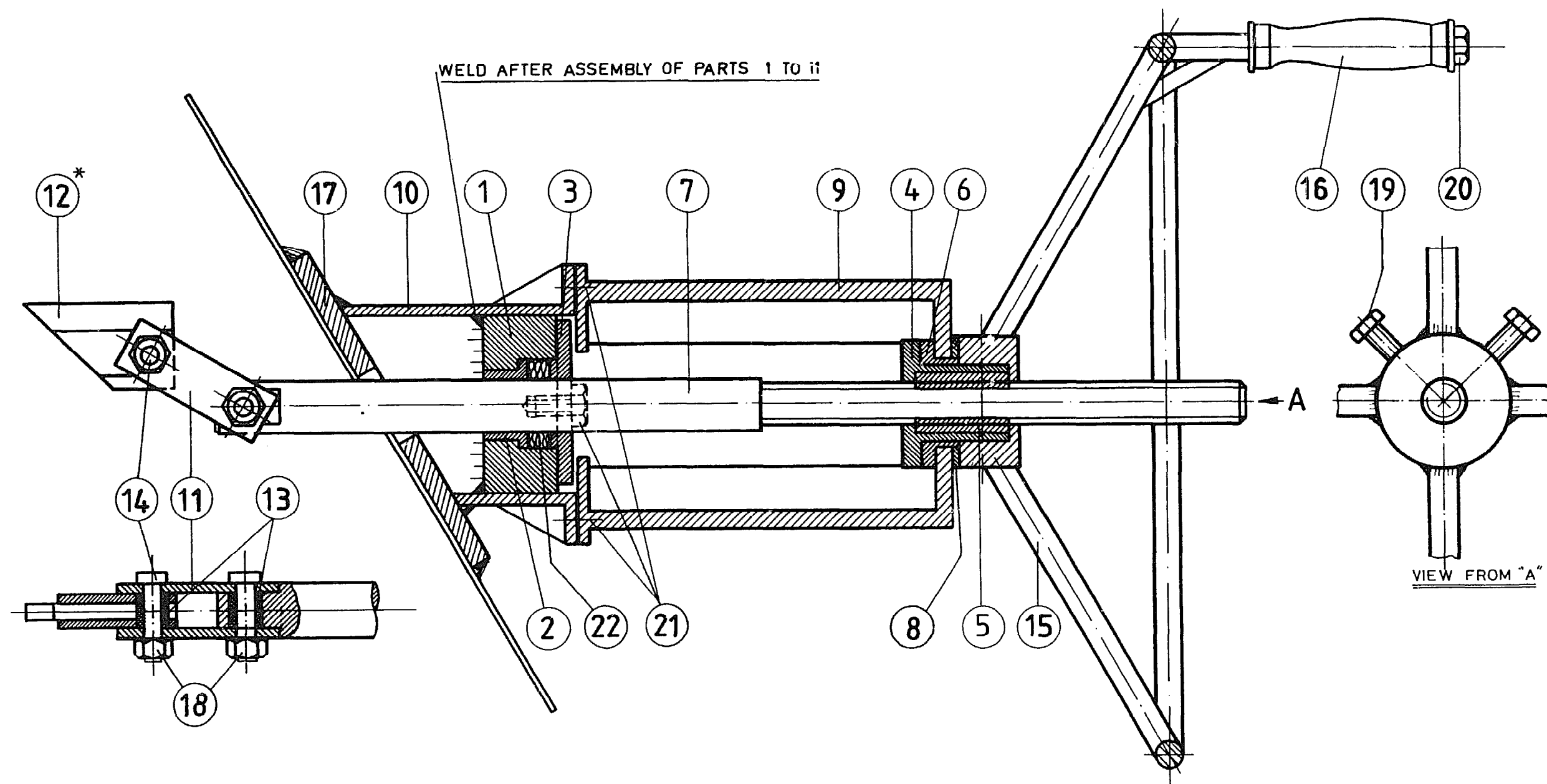
SCALE 1:25

287.02 Revins 2



INLETSQARE FLANGE X 70

T1-08,10/1



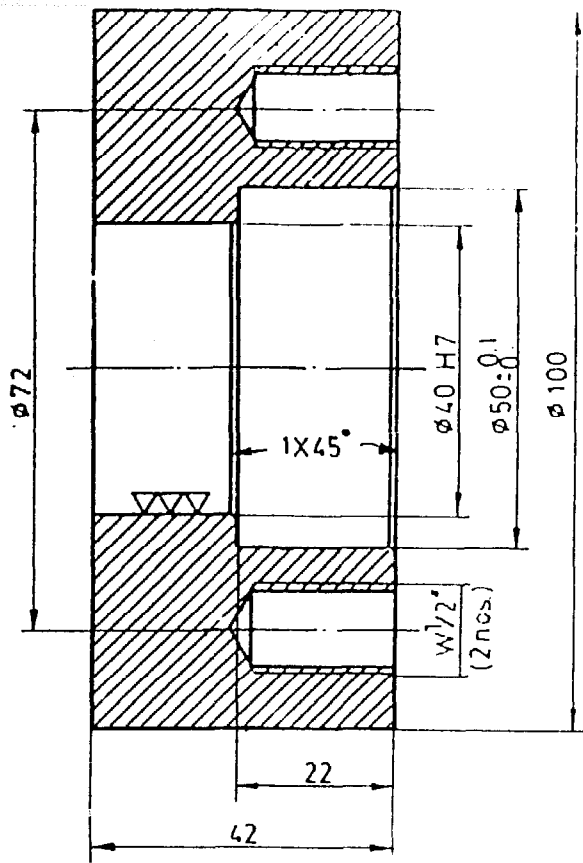
* WELD TO REGULATOR WING ASSEMBLY (T1-06.0)
 DURING ASSEMBLY IN OPEN POSITION OF GATE.
 MAKE SURE THAT FULL CLOSING OF GATE IS
 POSSIBLE BEFORE FULL WELDING.

REGULATOR MECHANISM

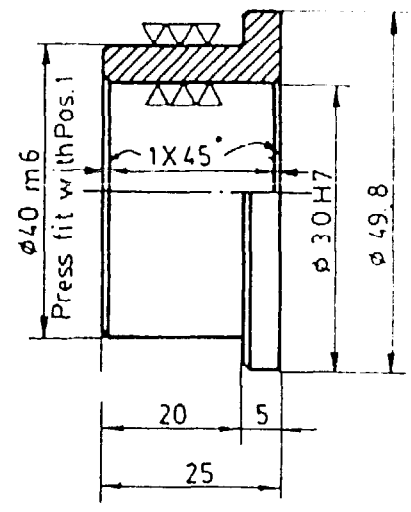
T1-09.0

SCALE 1:2.5

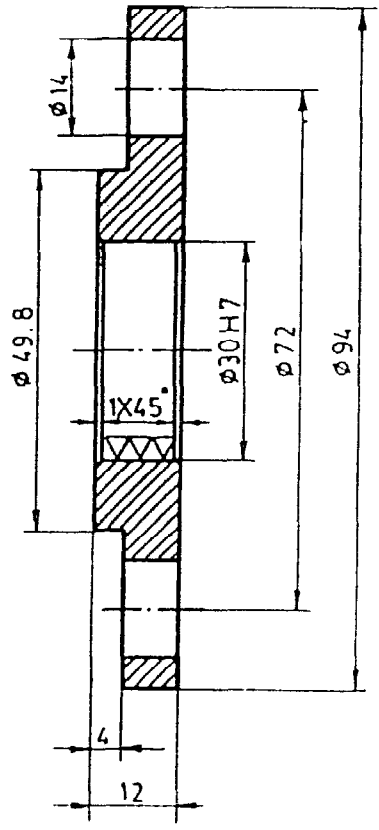
REVISED 29.7.52



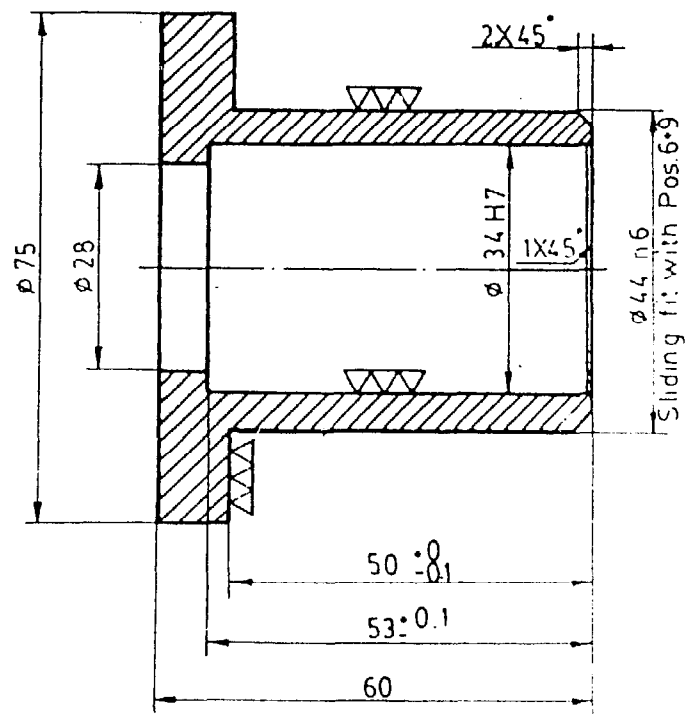
POS. - 1 M.S. ROD. 1 Pc.



POS. - 2 BRASS ROD. 1 Pc.



POS. - 3 M.S. ROD. 1 Pc



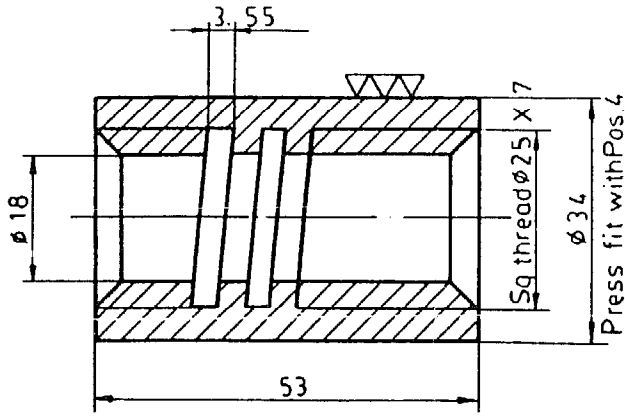
POS. - 4 M.S. ROD. 3" 1 Pc

Revised 29.7.81 by

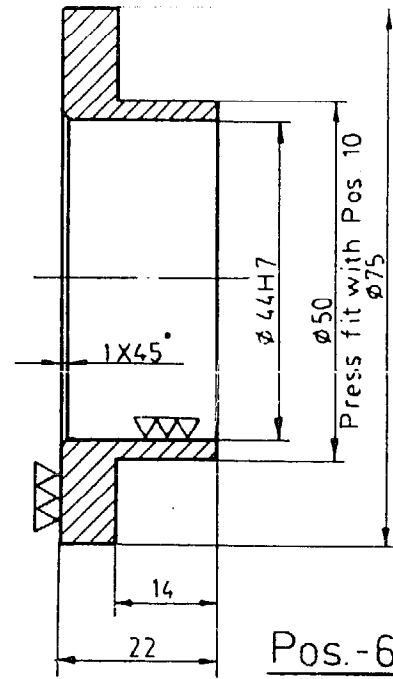
REGULATOR MECHANISM PARTS

T1-09.1-4

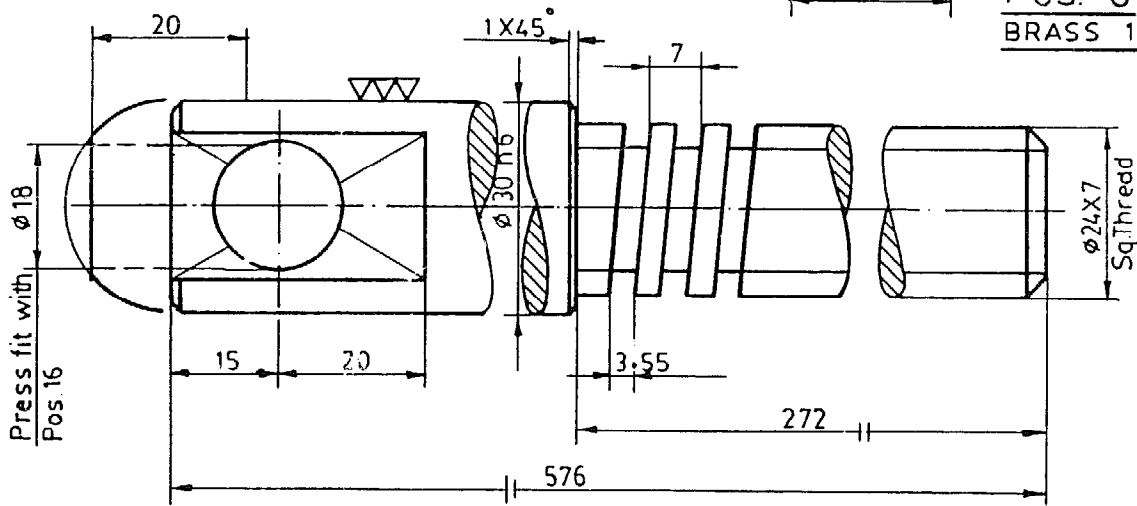
SCALE 1:1



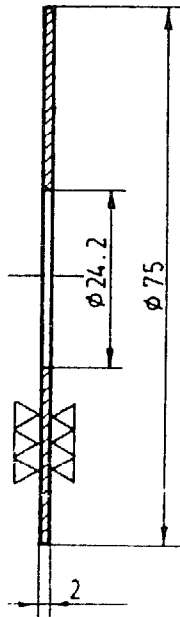
Pos. - 5 BRASS 1Pc.
 CUT THREAD AFTER ASSEMBLY
 WITH POS. 4



Pos. - 6
 BRASS 1Pc.



Pos - 7 M.S. ROD ϕ 1 1/2' 1Pc.



Pos - 8 BRASS 1Pc.

Revised 09.7.82 def.

REGULATOR MECHANISM PARTS

T1-0.9.5-8

SCALE 1:1

POS	NO.OF ITEM	ITEM	DRAWING NUMBER	SPECIFICATION	REMARKS
1	1	BEARING PLATE	T1- 09.9	M.S.PLATE 6 MM X ϕ 75	
2	1	SUPPORT PLATE	T1- 09.9	M.S.PLATE 10 MM 100 X 140.	
3	2	ANGLE	T1-09.9	50 X50X196	
4	2	FLANGE	T1-09.9	M.S.PLATE 6MM 50 X75	

PART LIST

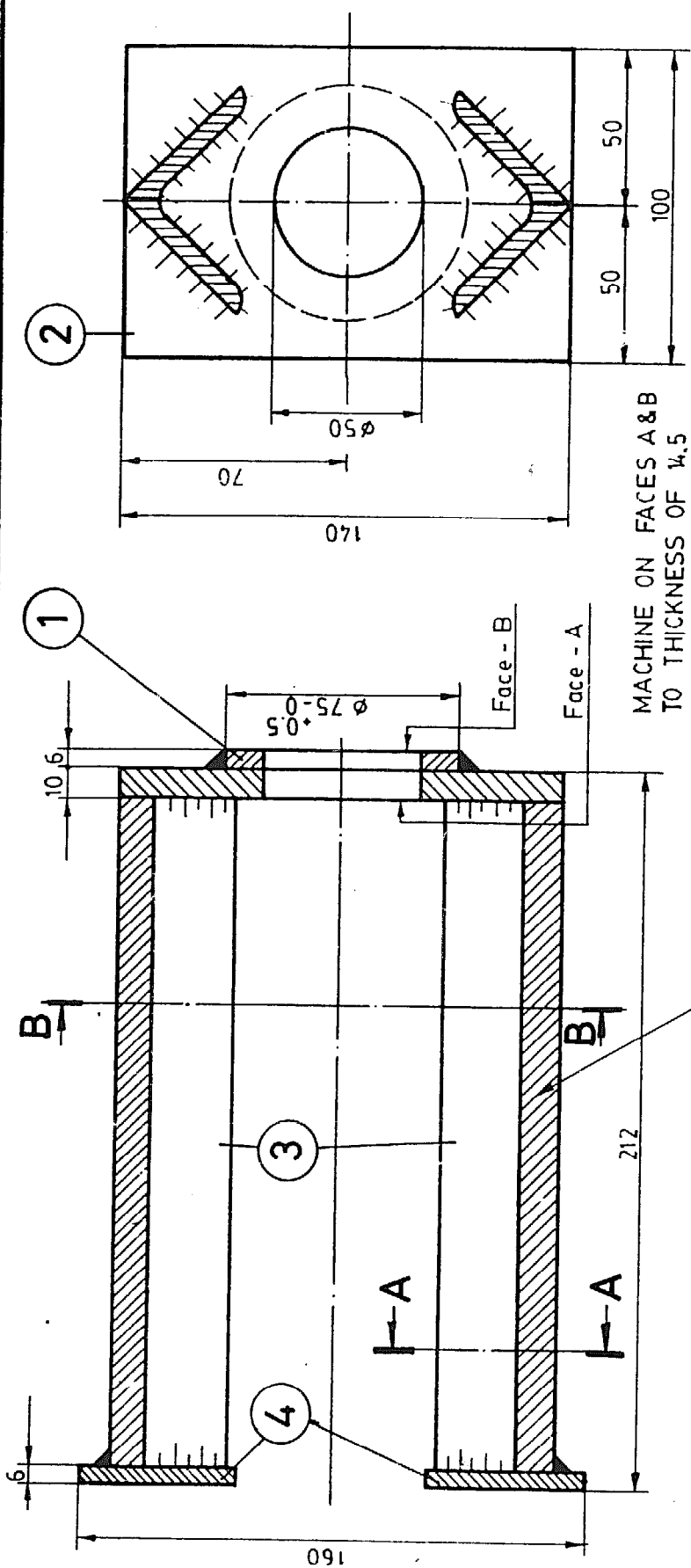
ANGLE FRAME

T1-09.9

Revised 29.7.82

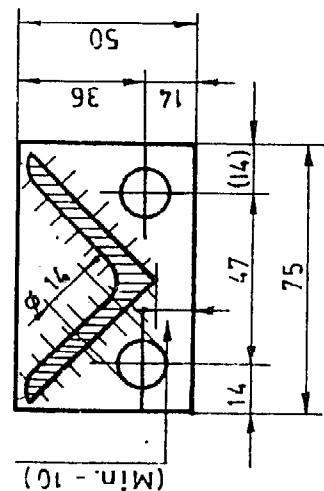
ANGLE FRAME

SCALE 1:2



MACHINE ON FACES A & B TO THICKNESS OF 4.5

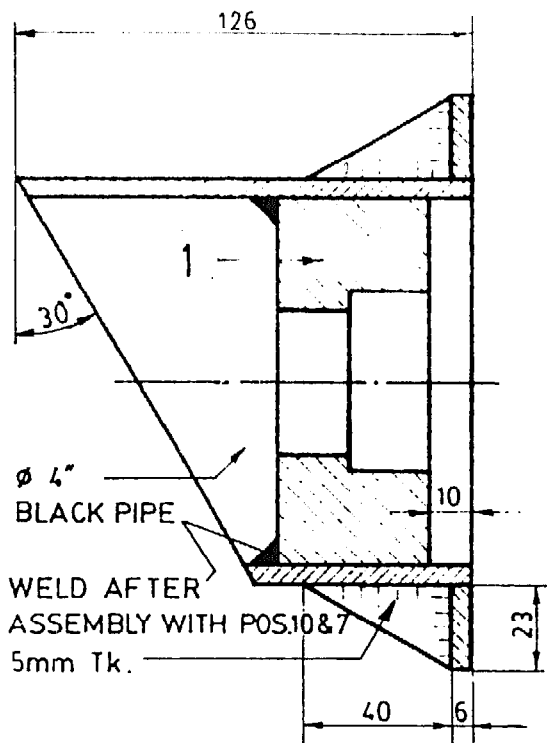
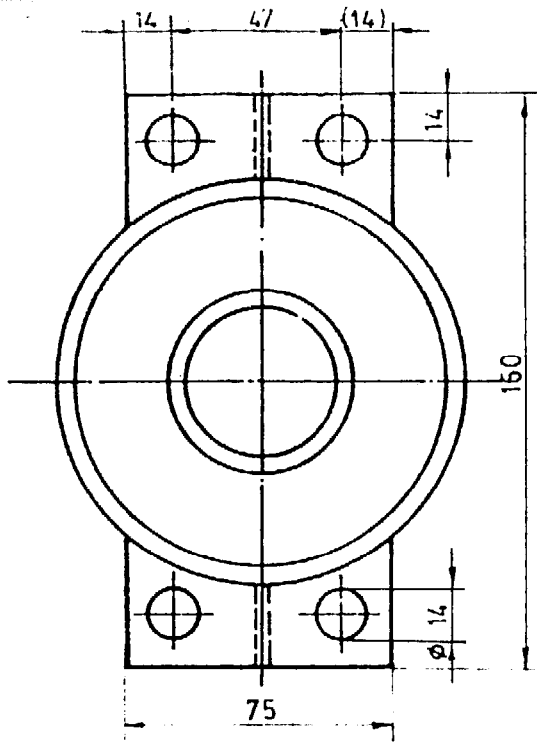
C.SECTION - B - B



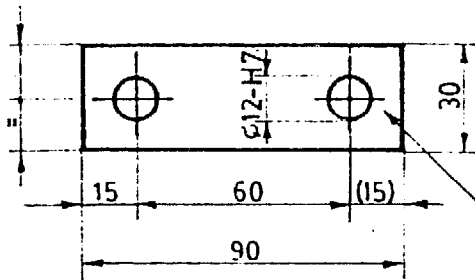
C.SECTION - A - A

WELDING OF ANGLE SHALL BE DONE IN COMPLETE ASSEMBLY OF MECHANISM.

T1-09,9

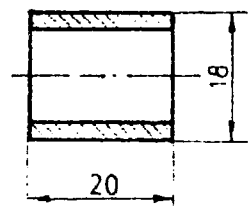
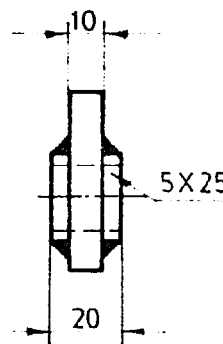
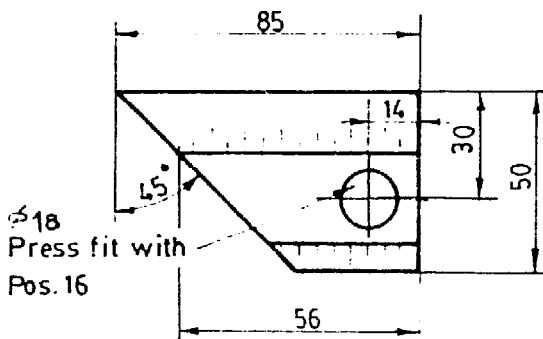


Pos -10 INO. ASSEMBLY



M.S. FLAT 6X30
(DRILL BOTH PARTS
TOGETHER)

Pos.11 2Pcs.



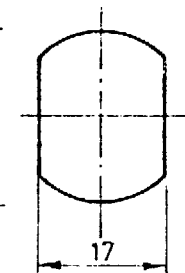
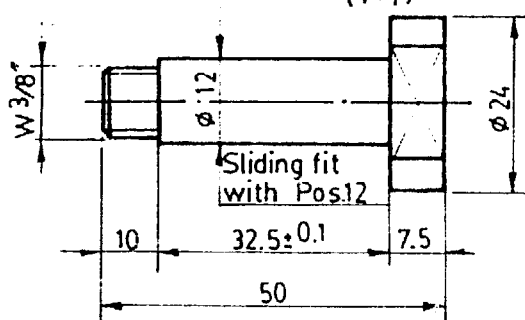
PVC PIPE $\phi 12$

Pos.-13 2 Pcs.

SCALE 1:1

Pos. -12 (Pc.)

(1:1)



M.S. ROD $\phi 1"$ Pos. -14 2Pcs.

Revised 29.7.82

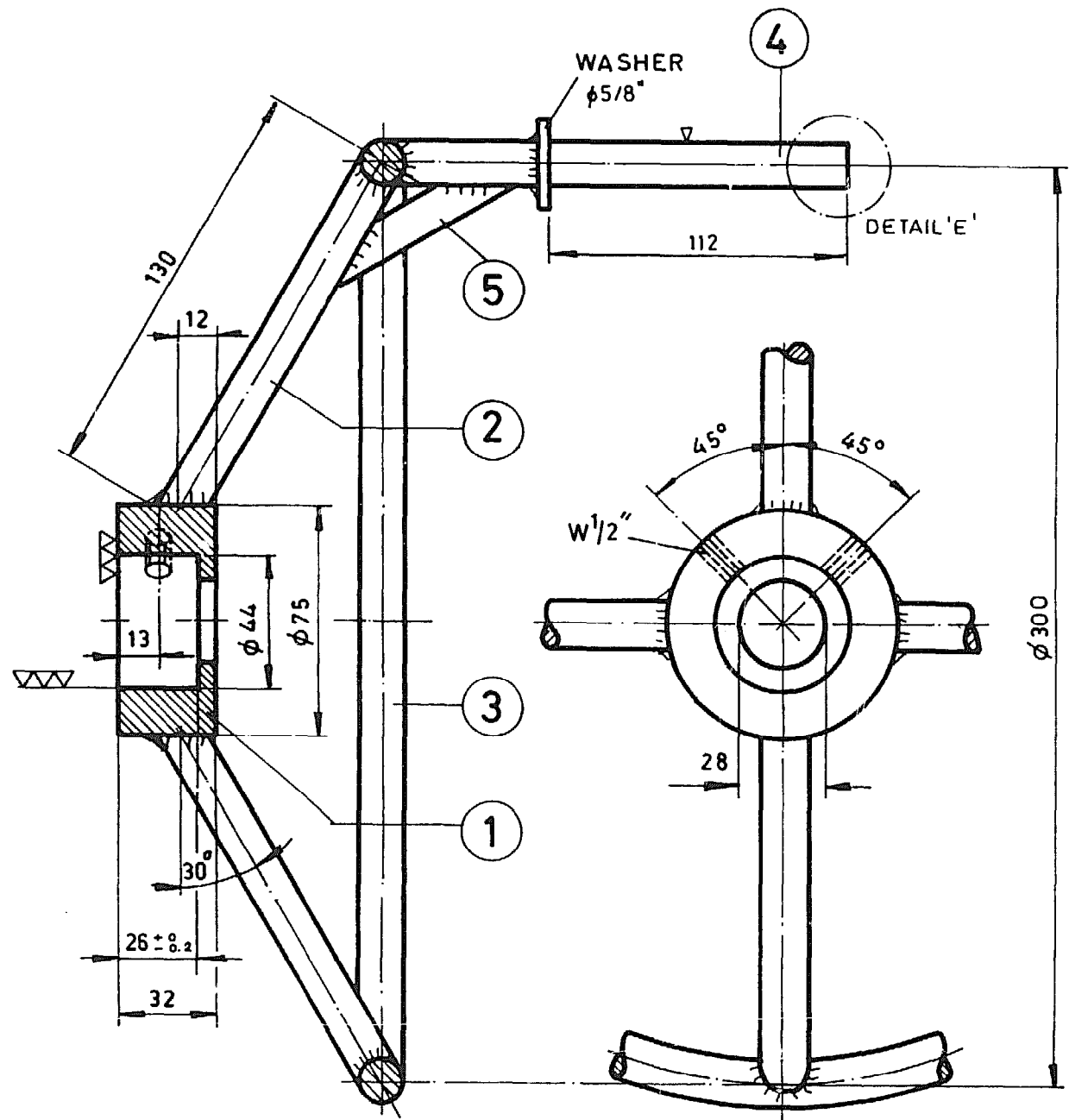
POS	NO.OF ITEM	ITEM	DRAWING NUMBER	SPECIFICATION	REMARK
1	1	HUB	T1-09.15	M.S.ROD ϕ 3" X 32	
2	4	SPOKE	T1-09.15	M.S.ROD ϕ 5/8" X 130	
3	1	RIM	T1-09.15	M.S.ROD ϕ 5/8" X 940	
4	1	HANDLE	T1-09.15	M.S.ROD ϕ 5/8 X 180	
5	1	RIB	T1-09.15	M.S.FLAT 6 X 12 X 62	

PART LIST

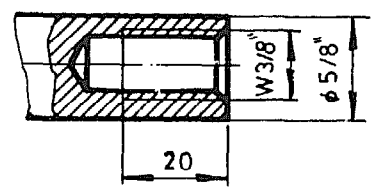
HAND WHEEL

T1-09,15

Revised 29.7.82 dff



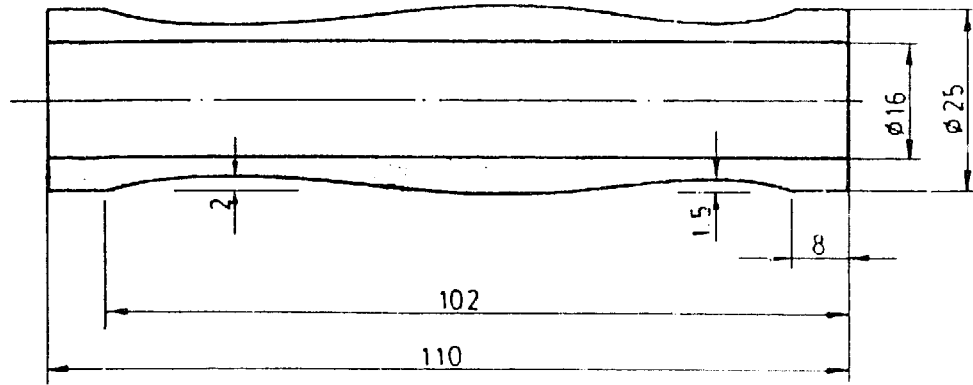
1. PC



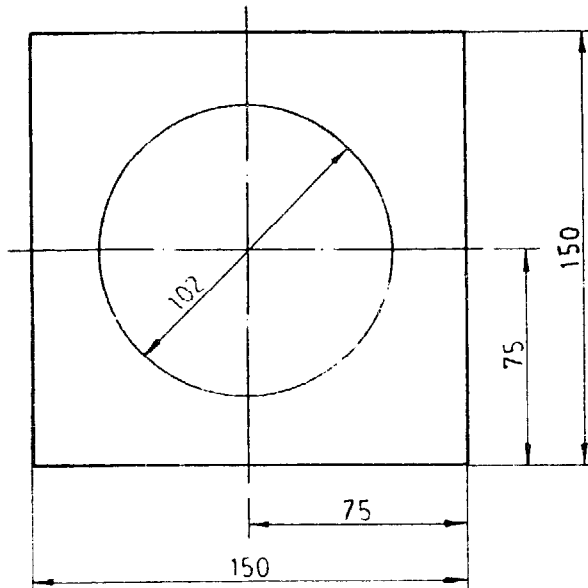
HAND WHEEL

1:2 (1:1)

T1-09,15

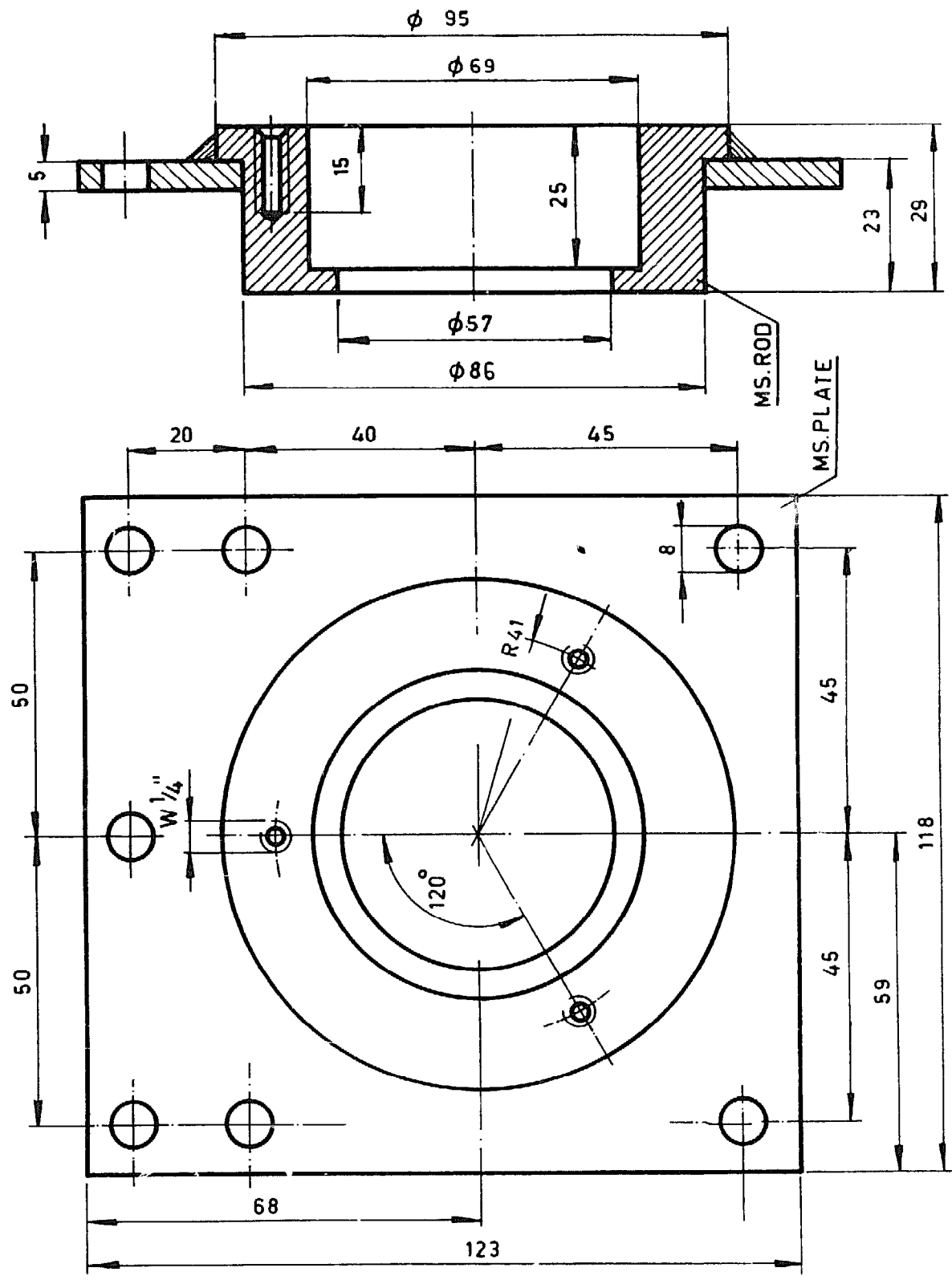


POS.16 (1:1)
 SEASONED WOOD
 1. NO



POS.17 (1:2.5)
 M.S.PLATE 6 MM
 1. NO

Revised 29.7.82. Ag



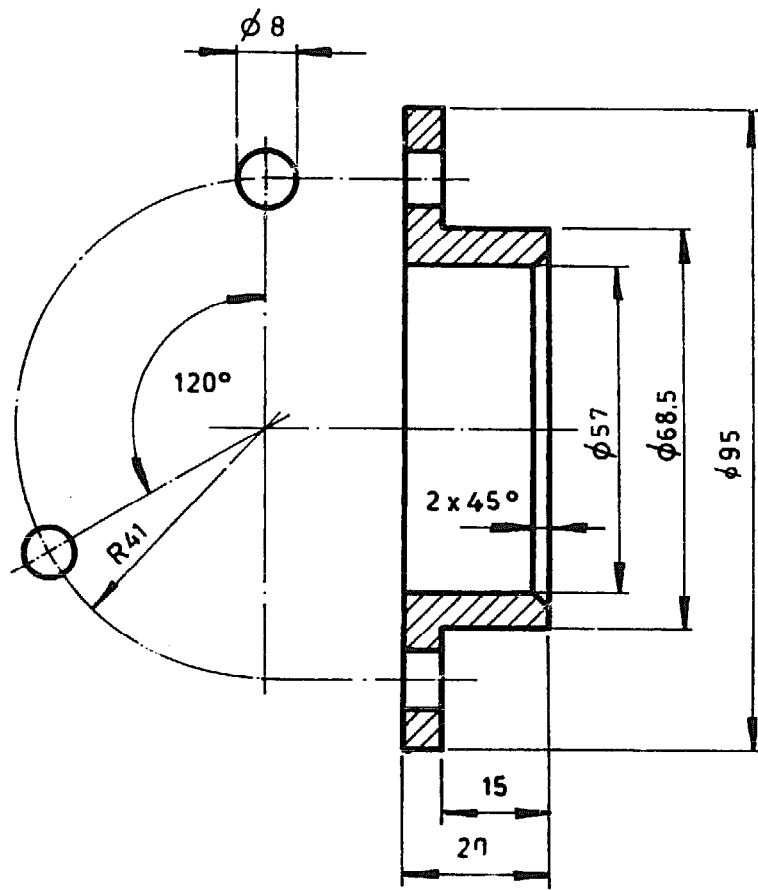
USE STUFFING BOX AS JIG TO DRILL HOLES FOR $W 1/4$ " THREADS ON SUPPORT BASE ASSEMBLY (T1-02.0) AND SEALING PLATE 'A' (T1-12.9).

2.PCS

Revised 28.8.82 dk

STUFFING BOX

T1-12.1



M.SROD

2.PCS

REVISED 28.7.82

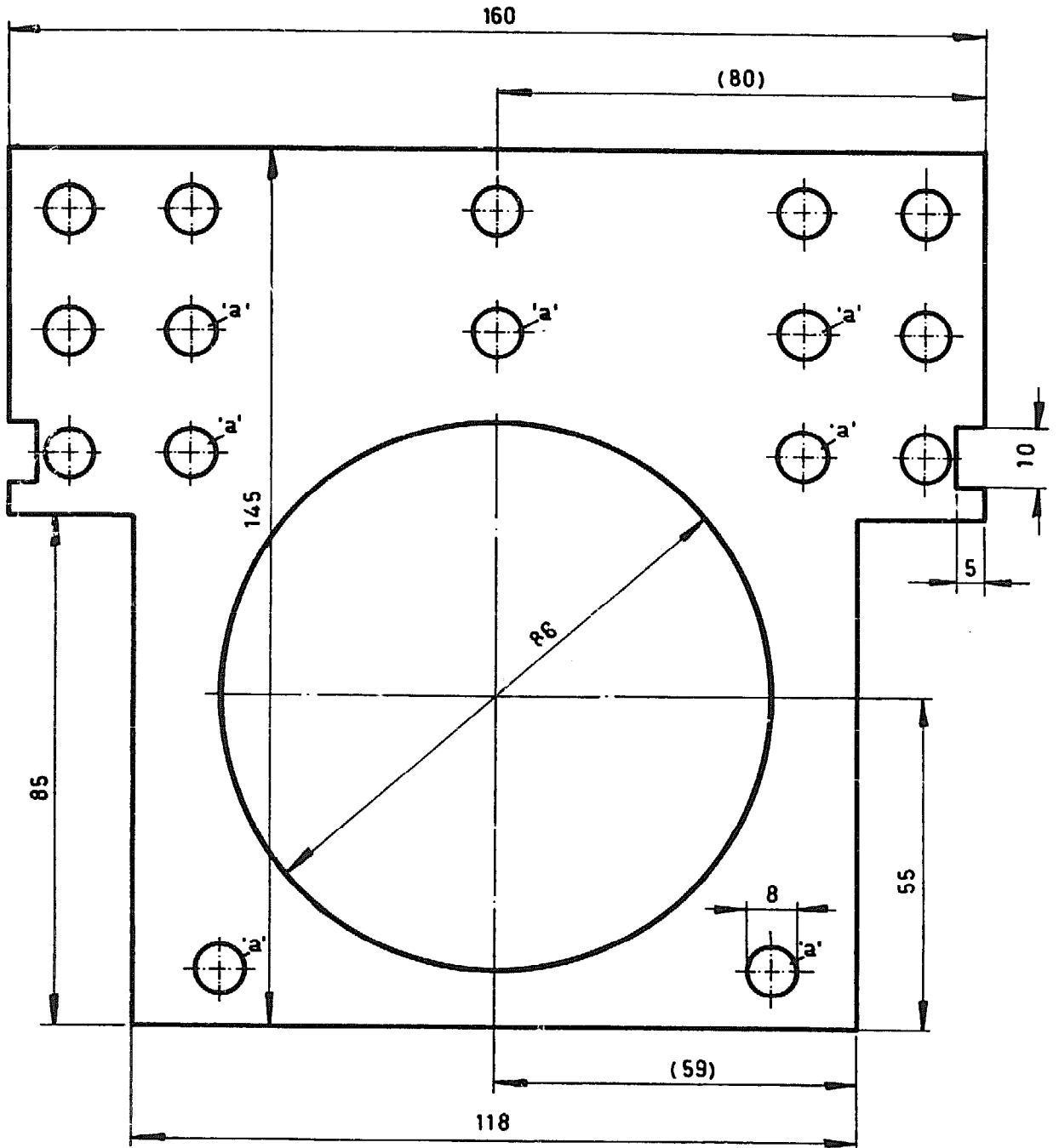
STUFFING BOX LID

T1-12.2

1:1

3MM RUBBER

2. PCS



-USE STUFFING BOX (T1-12.1) AS JIG TO MARK THE CENTRES OF THE HOLES INDICATED BY 'a'.

-REST OF THE HOLE CENTRES CAN BE MARKED BY USING COVER SHEET (T1-12.7) AS JIG.

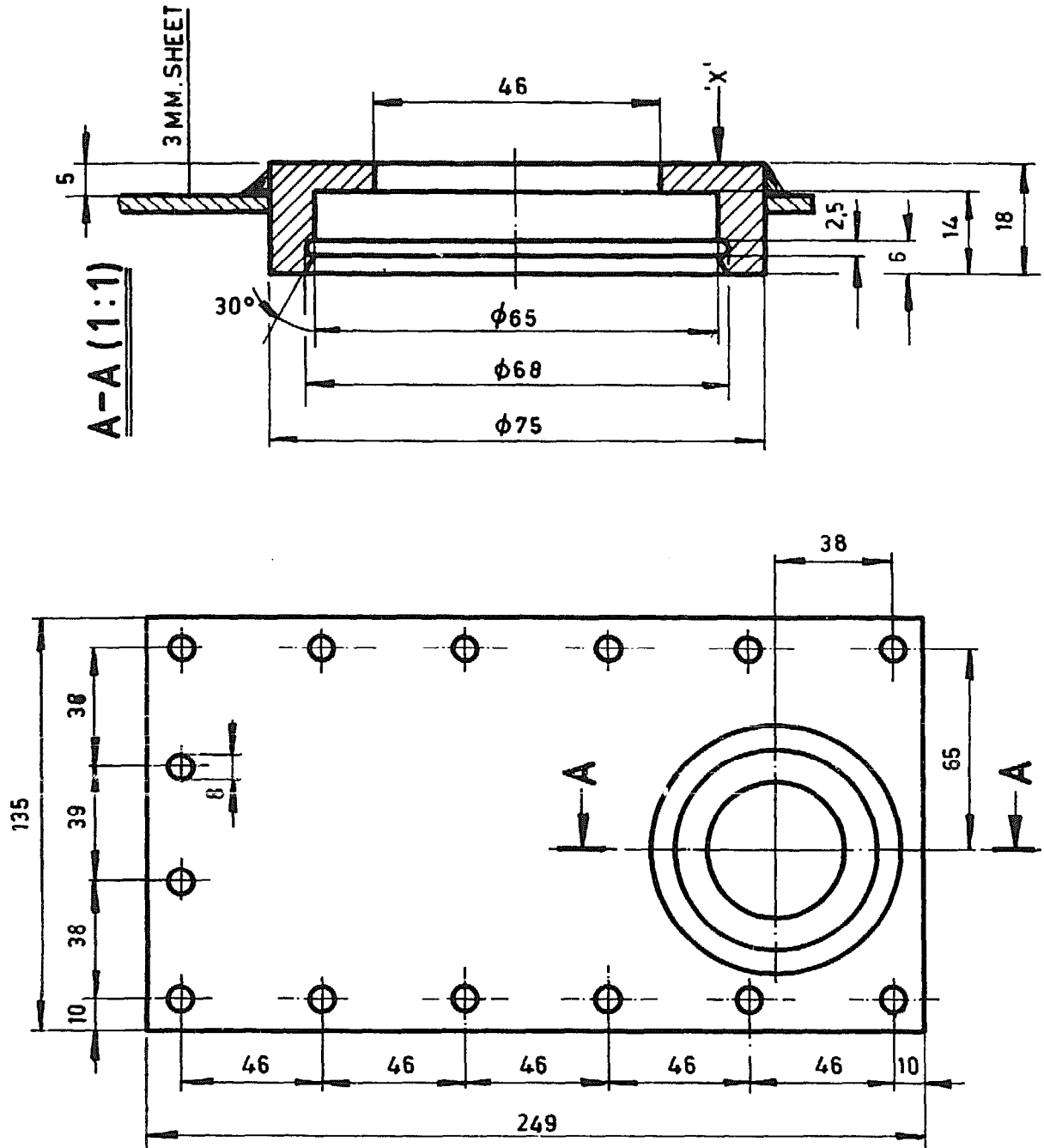
Revised ca. 1-82 JF

STUFFING BOX GASKET

T1-12.3

1:1

USE THIS PART AS JIG TO DRILL HOLES
 FOR W 1/4" THREAD REQUIRED ON. T1-2.4, T1-03.2, T1-02.5
T1-12.9



- MAKE ONE SET AS PER DRAWING.
- TURN THE FACE 'X' OF THE DISH ONLY ON THE NEXT SET. AND WELD

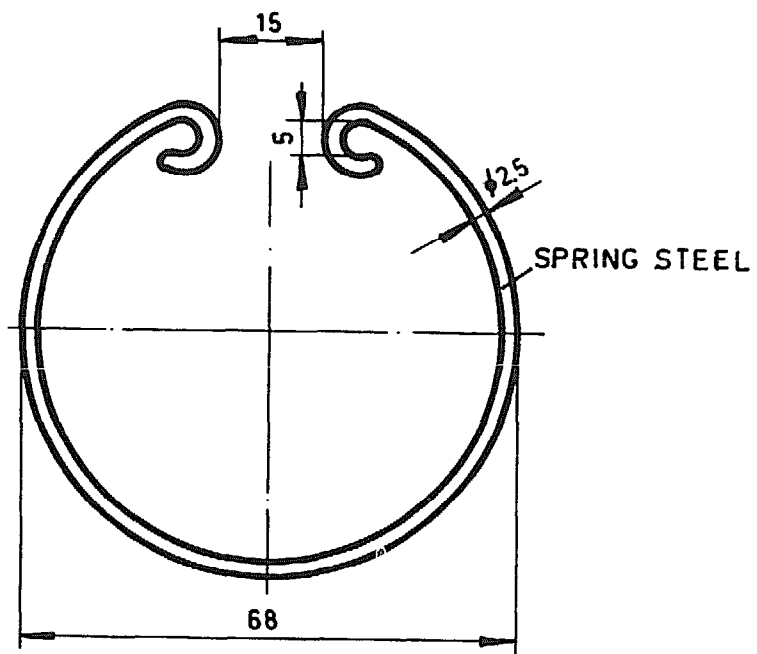
2.PCS

Revised 28.7.02

OIL SEAL HOUSING

T1-12.4

1:2 (1:1)



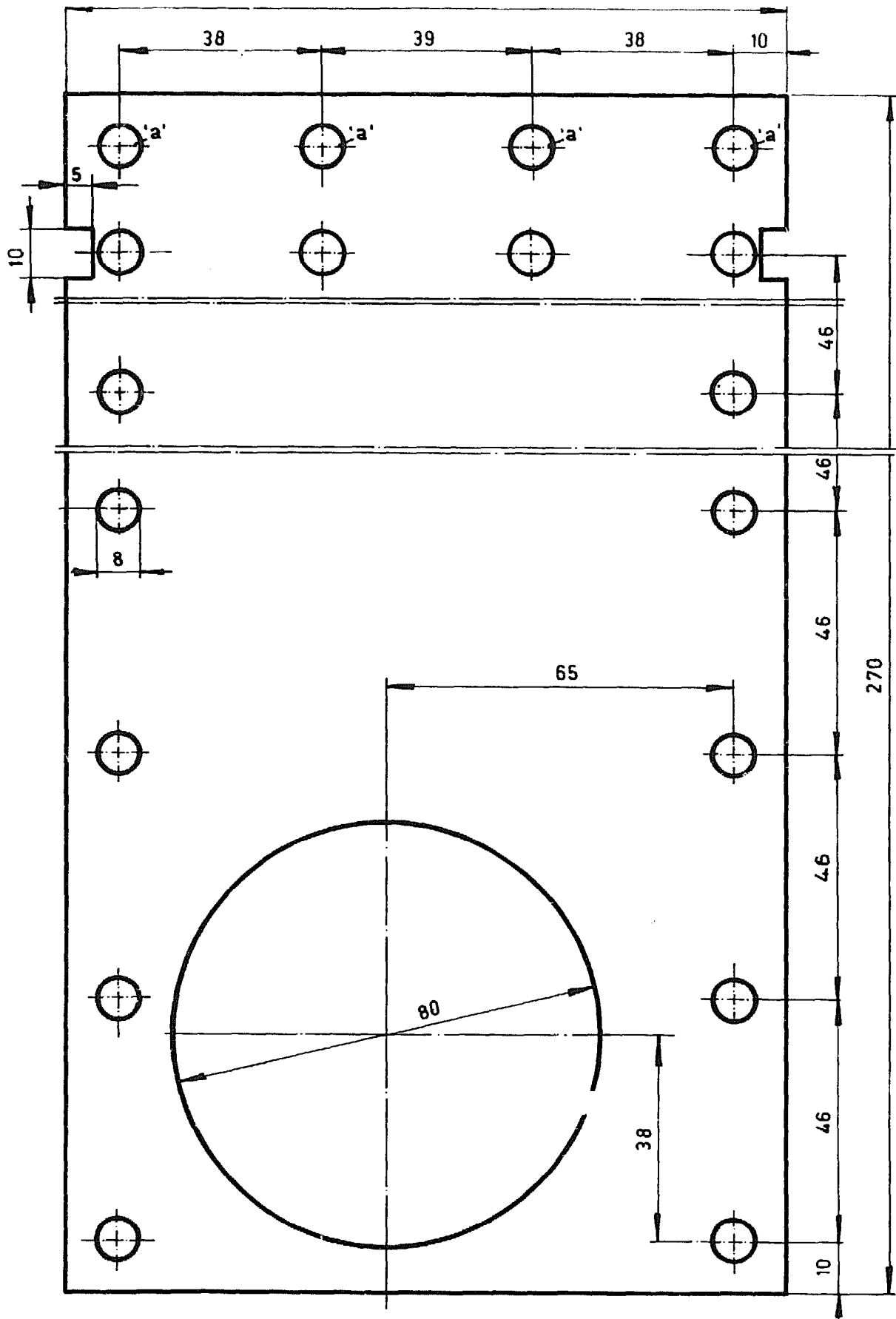
2.PC

Revised 28.7.92 *af*

LOCK SPRING

1:1

T1-12,5



Revised 28.7.82 A

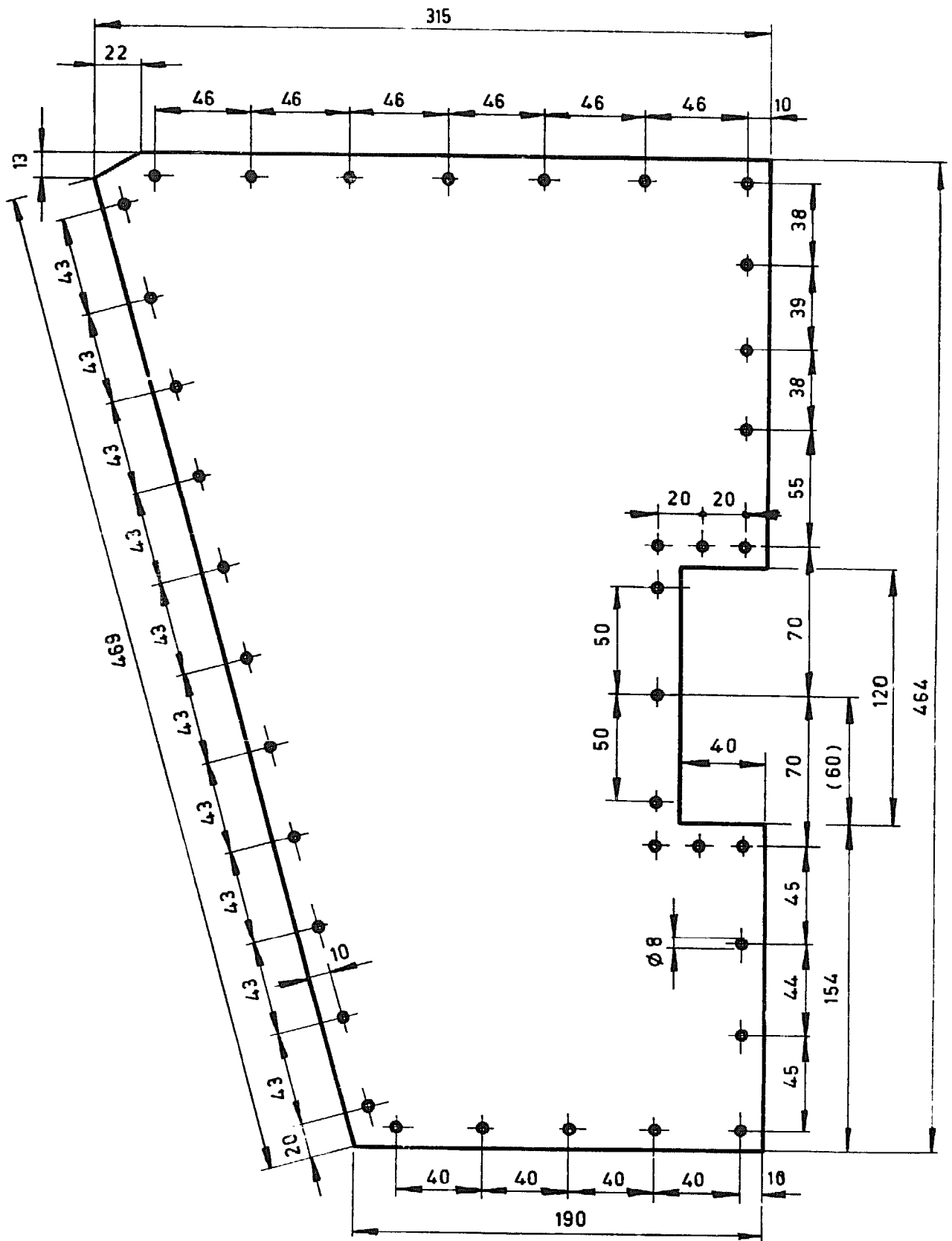
3 MM. RUBBER
2.PCS

USE COVER SHEET (T1-10,3) AS JIG TO MARK CENTRES OF THE HOLES INDICATED BY 'a'.

OIL SEAL HOUSING GASKET

T1-12.6

1:1



USE COVER SHEET AS JIG TO DRILL HOLES FOR $W\frac{1}{4}$ THREADS ON FOLLOWING PARTS:-

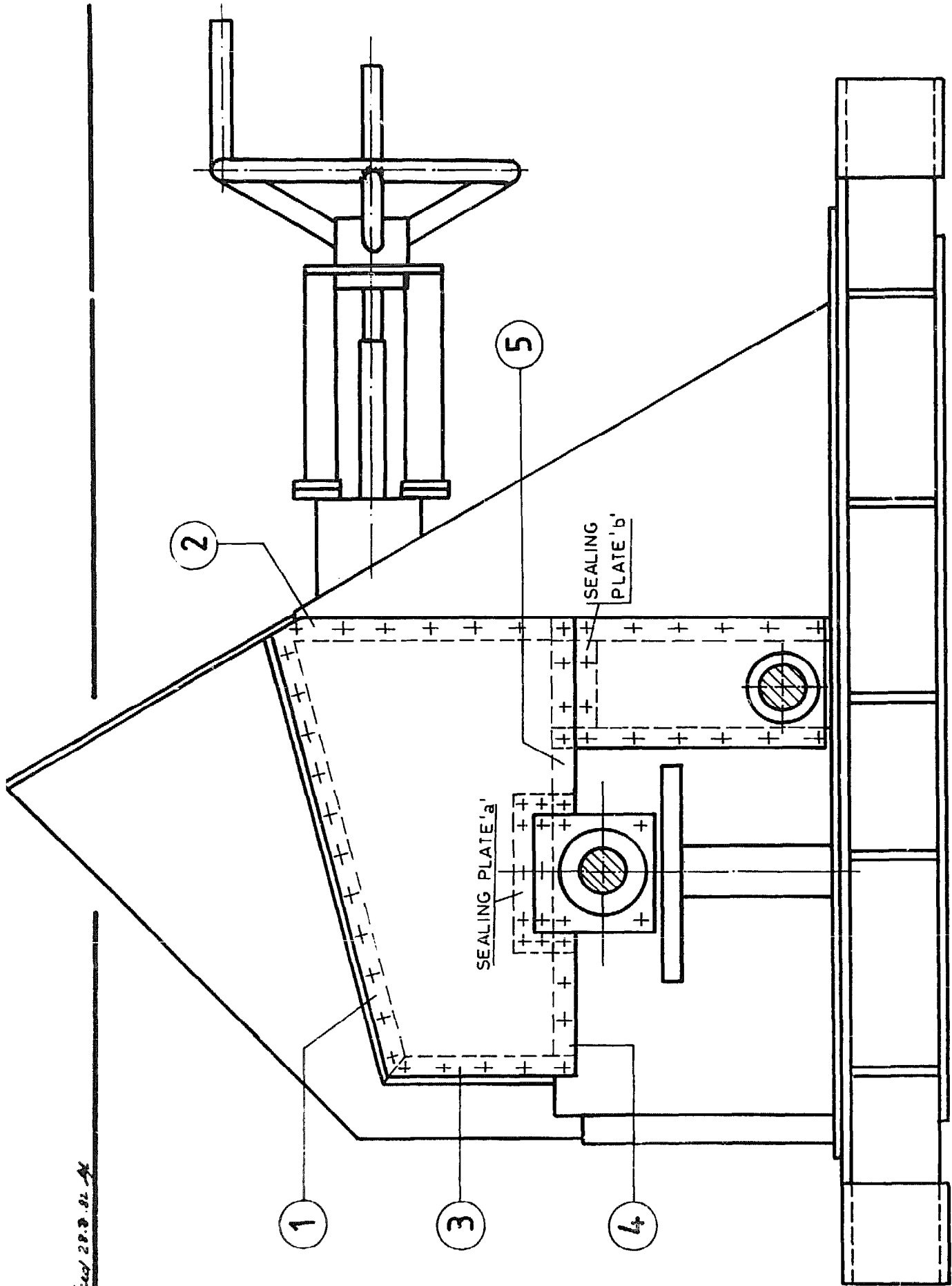
- SUPPORT ASSEMBLY (T1-02.0)
- BAFFLE HOUSING ASSEMBLY (T1-03.0)
- COVER SHEET FRAMES (T1- 8.4-5)
- SEALING PLATE (T1- 12.9 , T1- 12.10)

Revised 2.8.7.82

COVER SHEET

T1-12,7

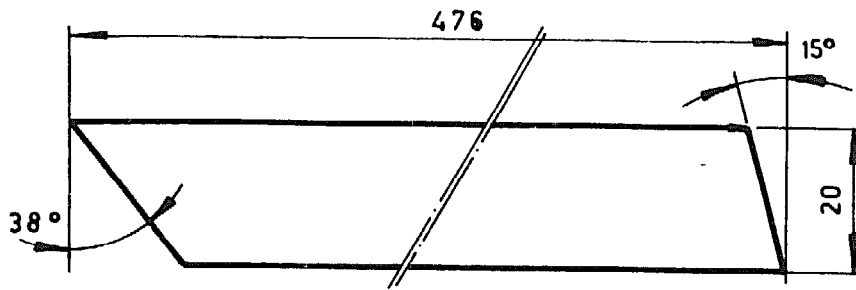
SCALE 1: 2.5



Revised 28.8.81 M

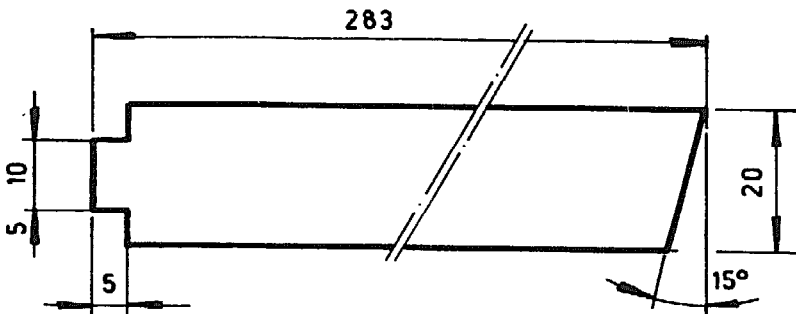
SHEET COVER GASKETS

T1-12.8



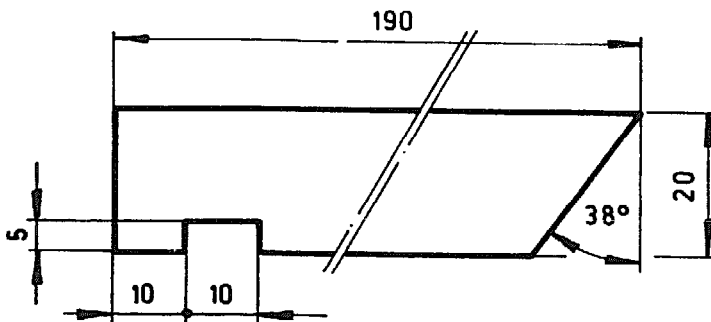
POS 1

2.PCS



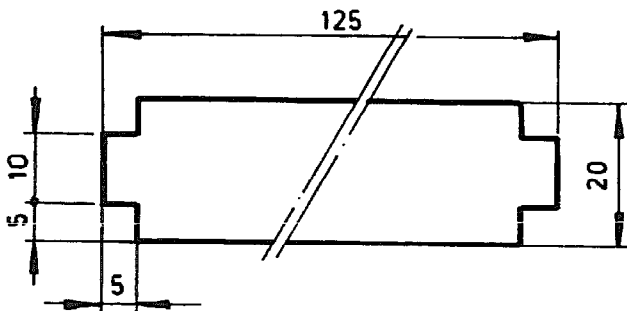
POS 2

2.PCS



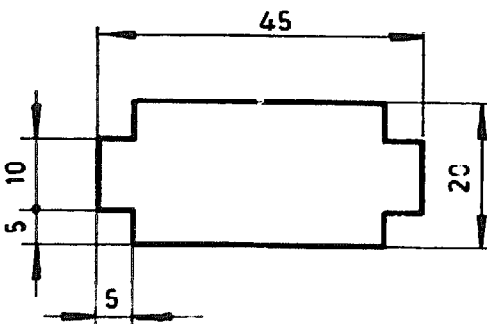
POS 3

2.PCS



POS 4

2.PCS



POS 5

2PCS

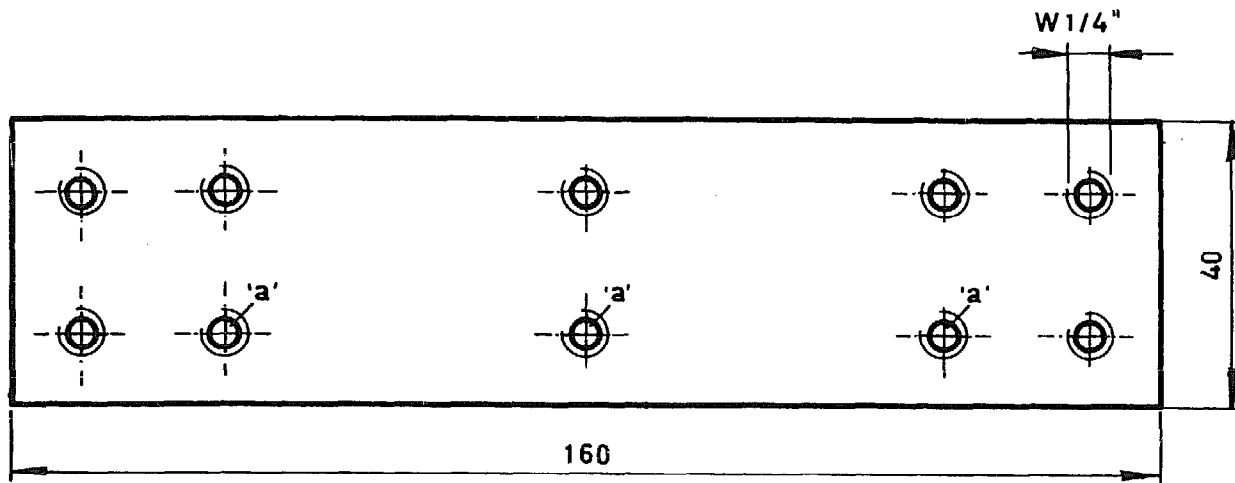
USE 3MM THICK RUBBER FOR ALL POSITIONS

Revised 20.7.92

COVER SHEET GASKET

T1-12.8/1-5

1:1



- A. USE STUFFING BOX (T1-12.1) AS JIG TO DRILL HOLES FOR THE THREADS INDICATED BY 'a'.
- B. USE COVER SHEET (T1-12.7) AS JIG TO DRILL HOLES REQUIRED FOR REST OF THE THREADS
- C. ABOVE MENTIONED OPERATIONS SHOULD BE CARRIED OUT DURING ASSEMBLY WORK.

6.MM PLATE

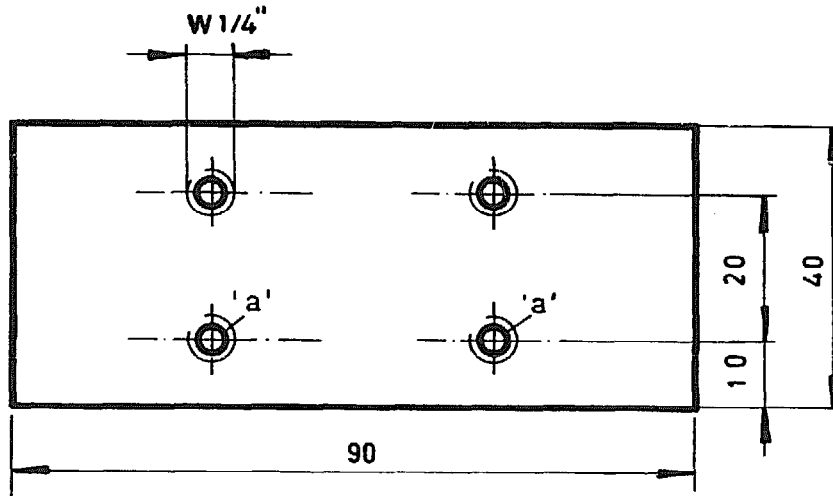
2.PCS

28.7.71 As Revised

SEALING PLATE 'A'

T1-12-9

1:1



6. MM PLATE

2. PCS

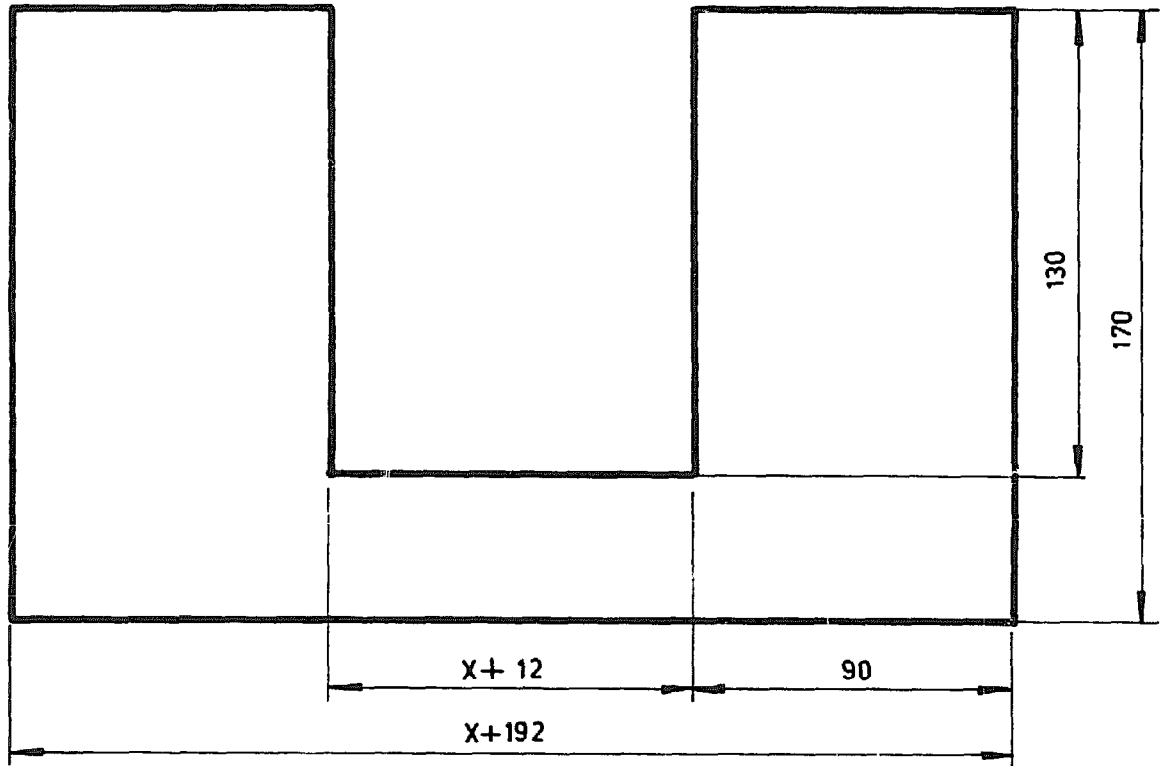
- THREADS INDICATED BY 'a' SHOULD BE MADE FIRST.
USE OIL SEAL HOUSING (T1-12.4) AS JIG TO MARK HOLE CENTER FOR THREADS.
- USE COVER SHEET (T1-12.7) AS JIG TO MARK HOLE CENTERS FOR REST OF THE TREADS.

REVISED 28.7.82 AF

SEALING PLATE 'B'

T1-12.10

111



3 MM RUBBER

1.PC

PUT THIS RUBBER IN BETWEEN INLET ASSEMBLY (T1-08.0) AND SUPPORT FRONT (T1-02.20) OF SUPPORT ASSEMBLY. MARK HOLE CENTER. PUNCH HOLES.

Revised 12.7.81 AK

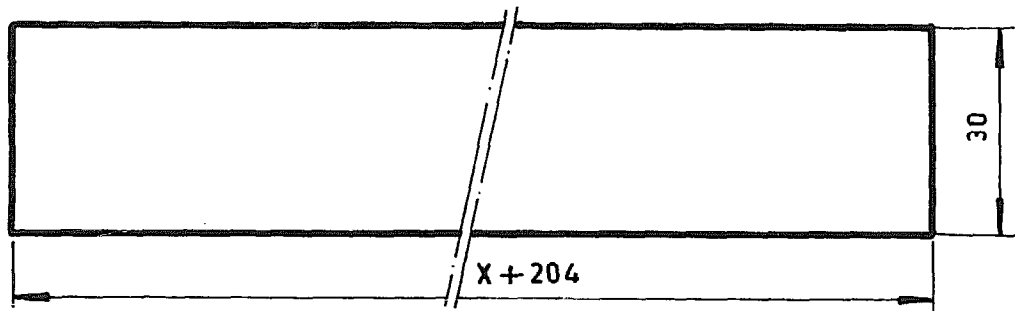
SEALING FLAP GASKET

T1-12.11

1:2

3.MM RUBBER

1 PC



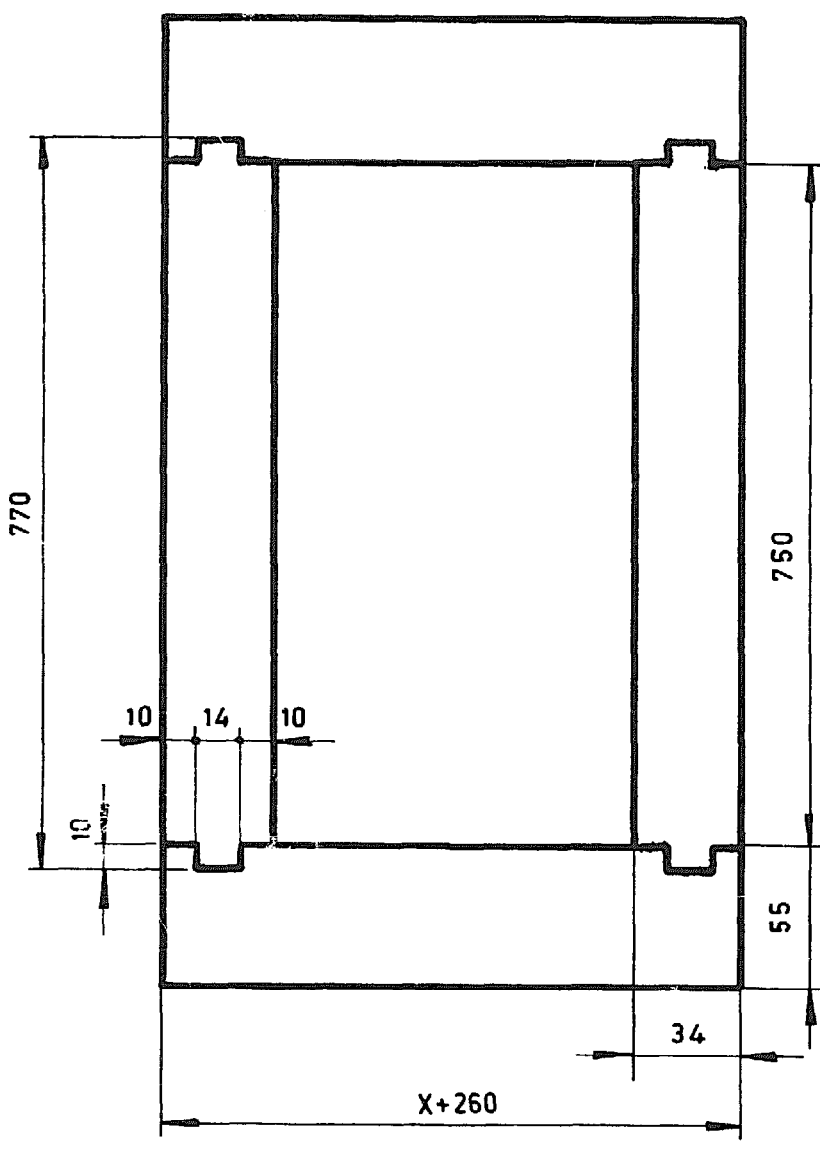
PUT THIS RUBBER INBETWEEN IN FLANGE (T1-08.5)+
SEALING STRIP (T1-08-8) AND BAFFLE HOUSING TOP (T1-03.3),
DURING ASSEMBLY WORK, MARK HOLE CENTRES. PUNCH HOLES.

Revised 18.7.72 M

BAFFLE PLATE GASKET

T1-12.12

1:1



6. MM RUBBER
1 NOS

Revised 28.7.82 J.

FOUNDATION FRAME GASKET

T1-12-13

HEX. HEAD BOLT

SR.NO	POS	SIZE	PCS									DRAWING NUMBER
			X70	X100	X150	X180	X200	X220	X300	X360	X400	
1	34	W 3/4" X 2"	4	4	4	4	4	4	4	4	4	T1-00.1-1
2	33	W 3/4" X 1/2"	2	2	2	2	2	2	2	2	2	T1-00.1-1
3	35	W 1/2" X 2"	4	4	4	4	4	4	4	4	4	T1-00.1-1
4	30	W 1/2" X 1 1/2"	37	39	41	41	44	44	47	47	47	T1-00.1-1
5	19	W 1/2" X 1 1/2"	2	2	2	2	2	2	2	2	2	T1- 09.0
6	21	W 1/2" X 1"	6	6	6	6	6	6	6	6	6	T1- 09.0
7	31	W 3/8" X 3/4"	5	5	6	6	6	7	7	8	8	T1- 00.2
8	20	W 3/8" X 3/4"	1	1	1	1	1	1	1	1	1	T1- 09.0
9	32	W 1/4" X 5/8"	122	122	122	122	122	122	122	122	122	T1-00.2
10	5	W 1/4" X 5/8"	8	8	8	8	8	8	8	8	8	T1- 05.0
11	6	W 1/4" X 5/8"	6	6	6	6	6	6	6	6	6	T1- 07.0
12	37	W 1/4" X 5/8"	4	4	4	4	4	4	4	4	4	T1- 00.3

HEX. NUT

SR.NO	POS	SIZE	PCS									DRAWING NUMBER
			X70	X100	X150	X180	X200	X220	X300	X360	X400	
1	34	W 3/4"	4	4	4	4	4	4	4	4	4	T1- 00.1
2	33	W 3/4"	2	2	2	2	2	2	2	2	2	T1- 00.1
3	35	W 1/2"	4	4	4	4	4	4	4	4	4	T1- 00.1
4	30	W 1/2"	37	39	41	41	44	44	47	47	47	T1- 00.1
5	21	W 1/2"	4	4	4	4	4	4	4	4	4	T1- 09.0
6	31	W 3/8"	5	5	6	6	6	7	7	8	8	T1- 00.2/T1-08.0
7	18	W 3/8"	2	2	2	2	2	2	2	2	2	T1- 09.0
8	37	W 1/4"	4	4	4	4	4	4	4	4	4	T1- 00.3
HEX. NUT/BOLT W 1/2" X 1 1/2" *			24	24	24	26	26	26	28	28	28	

* REQUIRED ONLY IF DRAFT TUBE IS USED.

PART LIST

FASTENERS

T1-13.0

Revised 12.8.82

POS.	NO. OF ITEMS	ITEM	DRAWING NO.	SPECIFICATIONS	REMARKS
1	1	ADAPTER	T1-14.1		
2	1	SQUARE FLANGE	T1-14.2		
3	1	PIPE FLANGE	T1-14.3		

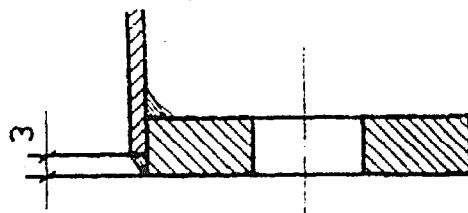
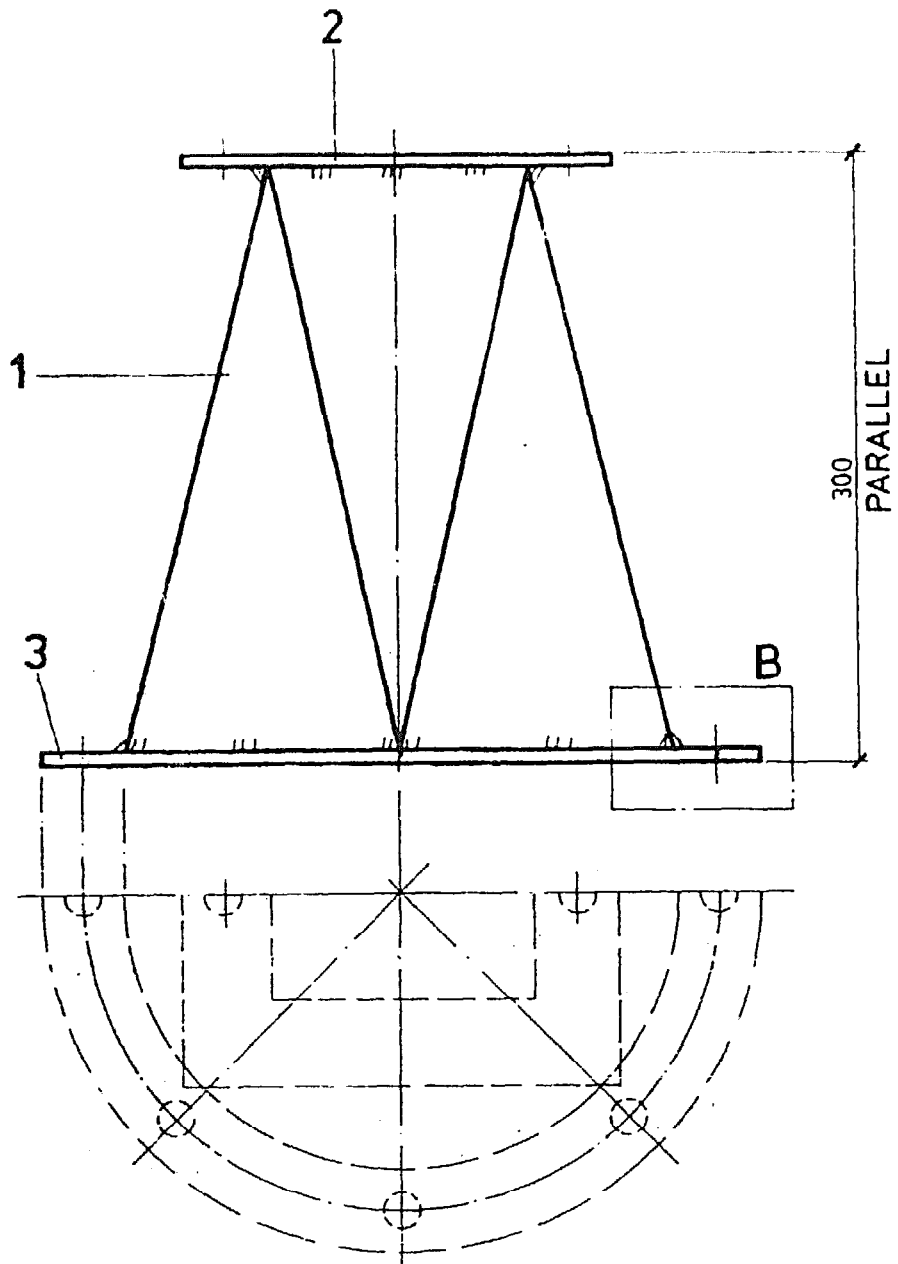
Revised 28.7.81 M.

↑
CONSISTING OF

ADAPTER ASSEMBLY

PARTS LIST

T1-14.0

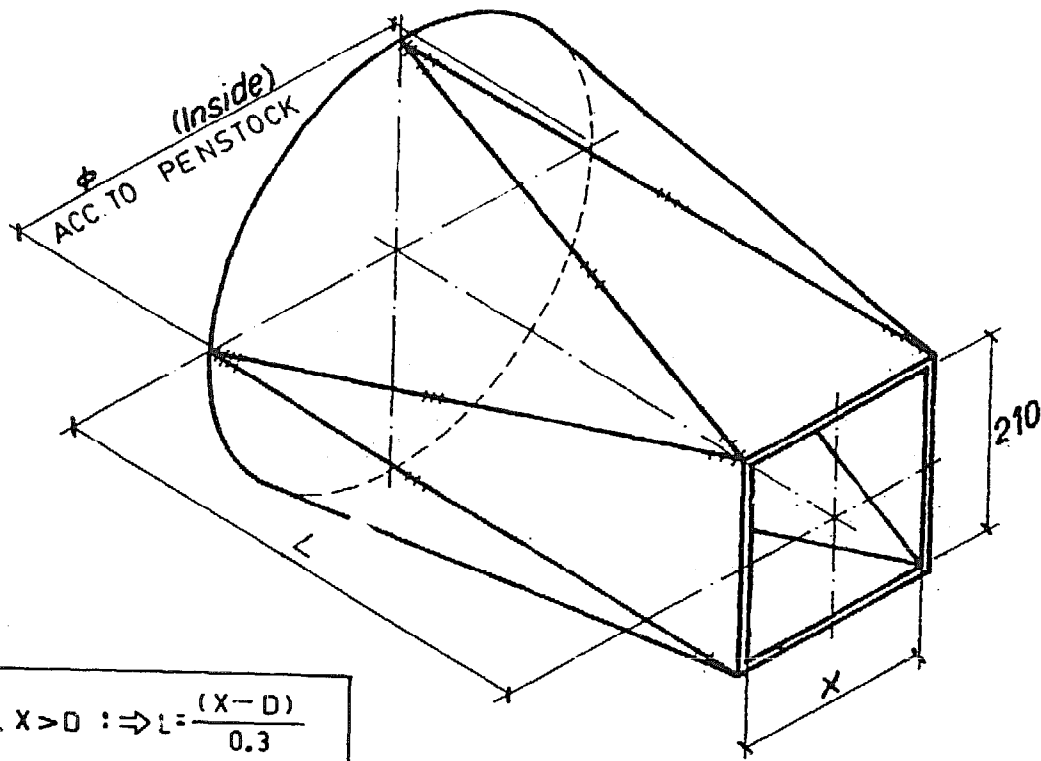


DETAIL 'B'

Revised 28792 H

ADAPTER

T1-14.0



$x > D : \Rightarrow L = \frac{(x - D)}{0.3}$
$x \leq D : \Rightarrow L = 300 \text{ mm}$

M.S SHEET 2.5 mm

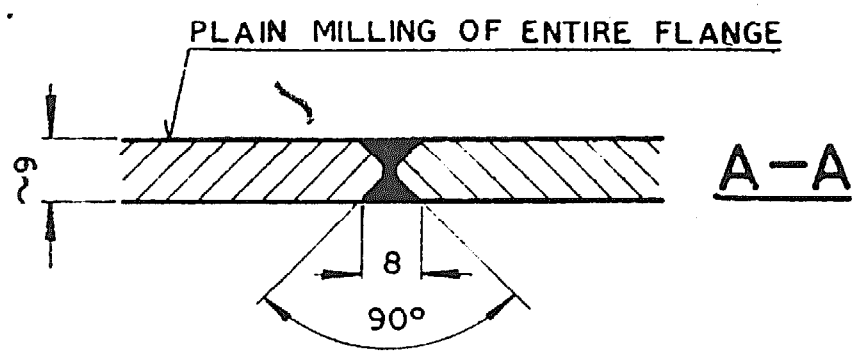
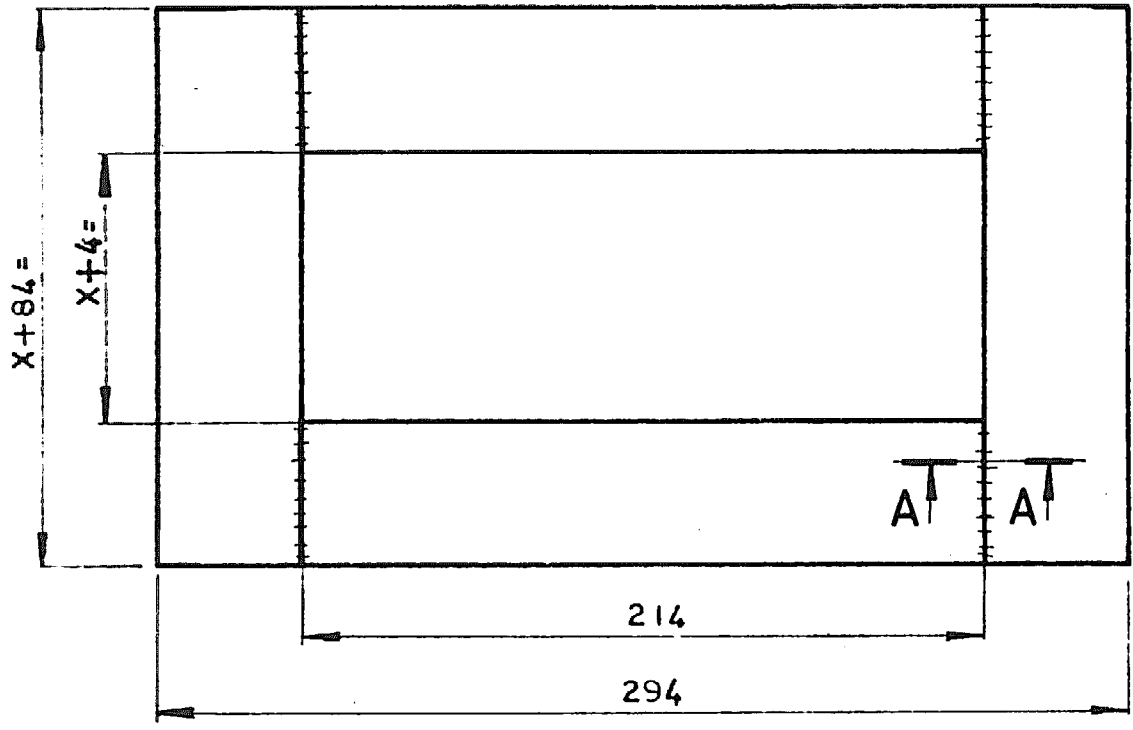
1.Pc

Revised 28.7.82

ADAPTER

T1-14.1

MS FLAT 10 X 40

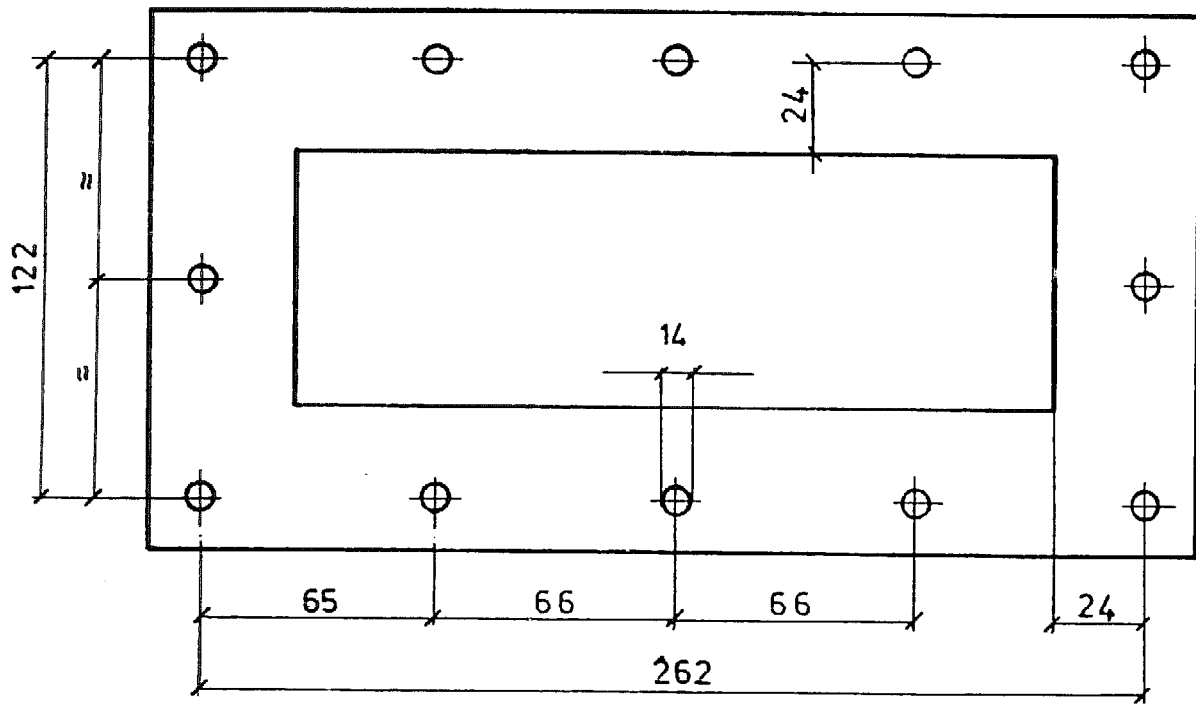


FOR DRILLING HOLES REFER TO T1-14.2/1 - 2/4

Revised 20.7.81 dx.

ADAPTER SQUARE FLANGE

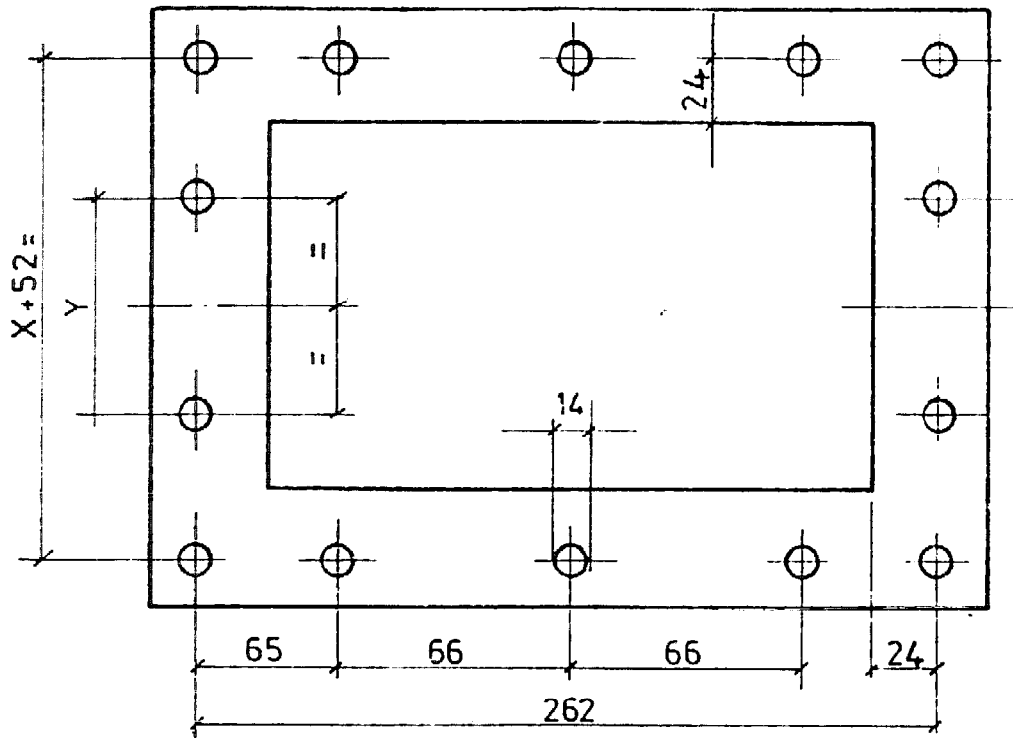
T1-14.2



REVISED 28.7.11.04

ADAPTER FLANGE (X70)

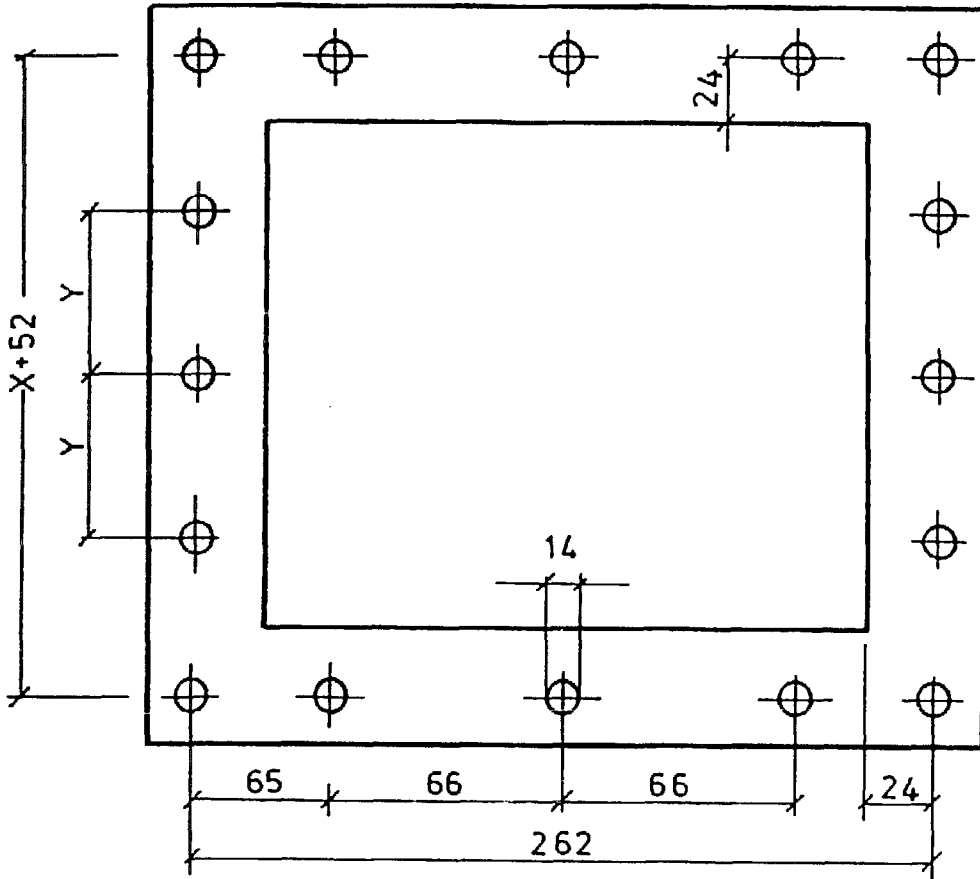
T1-14.2/1



	X 100	X 150	X 180
Y	50	68	80

Lectins 207.81.04

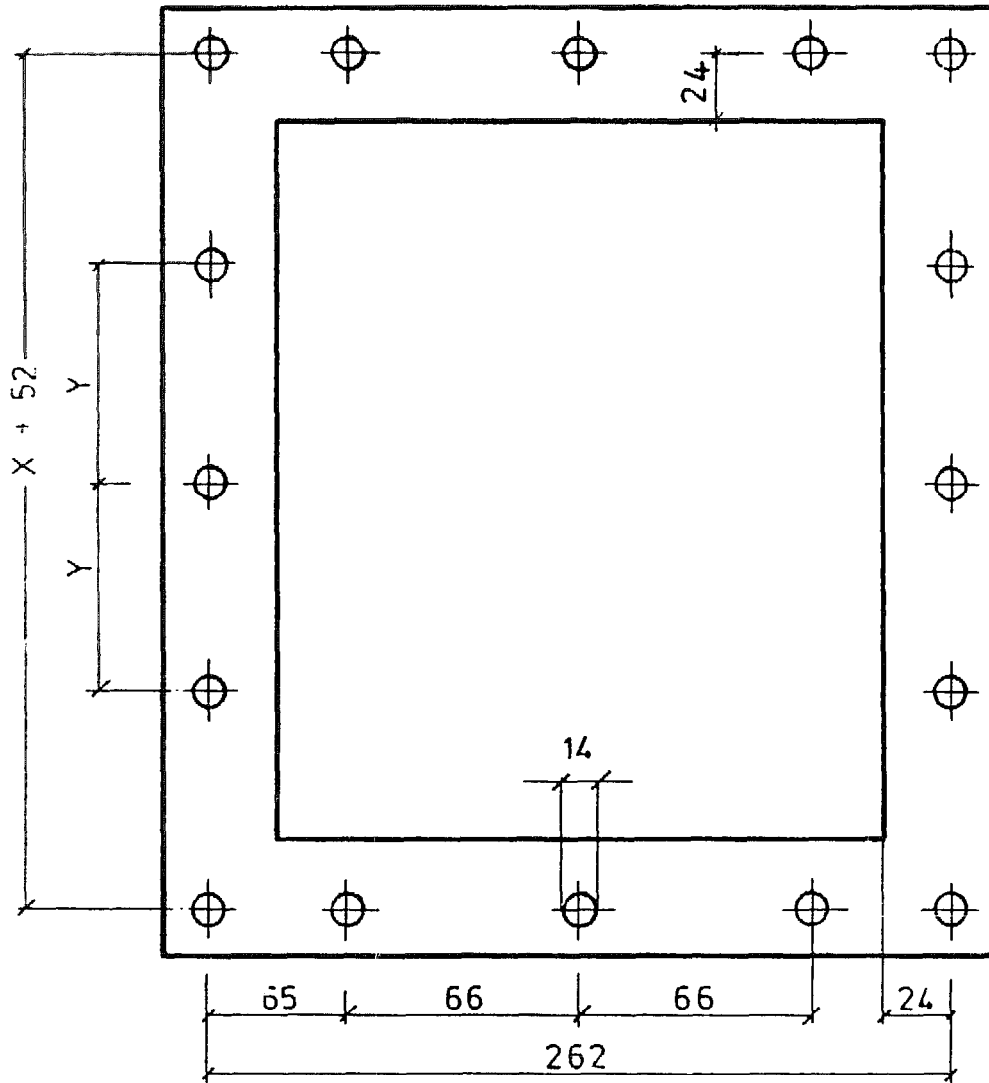
ADAPTER FLANGE (X100, X150, X180)



	X 200	X 220
Y	63	68

Revised 28.7.91. *af*

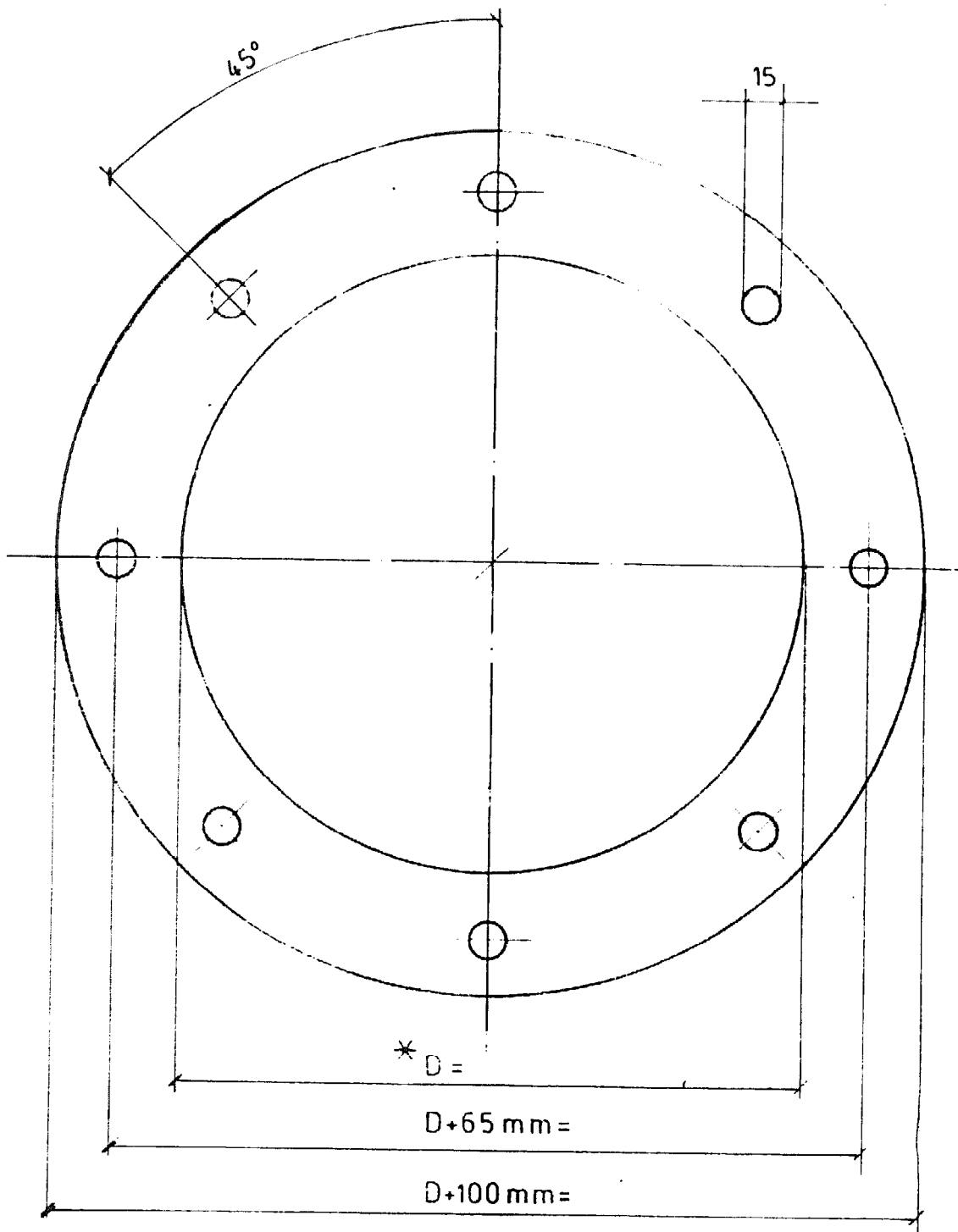
ADAPTER FLANGE (X200,X220) T1-14.2/3



	X 300	X 360	X 400
Y	88	103	113

Revised 287.81-44

ADAPTER FLANGE (X300, X360, X400)



USE 8 MM PLATE

NOS

* ACCORDING TO PENSTOCK USED.

Revised 25.7.81 ddy.

PIPE FLANGE

T1-14.3