TRADE TRANING II-III

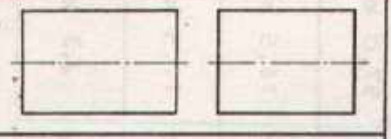
TTC PROGRAMME

MACHININST

GOVERNMENT OF THE PUNJAB
TECHNICAL EDUCATION & VOCATIONAL TRAINING AUTHORITY
PUNJAB BOARD OF TECHNICAL EDUCATION
TRADE TESTING CELL, LAHORE

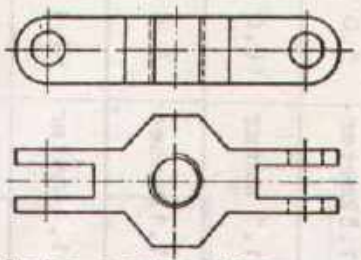
T.T.P Series No. 26

Price Rs. 40.00



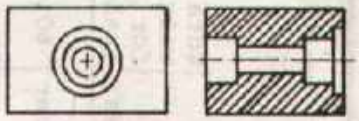
Square milling

1 → 4 | 2 → 10



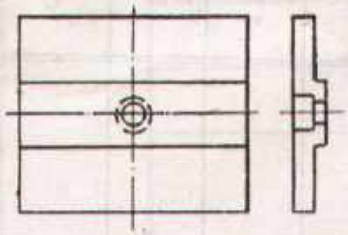
Sloting, angular milling

3 → 3.1.1/19



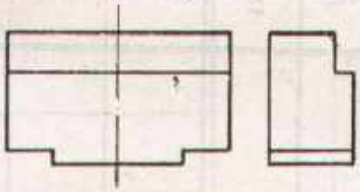
Square miling & boring

4 → 12



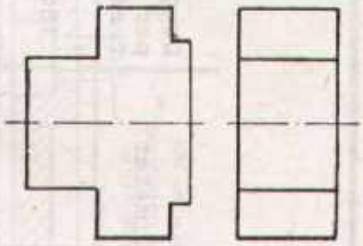
Step milling

5



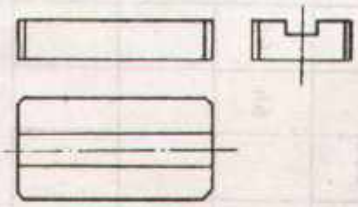
Exercising of known operations

6 → 9



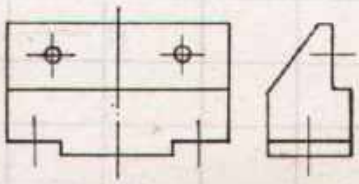
Step milling

7 → 11



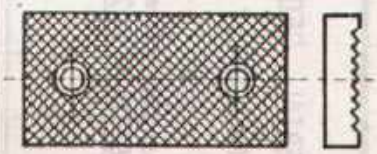
Slot milling

8 → 13



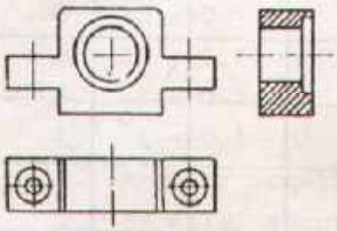
Step & angular milling

6 → 9



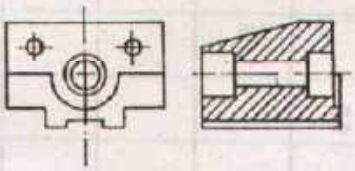
Groove milling

2 → 10



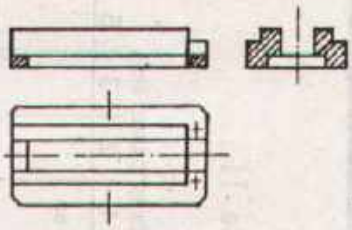
Exercising of known operations

7 → 11



Exercising of known operations

4 → 12



Internal milling

8 → 13

In addition to the exercises shown above, the trainees have to make parts which are needed for the training centre.

TRADE TRAINING II	LAYOUT	MP/2.1/3.2.1 MILLING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

TRADE TRAINING II

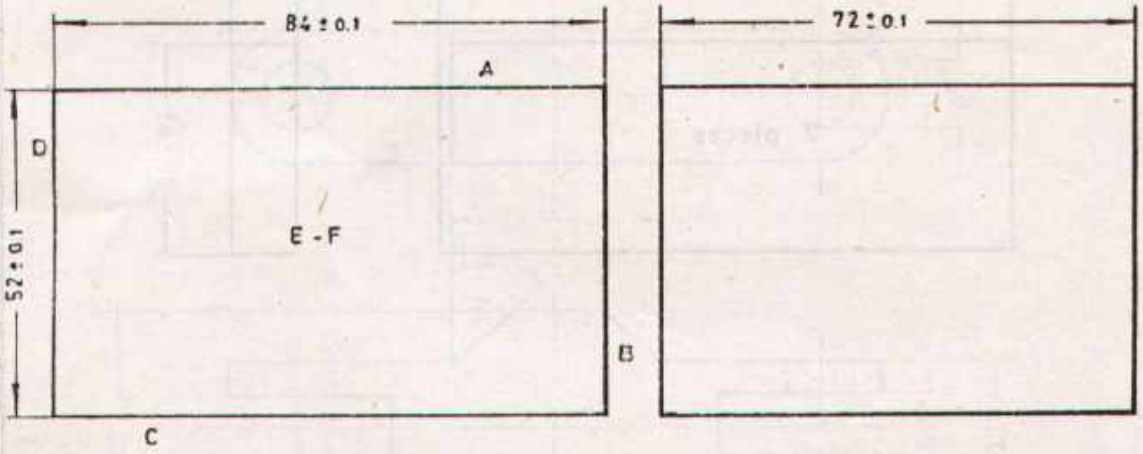
MATERIAL REQUIRED

MACHINIST

MILLING II

No. 3.2.1/1 to 14

	Exercise No. (Length given in Millimeter)												Length per Trainee	Total length for 16 Trainees	Total weight for 16 Trainees
	1	2	3	5	6	7	8	14.1	14,2	14,3	14,4				
Cast Iron - 80x60 mm (3 1/4 x 2 1/4)	90												180 mm	2.88meter	80.0 kg
Cast Iron - 80x60mm (3 1/4 x 2 1/4)					90										
Carbon Steel Flat 35 x 12 mm (1 1/2" x 1/2")		95											95 mm	1.52meter	5.0 kg
M.S.Flat 44 x 25 mm (1 3/4" x 1")			106										106 mm	1.7 meter	15.0 kg
M.S.Flat 75 x 12 mm (3" x 1/2")				70									70 mm	1.12meter	8.6 kg
M.S.Flat 50 x 31 mm (2" x 1 1/4")						90							90 mm	1.44meter	13.4 kg
M.S.Flat 119x25 mm (4 3/4" x 1")							256						256 mm	4.1 meter	97.0 kg
M.S.Flat 50 x 19 mm (2" x 3/4")								66	66				132 mm	2.2 meter	16.5 kg
M.S.Flat 60 x 19 mm (2 1/2 x 3/4")										72			72 mm	1.2 meter	11.5 kg
M.S.Flat 16 x 10 mm (5/8" x 3/8") (2 pieces)											108		108 mm	1.8 meter	2.3 kg



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 84 ± 0.1
2. 72 ± 0.1
3. 52 ± 0.1
4. Accuracy of right angle A - B
5. Accuracy of right angle C - D
6. Accuracy of right angle A B C D - E
7. Accuracy of right angle A B C D - F
8. Parallel surface all over
9. Plane surface all over
10. Smoothness all over

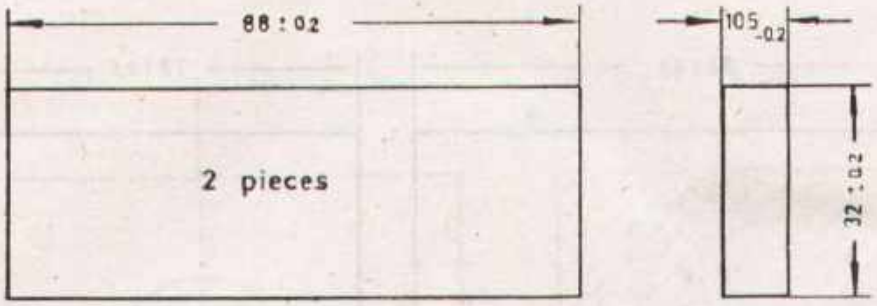
Debur all edges before checking the dimensions !

SCALE 1:1	MOVEABLE JAW (VICE)	MP/2.3/3.2.1/1
MAT: CAST IRON		MILLING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 88 ± 0.2 - Piece No. 1
2. 32 ± 0.2 - Piece No. 1
3. 10.5 - 0.2 - Piece No. 1
4. Angular accuracy - Piece No. 1
5. Smoothness all over - Piece No. 1
6. 88 ± 0.2 - Piece No. 2
7. 32 ± 0.2 - Piece No. 2
8. 10.5 - 0.2 - Piece No. 2
9. Angular accuracy - Piece No. 2
10. Smoothness all over - Piece No. 2

Always check the material before starting the work !

SCALE 1:1	JAWS INSERT (VICE)	MP/23/3.2.1/2
MAT.:CARBON ST.		MILLING II

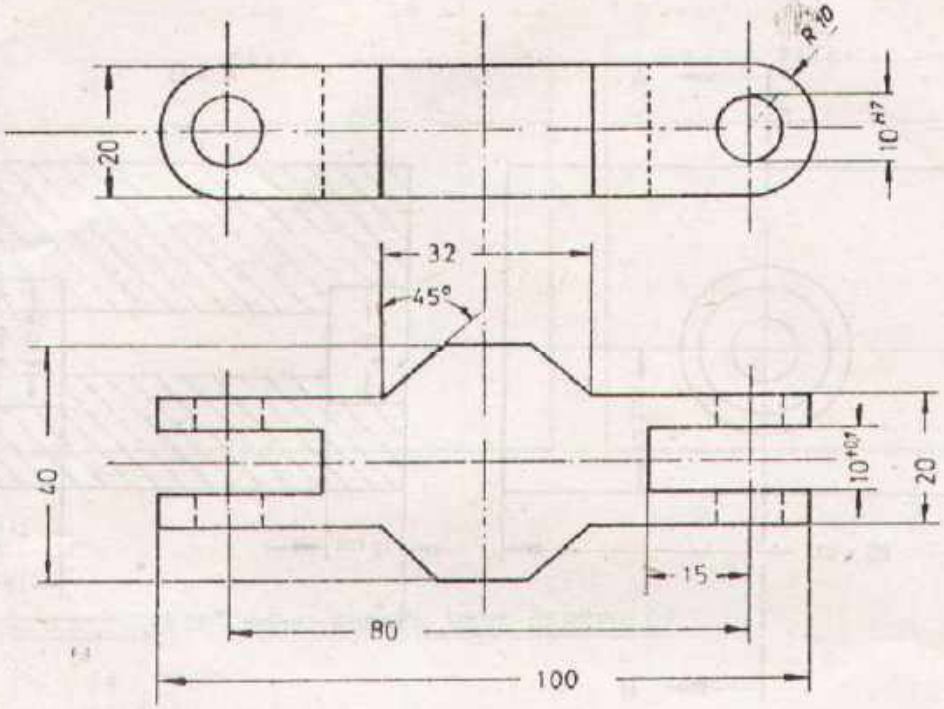
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

4

TOLERANCE ±0,1 UNLESS
OTHERWISE STATED



CHECK THE FOLLOWING POINTS VERY CAREFULLY

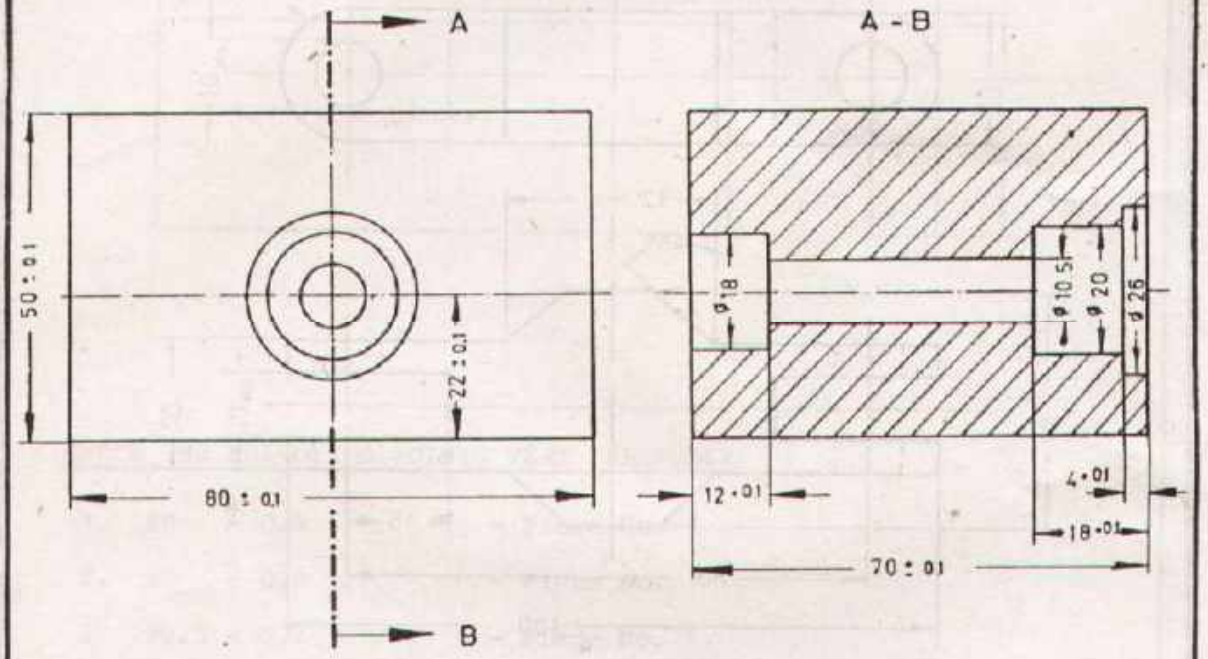
1. 80 ± 0.1
2. 40 ± 0.1
3. 32 ± 0.1
4. 15 ± 0.1
5. 10 ± 0.1
6. 10 ± 0.1
7. Angle 45°
8. Radius 10 mm
9. Parallel surfaces all over
10. Smoothness all over

SCALE 1:1	YOKE	MP/2.3/3.2.1/3
MAT: MILD STEEL		MILLING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

Tolerance ± 0.1



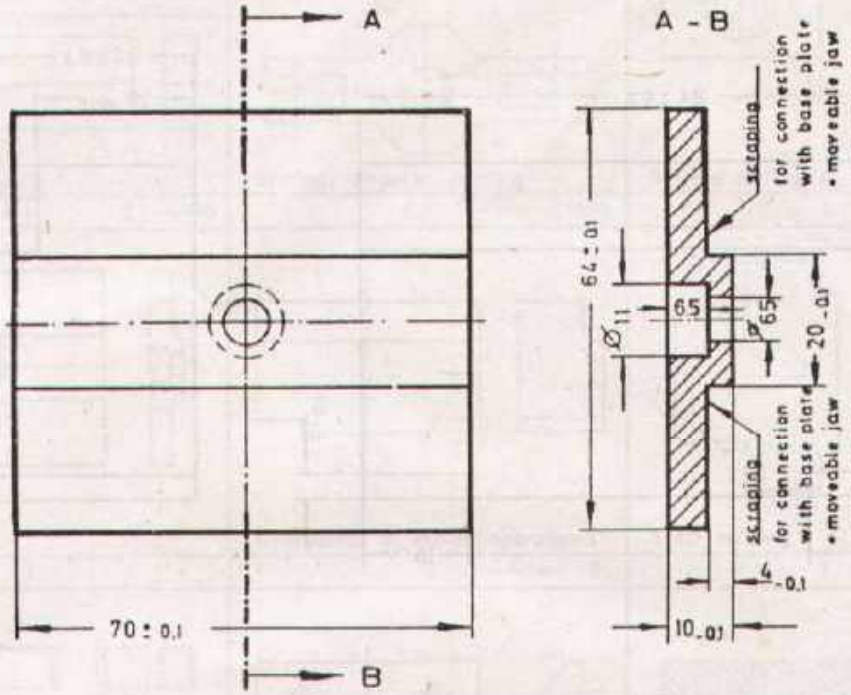
CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 80 ± 0.1
2. 70 ± 0.1
3. 50 ± 0.1
4. 22 ± 0.1
5. $18 + 0.1$
6. $12 + 0.1$
7. $4 + 0.1$
8. Angular accuracy
9. Accuracy of drilled holes
10. Smoothness all over

Prepare bore and counterbore on the drilling machine !

SCALE 1:1	MOVEABLE JAW (VICE)	MP/2.3/ 3.2.1/4
MAT: CAST IRON	from Ex.1	MILLING II

Tolerance ± 0.2



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 70 ± 0.1
2. 64 ± 0.1
3. $10 - 0.1$
4. $20 - 0.1$
5. $4 - 0.1$
6. $4 - 0.1$
7. Angular accuracy
8. Parallel accuracy
9. Accuracy of drilled hole
10. Smoothness all over

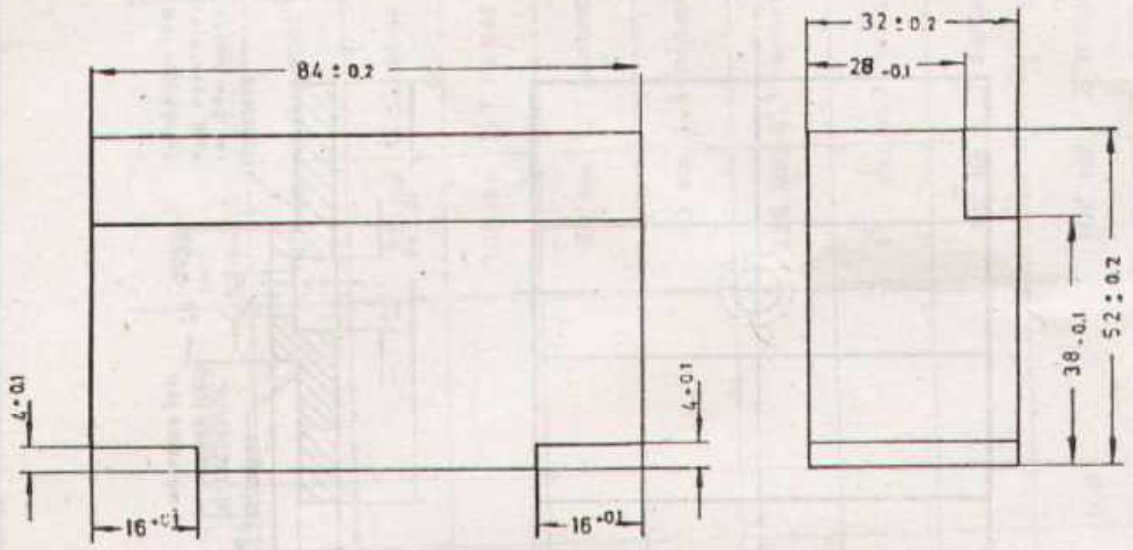
Prepare hole and counterbore according to the screw available !

SCALE 1:1	SLIDING PLATE (VICE)	MP/2.3/3.2.1/5
MAT.: MILD STEEL		MILLING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



CHECK THE FOLLOWING POINTS VERY CAREFULLY

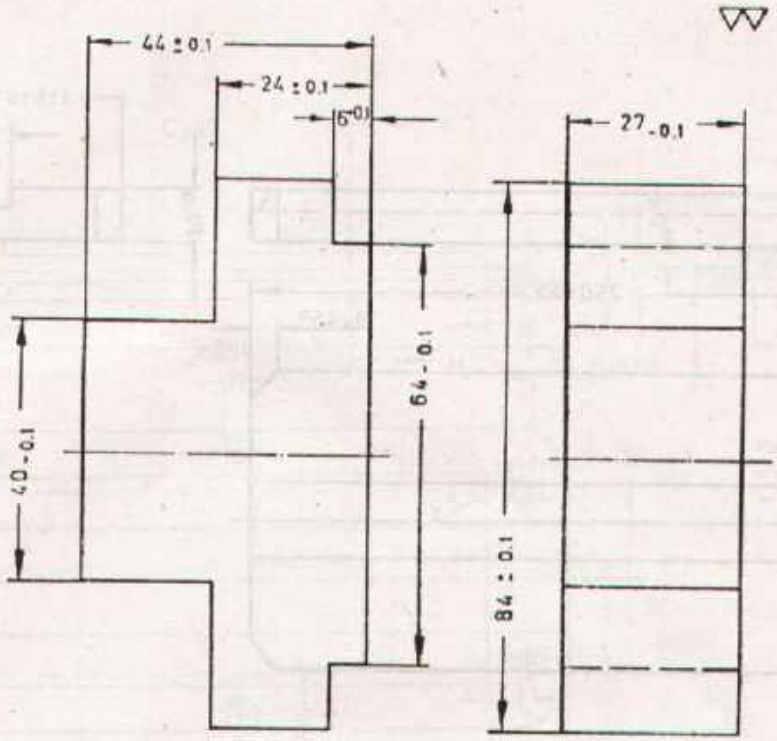
1. 84 ± 0.2
2. 52 ± 0.2
3. 32 ± 0.2
4. $38 - 0.1$
5. $28 - 0.1$
6. $16 + 0.1$
7. $16 + 0.1$
8. $4 + 0.1$
9. $4 + 0.1$
10. Accuracy and smoothness all over

Make sure that the two 16 mm wide steps are precisely equal in depth !

SCALE 1:1	FIXED JAW (VICE)	MP/2.3/3.2.1/6
MAT: CAST IRON		MILLING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

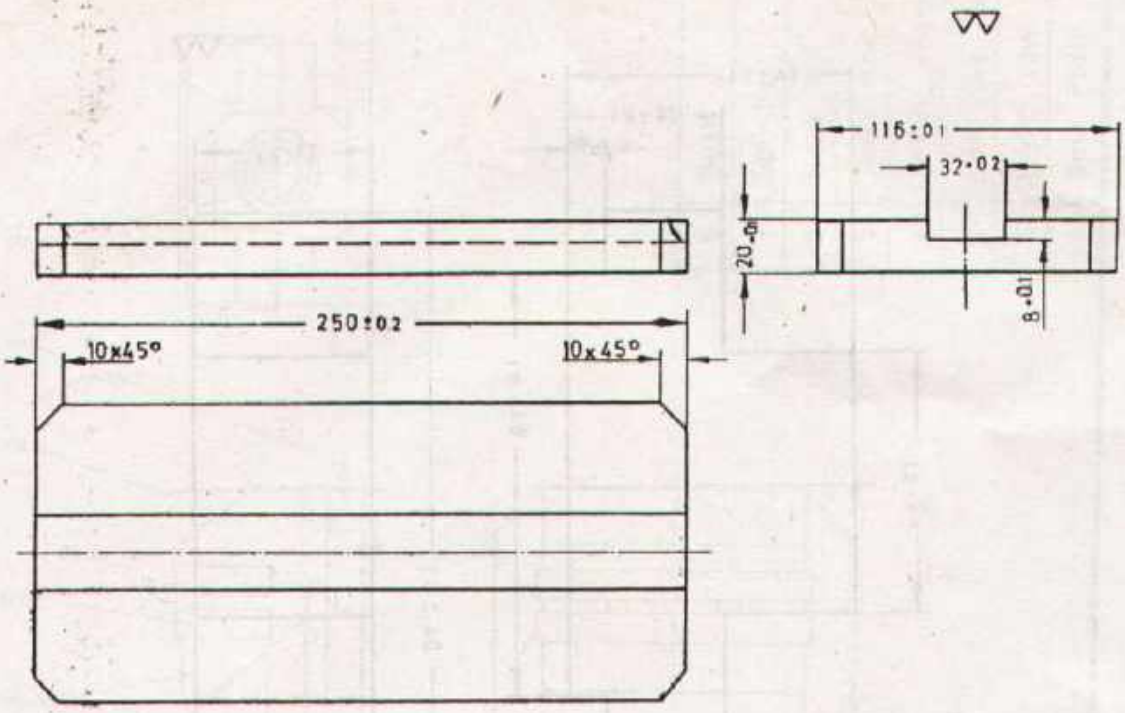


CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 84 ± 0.1
2. $64 - 0.1$
3. 44 ± 0.1
4. $40 - 0.1$
5. $27 - 0.1$
6. 24 ± 0.1
7. 24 ± 0.1
8. $6 + 0.1$
9. $6 + 0.1$
10. Angular accuracy and smoothness all over

Punch the marking lines and mill according to them !

SCALE 1:1	BASE NUT (VICE)	MP/2.3/3.2.1/7
MAT.: MILD STEEL		MILLING II
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING PAK-GERMAN TECHNICAL TRAINING PROGRAMME		MACHINIST



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 250 ± 0.2
2. 116 ± 0.1
3. 20 - 0.1
4. 42 - 0.1 } centrical position of slot
5. 42 - 0.1 }
6. 32 + 0.2
7. 8 + 0.1
8. Accuracy of chamfer 2 x 45
9. Angular accuracy
10. Smoothness all over

Mind the reduced scale of this drawing !

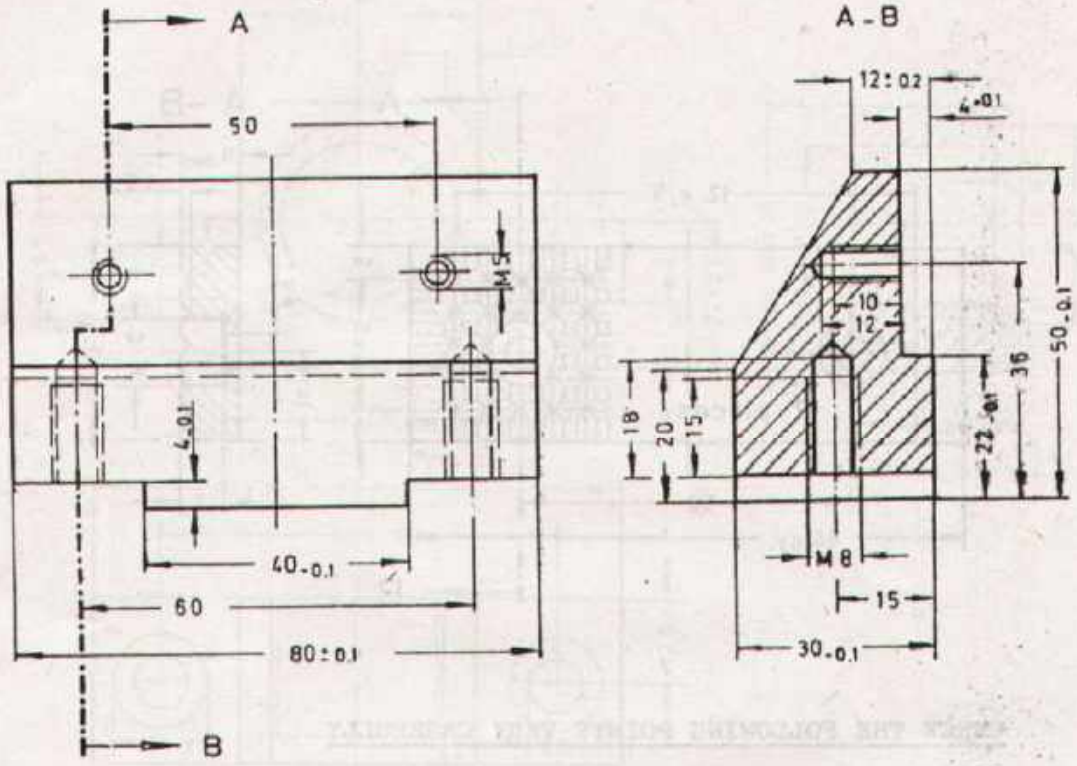
SCALE 1:2.5	BASE PLATE (VICE)	MP/2.3/3.2.1/8
MAT.: MILD STEEL		MILLING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

Tolerance ± 0.1



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 80 ± 0.1
2. 50 - 0.1
3. 30 - 0.1
4. 40 - 0.1
5. 4 - 0.1
6. 22 - 0.1
7. 4 + 0.1
8. Angular accuracy all
9. Parallel surface a'l over
10. Smoothness all over

Drill all holes during assembly !

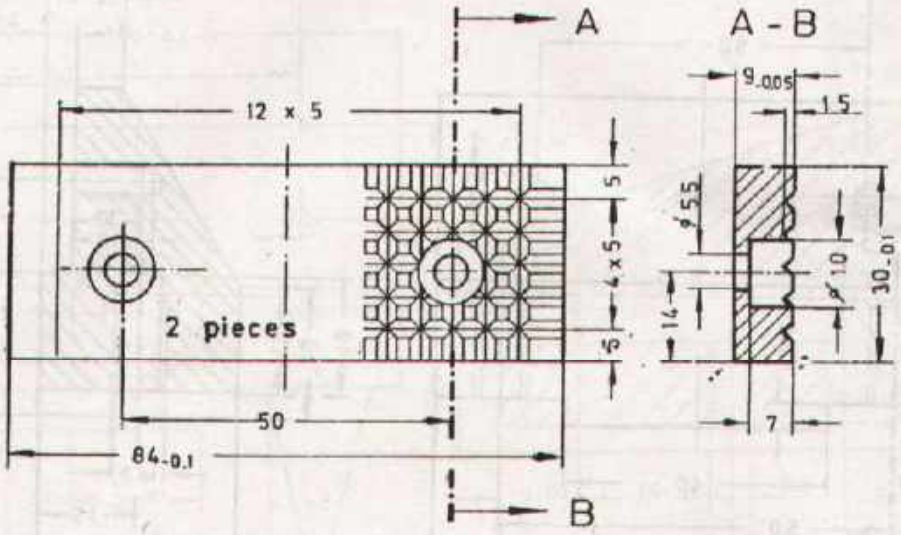
SCALE 1:1	FIXED JAW (VICE)	MP/23/3.2.1/9
MAT: CAST IRON	from Ex.6	MILLING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAN-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

Tolerance ± 0.1



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1.	84 - 0.1	- Piece No. 1
2.	30 - 0.1	- Piece No. 1
3.	9 - 0.05	- Piece No. 1
4.	Accuracy of notches	- Piece No. 1
5.	Accuracy of smoothness all over	- Piece No. 1
6.	84 - 0.1	- Piece No. 2
7.	30 - 0.1	- Piece No. 2
8.	9 - 0.05	- Piece No. 2
9.	Accuracy of notches	- Piece No. 2
10.	Accuracy and smoothness all over	- Piece No. 2

Drill and counterbore holes during assembly !

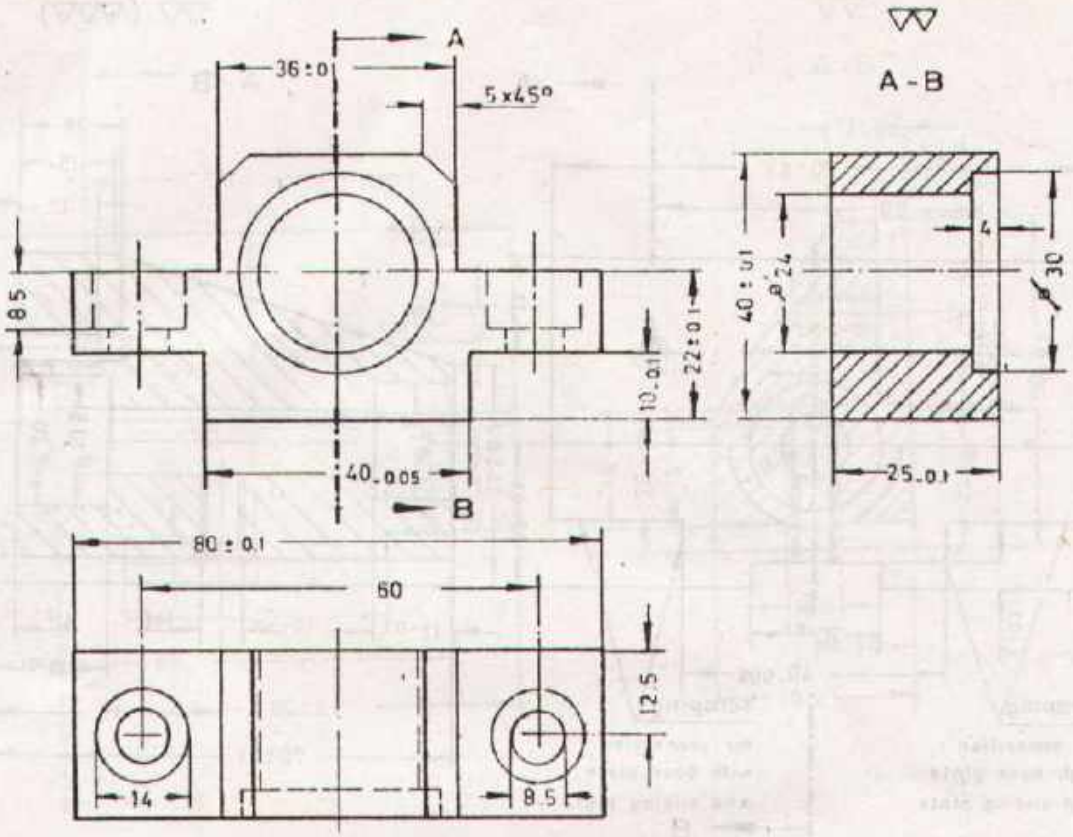
SCALE 1:1	JAWS INSERT (VICE)	MP/2.3/3.2.1/10
MAT.: CARBON STEEL from Ex.2		MILLING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

Tolerance ± 0.1



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 80 ± 0.1
2. 40 ± 0.1
3. 25 - 0.1
4. 40 - 0.05
5. 36 ± 0.1
6. 22 ± 0.1
7. 10 - 0.1
8. Angular accuracy
9. Accuracy of drilled holes
10. Smoothness all over

Check the external diameter of the bush before boring the hole to size !

SCALE 1:1	BASE NUT (VICE)	MP/2.3/3.2.1/11
MAT.: MILD STEEL	from Ex.7	MILLING II

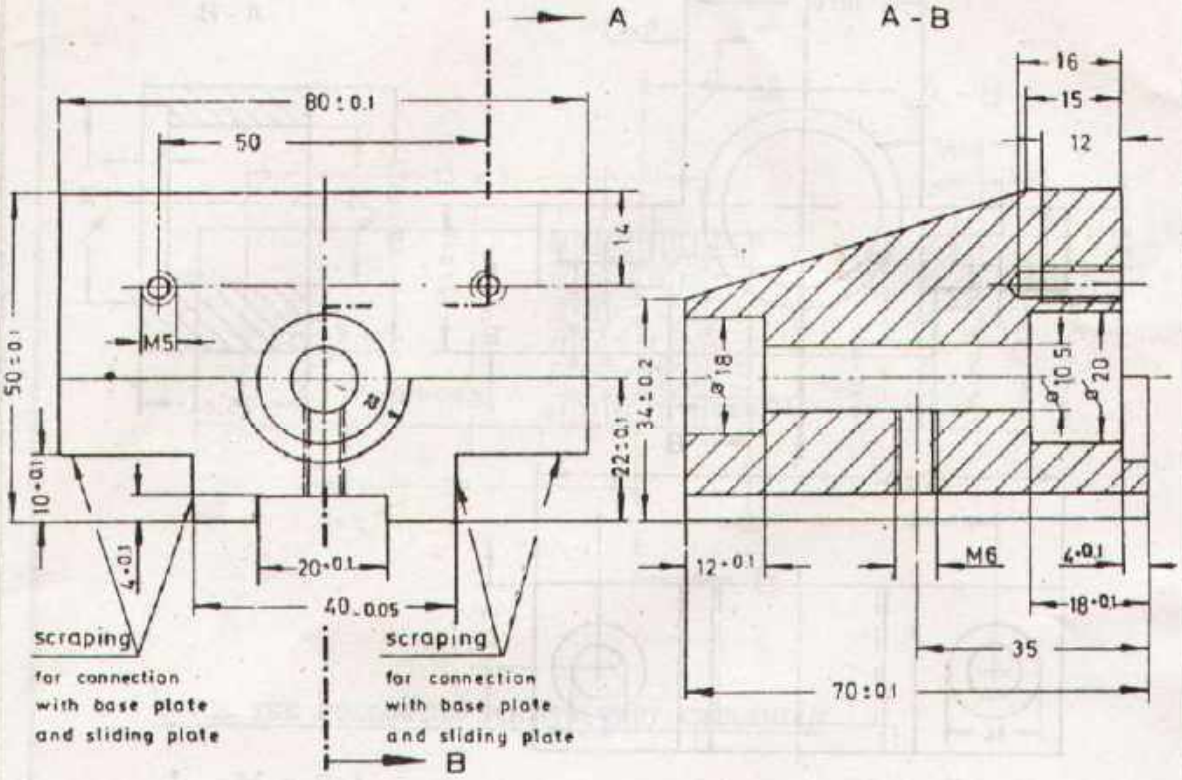
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

Tolerance ± 0.1

▽▽ (▽▽▽)



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 40 - 0.05
2. 20 + 0.1
3. 4 + 0.1
4. 10 + 0.1
5. 10 + 0.1
6. 34 ± 0.2
7. Accuracy of notch 20 x 4
8. Parallel surface all over
9. Angular accuracy all over
10. Smoothness all over

Drill holes for M 5 during assembly with part No. 9 !

SCALE 1:1	MOVEABLE JAW (VICE)	MP/2.3/3.2.1/12
MAT. CAST IRON	from Ex4	MILLING II

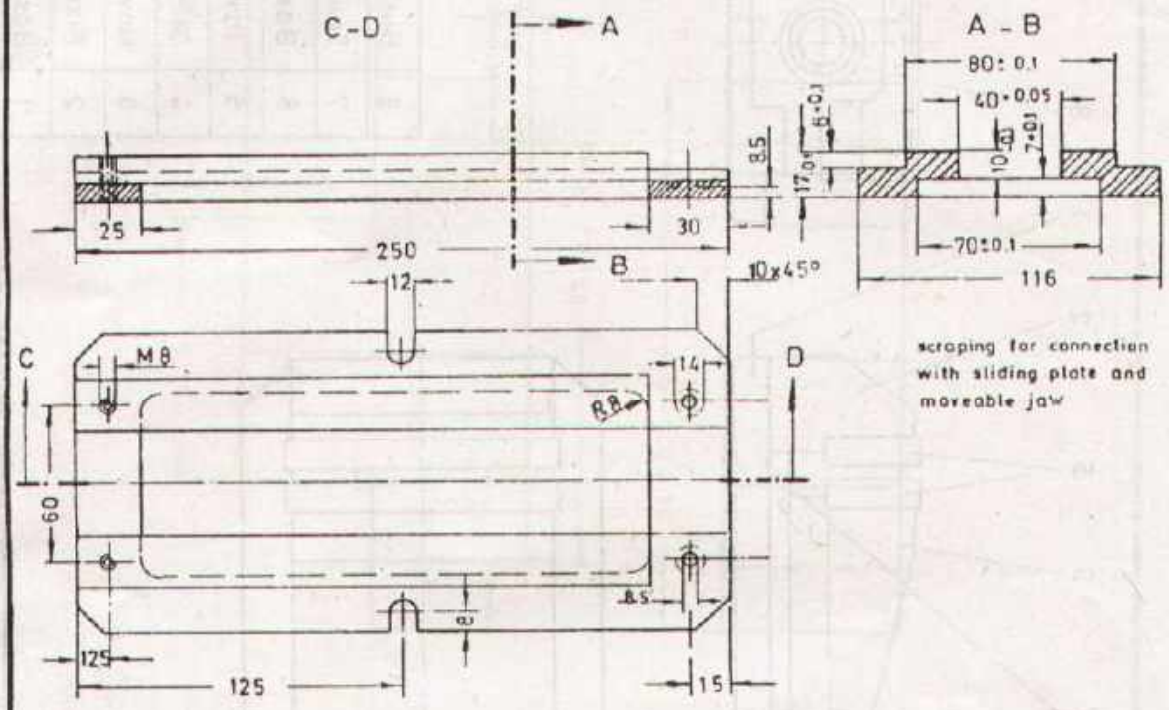
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

Tolerance ± 0.1

▽ (▽▽)



scraping for connection with sliding plate and moveable jaw

CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 80 ± 0.1
2. 70 ± 0.1
3. 40 + 0.05
4. 17 - 0.1
5. 10 - 0.1
6. 7 + 0.1
7. 6 + 0.1
8. Parallel surface all over
9. Angular accuracy all over
10. Smoothness all over

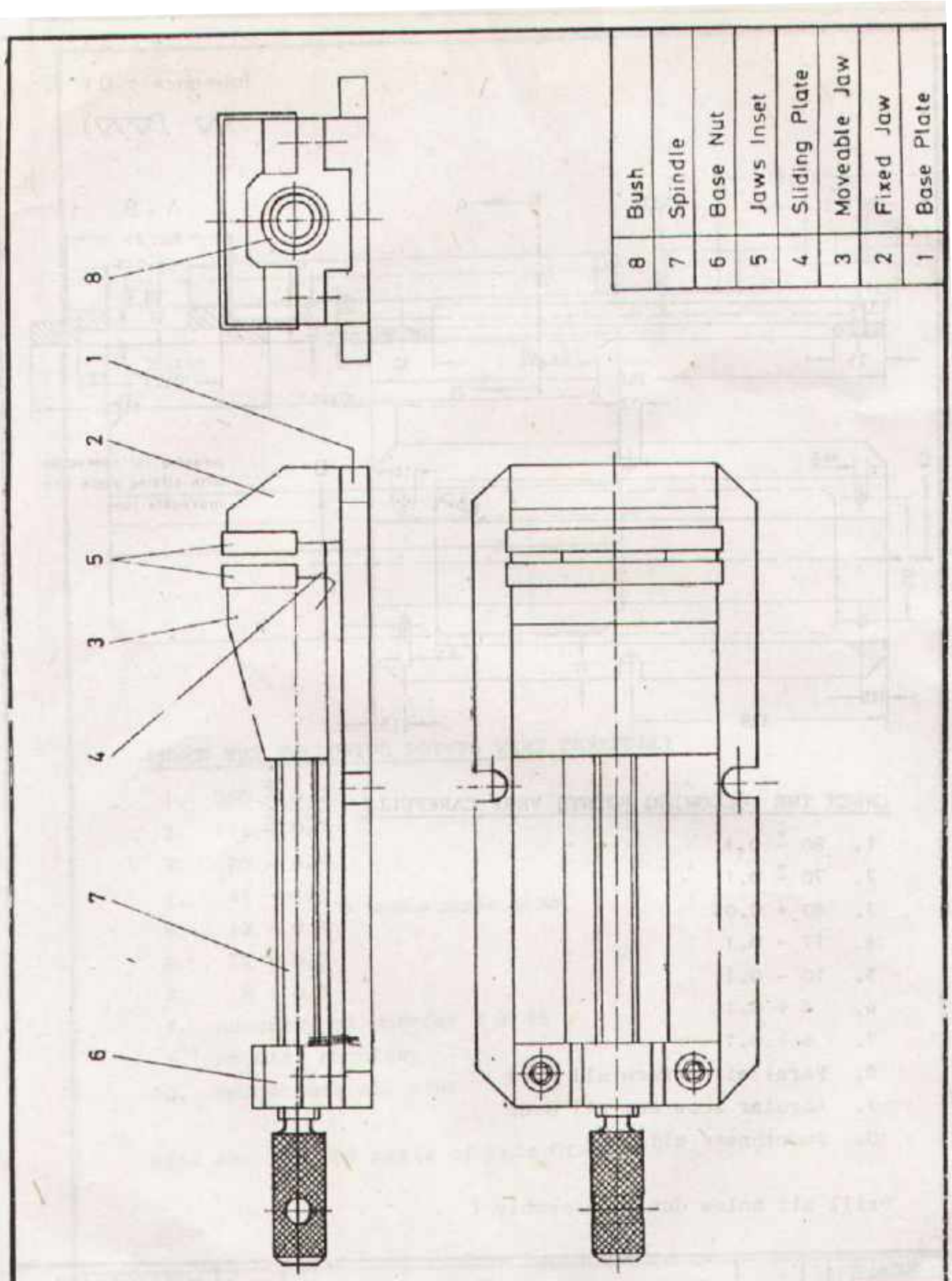
Drill all holes during assembly !

SCALE 1:1	BASE PLATE (VICE)	MP/23/3.2.1/13
MAT.: MILD STEEL	from Ex 8	MILLING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



8	Bush
7	Spindle
6	Base Nut
5	Jaws Inset
4	Sliding Plate
3	Moveable Jaw
2	Fixed Jaw
1	Base Plate

SCALE 1:1

MAT.:

MACHINE VICE (ASSEMBLY)

MP/2.3/3.2.1/13a

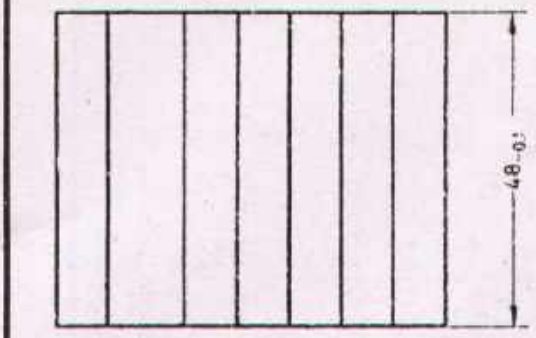
MILLING II

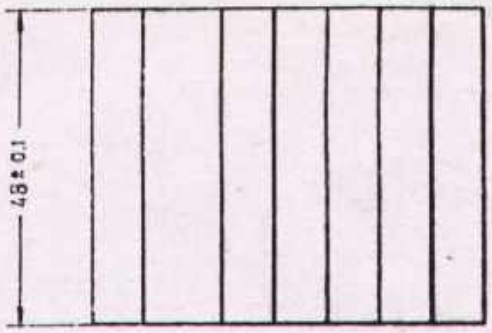
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

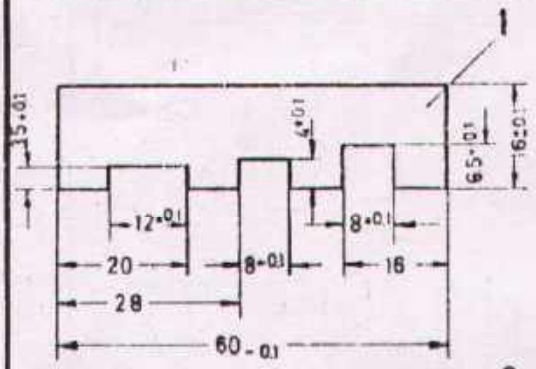
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

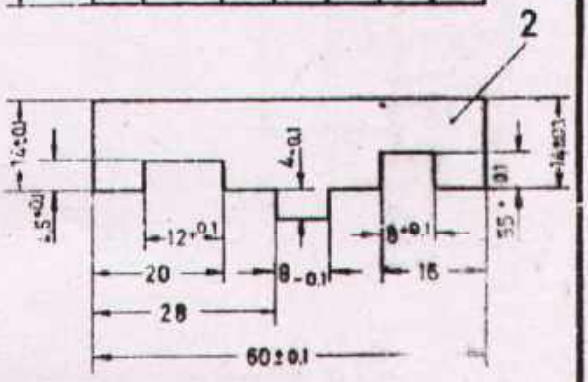
MACHINIST

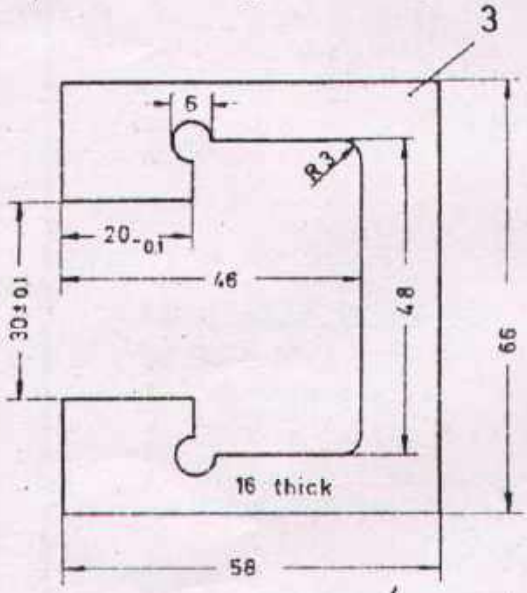
TOLERANCE ± 0.1 ▽ (▽▽)

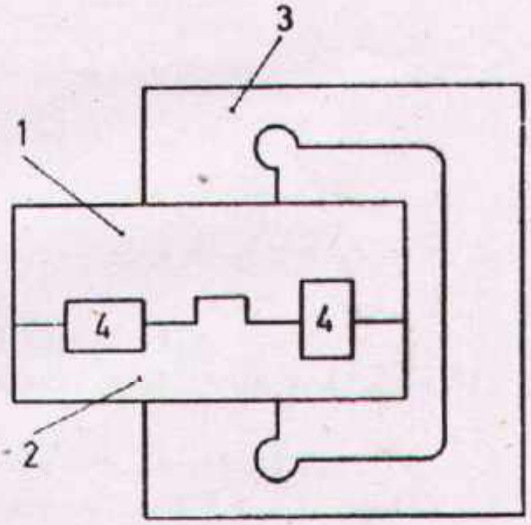


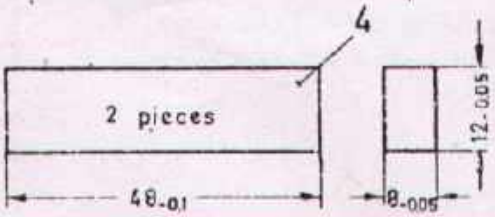










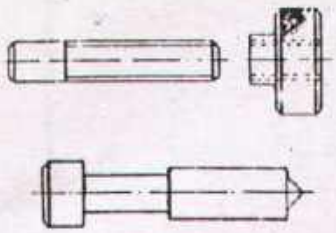


SCALE 1:1	KEYED JOINT WITH GAUGE	MP/23/3.2.1/14TEST
MAT.: MILD STEEL		MILLING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

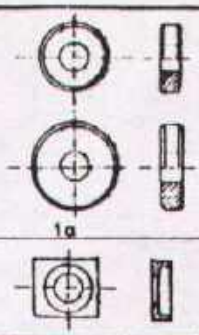
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



Knurling, thread cutting

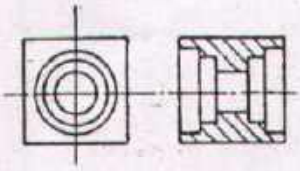
1 —— 4.3.2/4



3.1.2/6 —→ 2

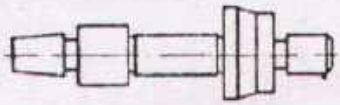
Knurling, turning to high accuracy

3



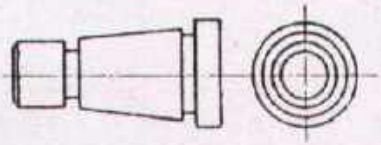
Internal step turning

4



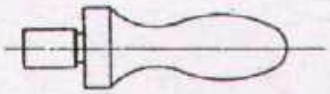
Step turning

5 —→ 4.2.2/3



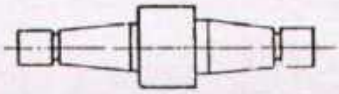
Taper turning

6 —→ 4.2.2/6



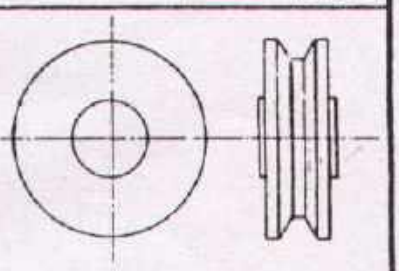
Form turning

7



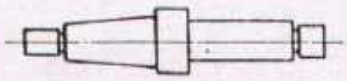
Taper turning

8



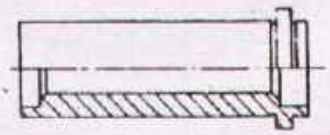
Vee turning

9



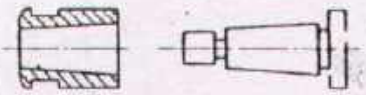
Longitudinal turning

10 —→ 4.2.2/7



Internal turning

11 —→ 4.2.2/4



Taper fitting

4.2.2/6 —→ 12

In addition to the exercises shown above, the trainees have to make parts which are needed for the training centre.

TRADE TRAINING II	LAYOUT	MP/2.1/3-2-2- TURNING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MATERIAL REQUIRED

TRADE TRAINING II — MACHINIST

TURNING II
No. 3.2.2/1to13

	Exercise No. (Length given in millimeter)													Length per trainee	Total length for 16 trainees	Totalweight for 16 trainees
	1.1	1.2	1.3	1.a	1.a	3.1	3.2	3.3	4	5	6	7	8			
M.S. ROUND ø16mm 5/8" DIA	95		58											154 mm	2.5 meter	4.0 kg
M.S. ROUND ø44mm 1 3/4" DIA		34									95			129 //	2.1 //	24.4 //
M.S. ROUND ø53mm 2 1/8" DIA				21										21 //	0.34 //	6.4 //
M.S. ROUND ø68mm 2 3/4" DIA					21									21 //	0.34 //	10.6 //
CAST IRON FLAT 80x22mmx100mm	To be arranged according pattern as per drawing supplied															
CARBON STEEL ROUND ø28mm 1 1/8" DIA						55	55							110 //	1.8 //	9.0 kg
M.S. ROUND ø22mm 7/8" DIA								86						86 //	1.4 //	4.2 //
M.S. SQ.44x44mm SQ. 1 3/4" x 1 3/4"									46					46 //	0.74 //	11.7 //
M.S. ROUND ø38mm 1 1/2" DIA										145			170	315 //	5.1 //	45.4 //
M.S. ROUND ø 28mm 1 1/8" DIA												115		115 //	1.85 //	9.0 //

Continued

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

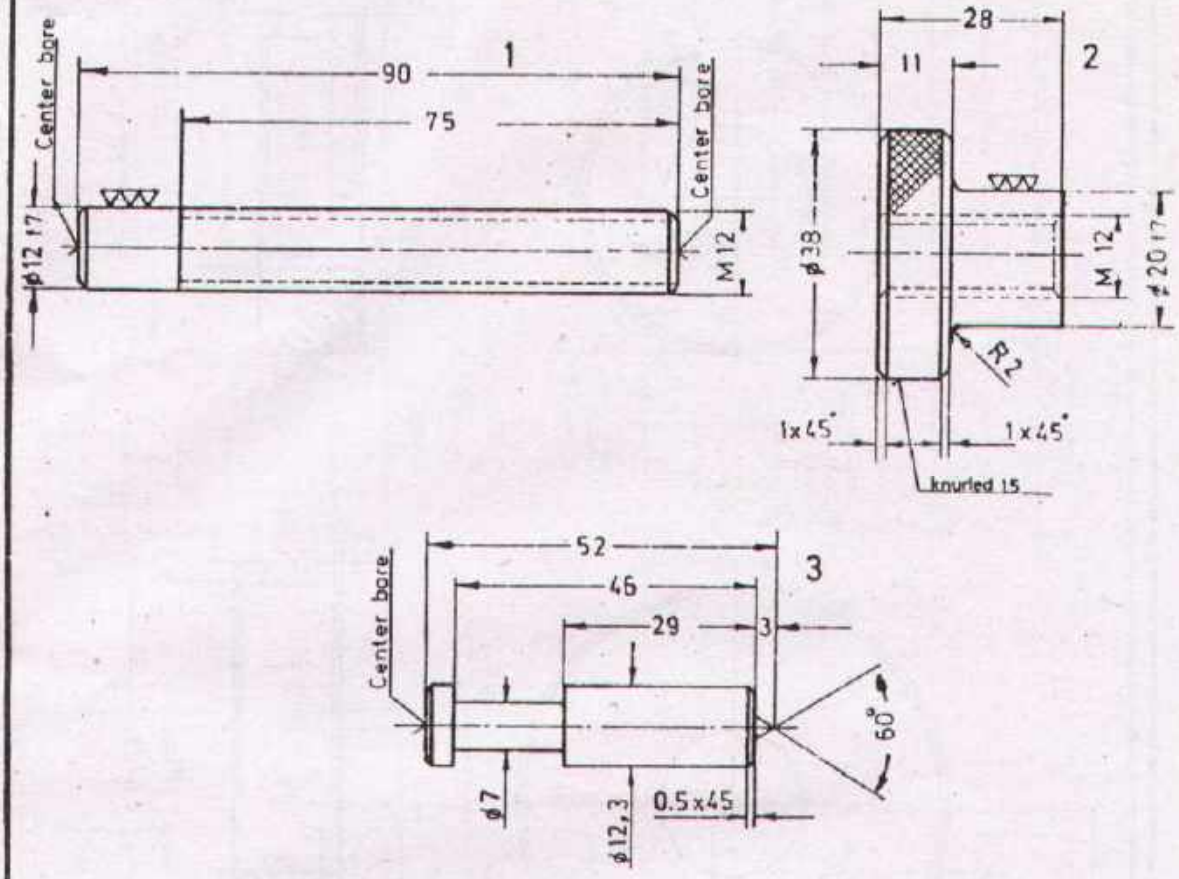
MATERIAL REQUIRED

TRADE TRAINING II - MACHINIST

TURNING II
No.3.2.2/9 to (13.TEST)

	Exercise No. (Length given in millimeter)										Length per trainee	Total length for 16 trainees	Total weight for 16 trainees
	9	10.1	10.2	11	12.1	12.2	12.3	13.1	13.2	13.3			
M. S. Round ø100mm 4" DIA	26										26 mm	0.42 meter	25.6 kg
M.S. ROUND ø31mm 1 1/4" DIA		170					30				200 //	3.2 //	19.0 //
M.S. ROUND ø38mm 1 1/2" DIA			26		86	54					166 //	2.7 //	24.1 //
M.S. ROUND ø56mm 2 1/4" DIA				136							136 //	2.2 //	43.6 //
M.S. ROUND ø50mm 2" DIA								40	32		72 //	1.2 //	18.5 //
M.S. ROUND ø44mm 1 3/4" DIA										14	14 //	0.23 //	3.0 //

TOLERANCE :0.1 UNLESS
OTHERWISE STATED



SEQUENCE OF OPERATION

1. Face part 1 to length 90 mm and turn step Ø 11.9 x 75 mm.
2. Cut thread M 12.
3. Hold in collet Ø 12 mm and turn Ø 12_{f7}.
4. Hold part 2 in three-jaw chuck, drill hole and tap M 12.
5. Turn Ø 37.7 and Ø 20_{f7}.
6. Knurl 1.5 mm part off and face to length 28 mm.
7. Turn part 3 to Ø 12.3 and groove to Ø 7.
8. Turn centre point to 60^{o}.

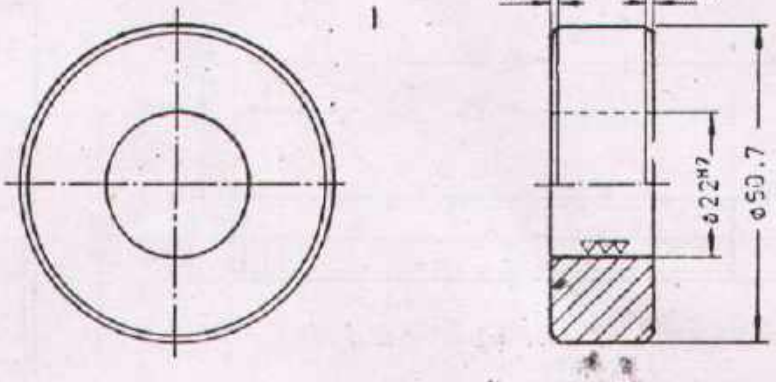
ø 12 f7	- 0.016 - 0.034
ø 20 f7	- 0.020 - 0.041

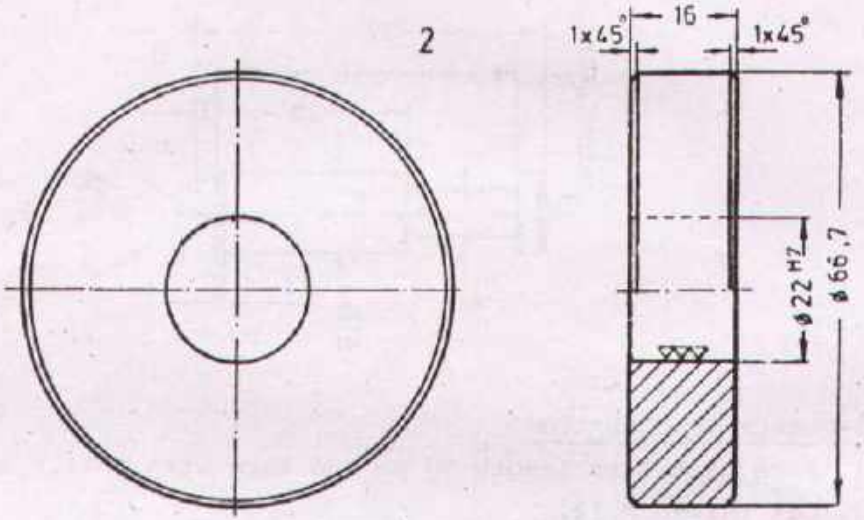
SCALE 1:1	DETAILS OF CIRCULAR CUTTER	MP/ 2.3/32.2/1
MAT. MILDSTEEL		TURNING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

▽▽ (▽▽▽)





SEQUENCE OF OPERATION

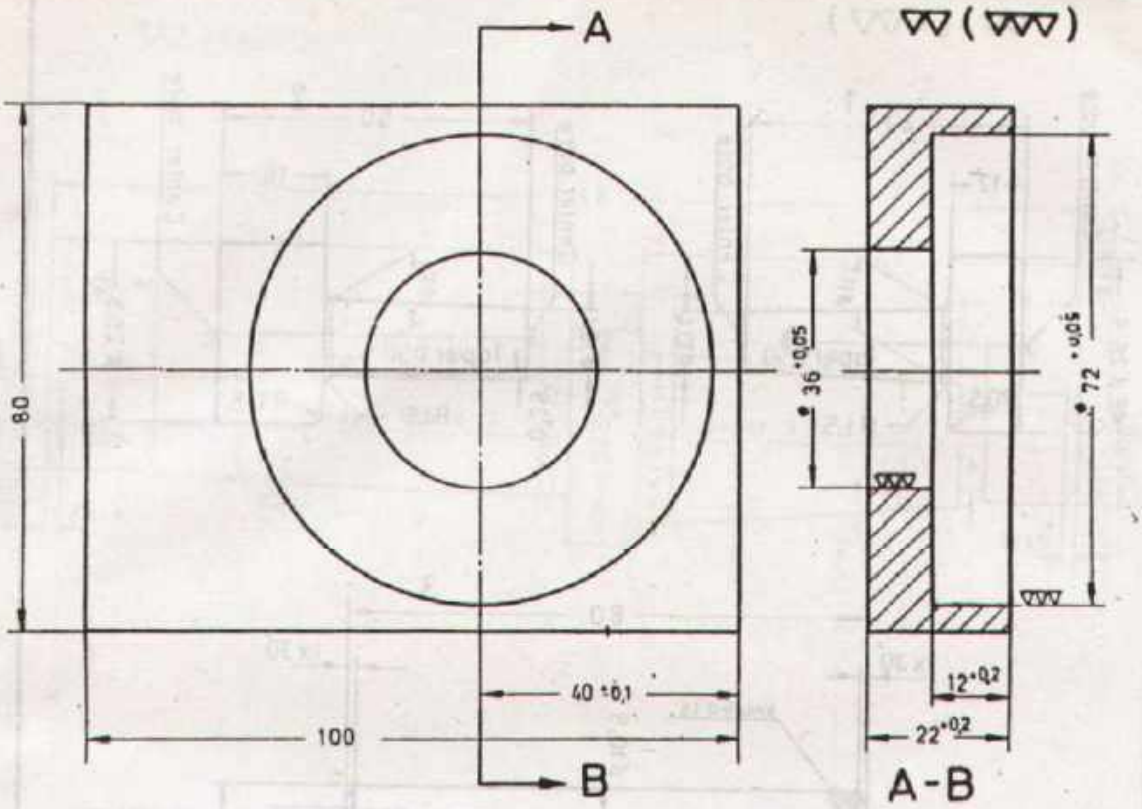
1. Face part 1 and 2 to thickness 16 mm.
2. Drill and ream hole ø 22^{H7}.
3. Hold on mandrel and turn outer ø 50.7 and ø 66.7 respectively.

SCALE 1:1	HELICAL-GEAR WHEELS	MP/ 2.3/ 3.2.2/1a
MAT. MILDSTEEL		TURNING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



Sequence of Operation

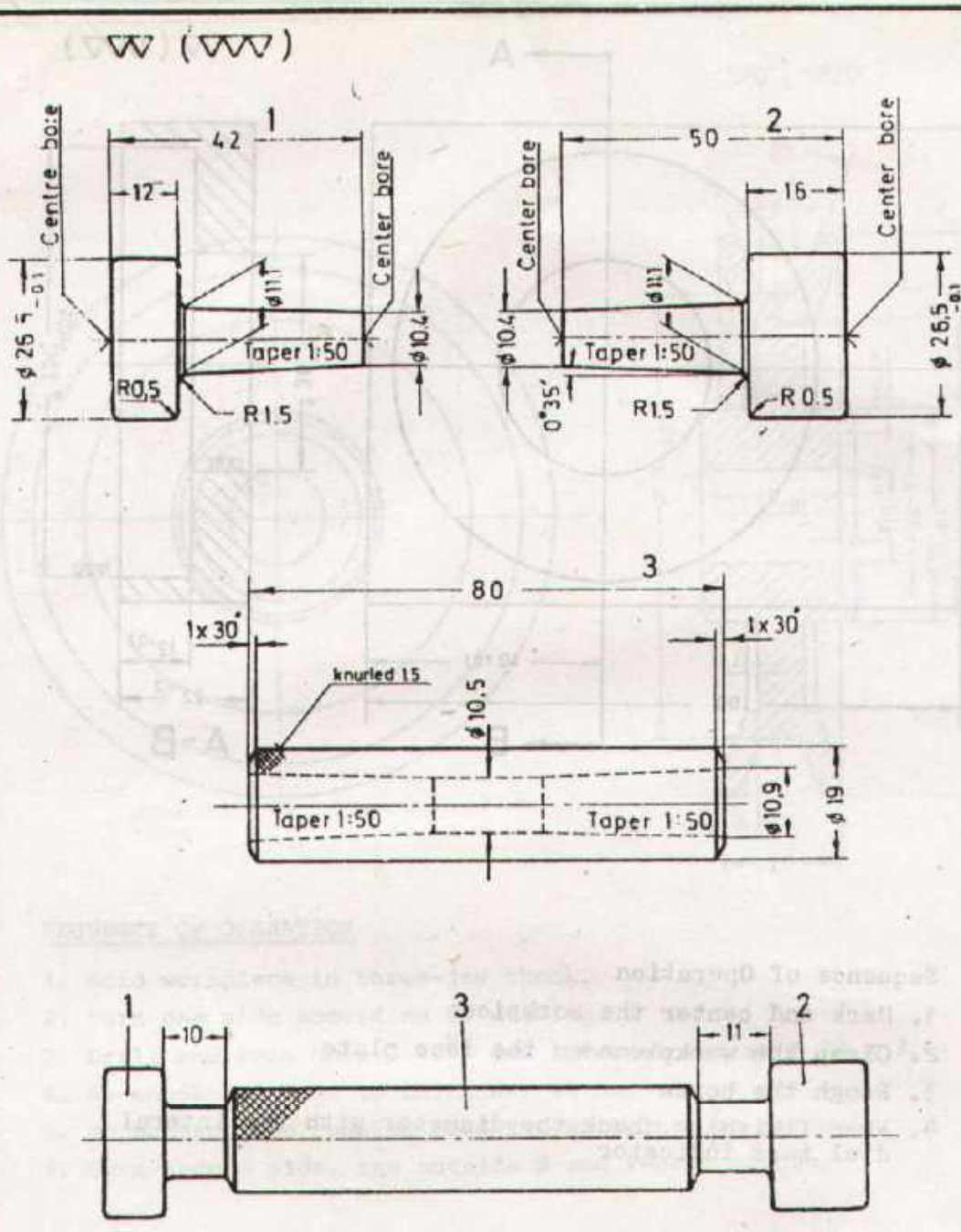
1. Mark and center the workpiece
2. Clamp the workpiece on the face plate
3. Rough the bores
4. When finishing, check the diameter with the interal dial test indicator

SCALE 1:1	ECCENTRIC BORING PLATE	MP/ 2.3/ 3.2.2/ 2
MAT. CAST IRON	From 3.1.2/6	TURNING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

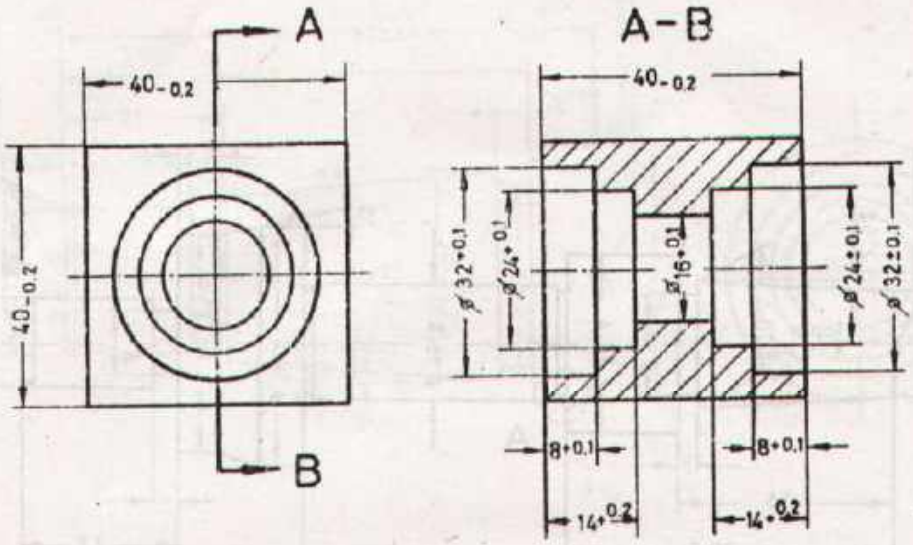


SCALE 1:1	PLUG GAUGE	MP/ 2.3/ 32.2/3
MAT. CARBON ST.		TURNING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



SEQUENCE OF OPERATION

1. Hold square block in four-jaw chuck and face all six sides.
2. Centre drill and drill a through hole ø 16.
3. Bore the two internal steps of ø 24 and ø 32.
4. Re-chuck and repeat operation No. 3

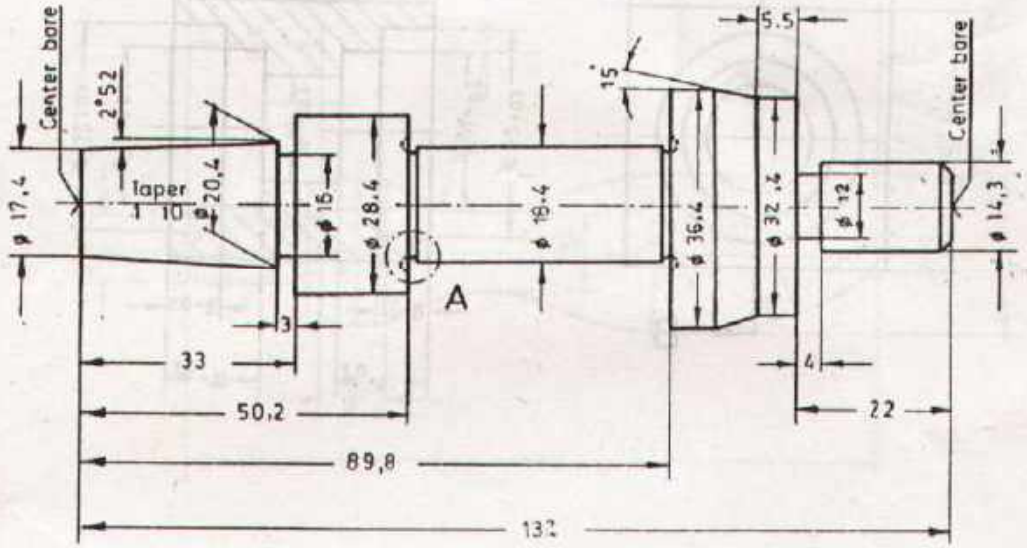
SCALE 1:1	PAPER WEIGHT	MP/ 2.3/3.2.2/4
MAT. MILDSTEEL		TURNING II.

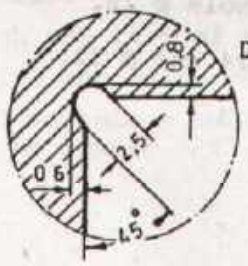
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

TOLERANCE ± 0.1
unless otherwise stated





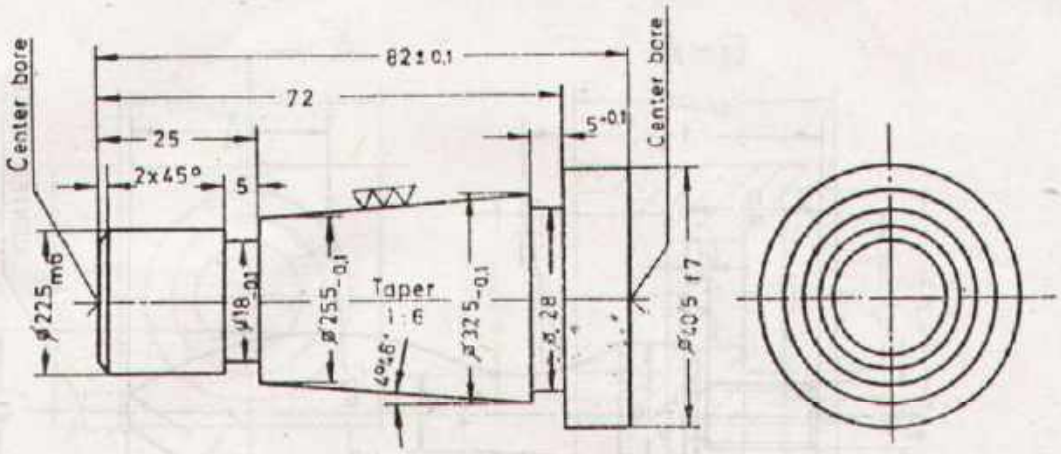
Detail A

SCALE 1:1	SPINDLE WITH TAPER	MP/ 2 3/ 322/5
MAT. MILDSTEEL		TURNING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

▽▽(▽▽)



SEQUENCE OF OPERATION

1. Hold workpiece in three-jaw chuck and face to length 82 mm.
2. Centre drill both sides.
3. Hold workpiece between centres and turn to Ø 40.5_{f7} x 15 mm.
4. Turn groove Ø 28 x 5.
5. Re-clamp workpiece and turn to Ø 32.5. Ø 22.5 and groove Ø 18 x 5.
6. Adjust topslide to $4^{o}46'$ and turn taper 1 : 6.

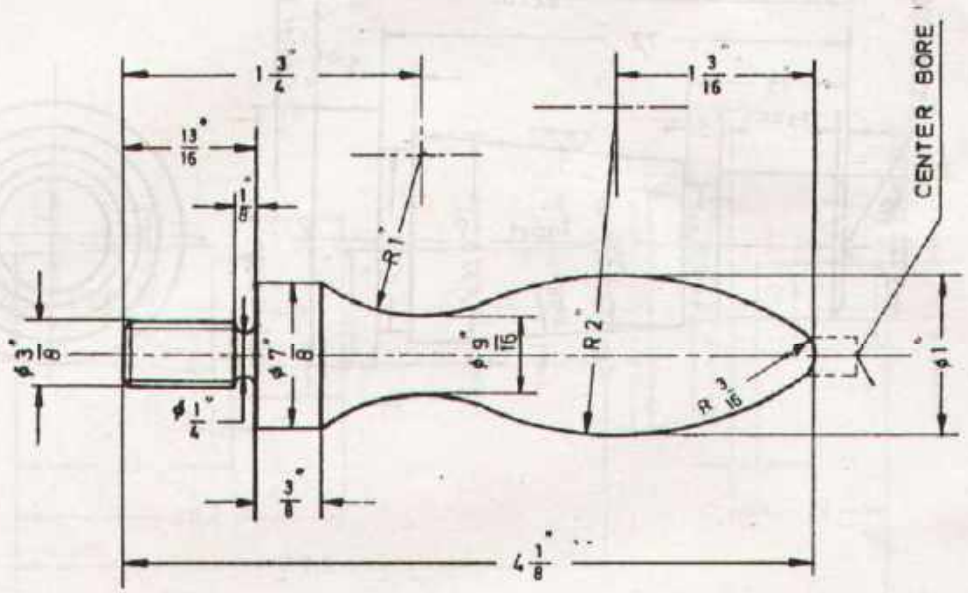
ϕ 22.5 m6	+ 0.021 + 0.008
ϕ 40.5 f7	- 0.025 - 0.050

SCALE 1:1	SHANK SCREW WITH TAPER	MP/ 2.3/ 3.2.2/6
MAT. MILDSTEEL		TURNING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



SEQUENCE OF OPERATION

1. Face one side, turn to Ø 3/8" and cut thread.
2. Centre drill both sides and hold workpiece between centres.
3. Rough the form of the handle with a radius tool.
4. Finish according to form gauge by using hand tool.
5. Hold workpiece collet chuck Ø 7/8", turn radius 3/16 and to length 4/8".

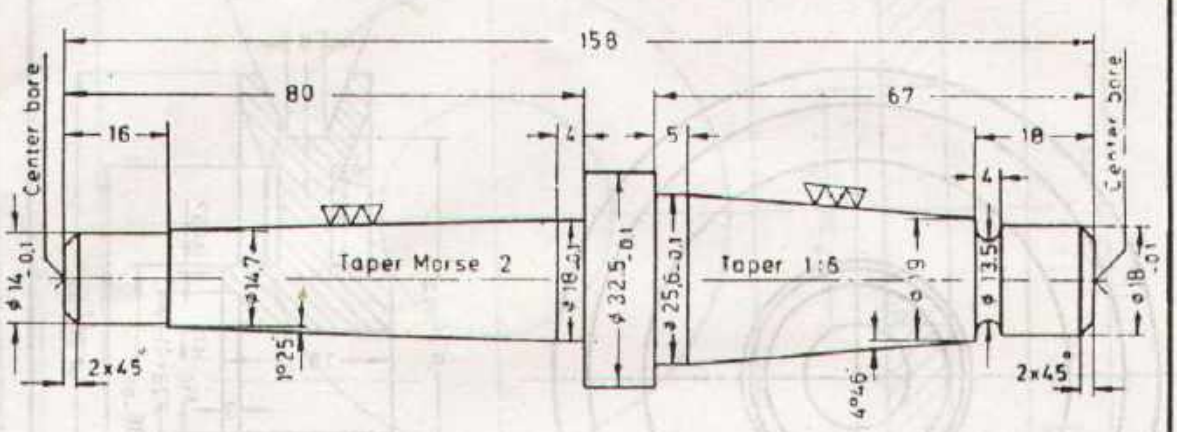
SCALE 1:1	HANDLE	MP/ 2.3/ 3.2.2/ 7
MAT. MILDSTEEL		TURNING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

▽ (▽▽)



SEQUENCE OF OPERATION

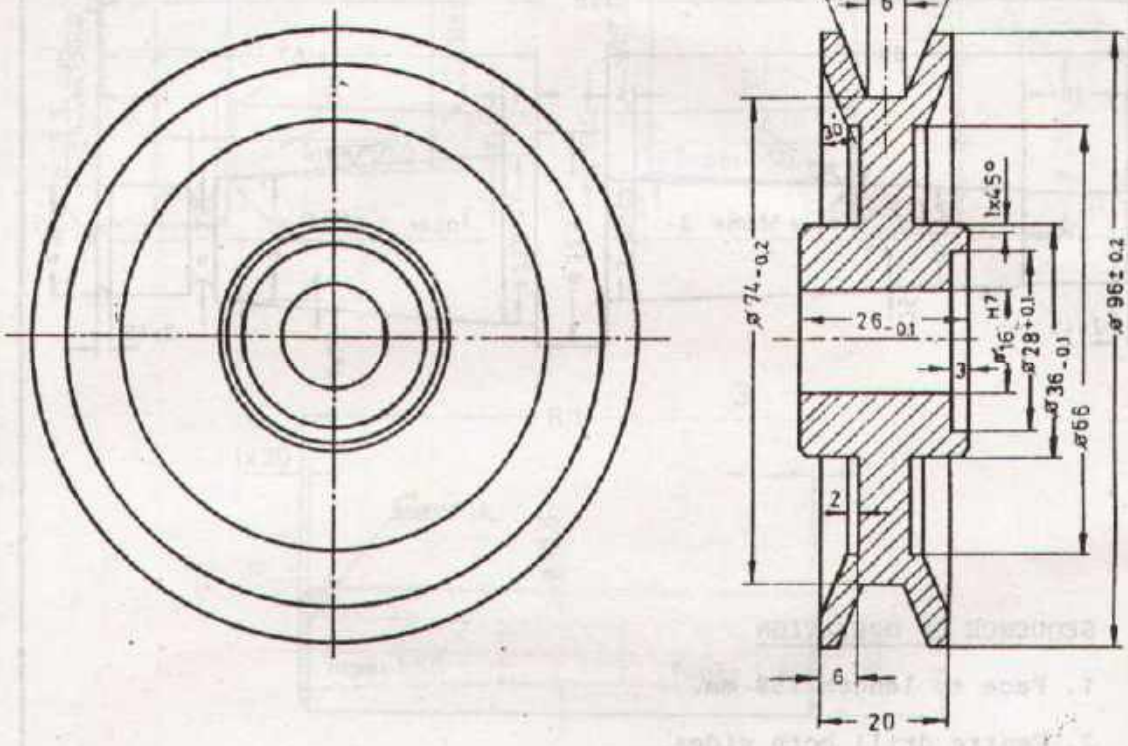
1. Face to length 158 mm.
2. Centre drill both sides.
3. Mount driving plate and hold workpiece between centres.
4. Turn to Ø 32.5 mm and step Ø 18 x 18.
5. Turn groove and adjust topslide to $4^{\circ}46'$.
6. Turn taper 1 : 6.
7. Re-clamp, turn step Ø 14 x 16 and taper morse 2.

SCALE 1:1	THREADED BOLT WITH TAPER	MP/ 2.3/322/8
MAT. MILDSTEEL		TURNING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



SEQUENCE OF OPERATION

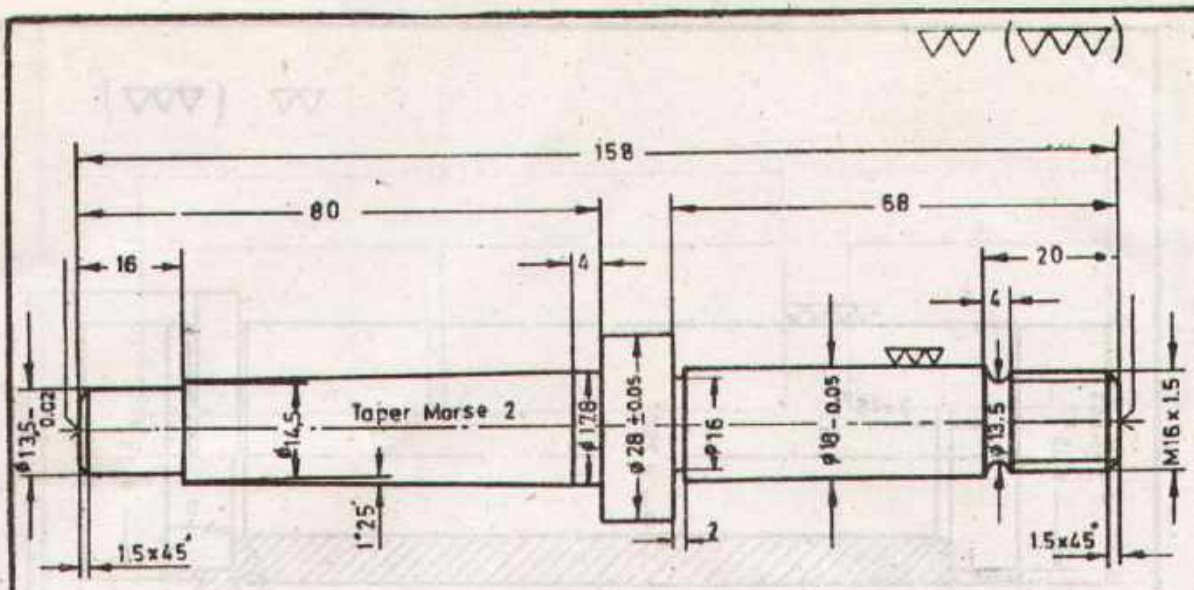
1. Hold workpiece in three-jaw chuck.
2. Turn one side according to drawing.
3. Drill and ream hole Ø 16^{H7} and internal recess Ø 28 x 3.
4. Re-chuck and face to thickness 26 mm.
5. To ensure true running hold the workpiece on mandrel.
6. Turn second side, the outside Ø and V-belt groove.

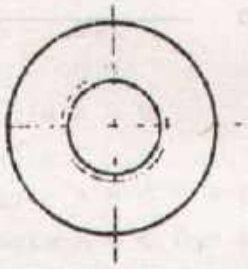
		16^{H7} $^{+0.018}_{0}$
SCALE 1:1	V - BELT PULLEY	MP/ 2.3/ 3.2.2/9
MAT. MILDSTEEL		TURNING II

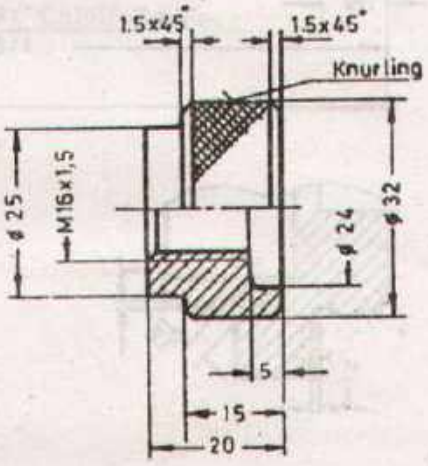
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST







SEQUENCE OF OPERATION

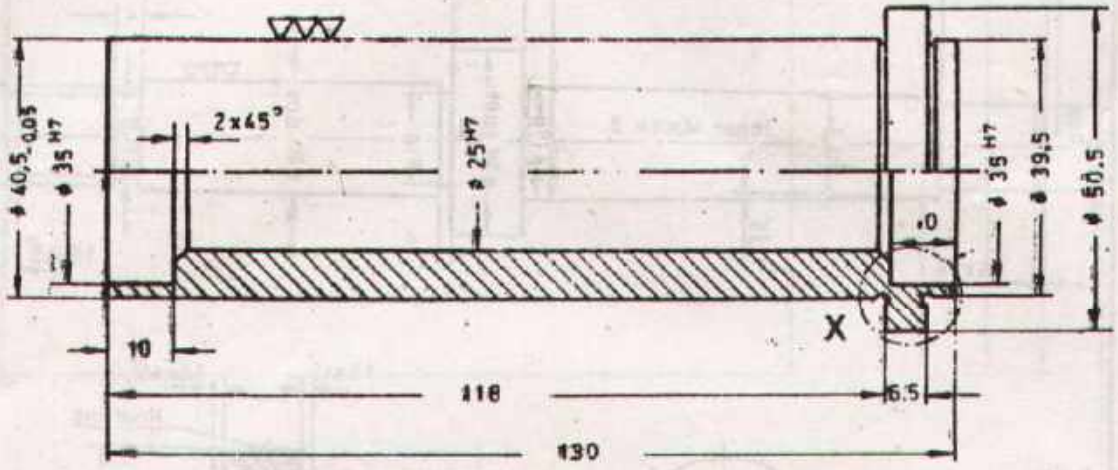
1. Hold mandrel between centre and turn step to Ø 16.
2. Cut thread M 16 x 1.5 on lathe machine.
3. Hold workpiece for nut in three-jaw chuck.
   Drill hole and cut internal thread.
   Check for proper fitting with the previous made mandrel thread.
4. Turn outer shape of nut and knurl.
5. Part off and face to length.

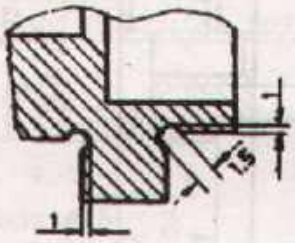
SCALE 1:1	MANDREL WITH NUT	MP/ 2.3/3.2.2/10
MAT. MILDSTEEL		TURNING II

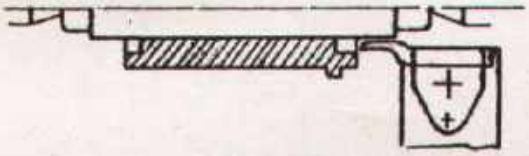
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST







SEQUENCE OF OPERATION

1. Clamp workpiece in three-jaw chuck and turn roughly the outside diameters.
2. Finish the hole ø 25^{H7} and rough both diameters 35^{H7} to ø 34.
3. Hold workpiece on a mandrel, finish outside diameters and the two bearing seats 35^{H7}

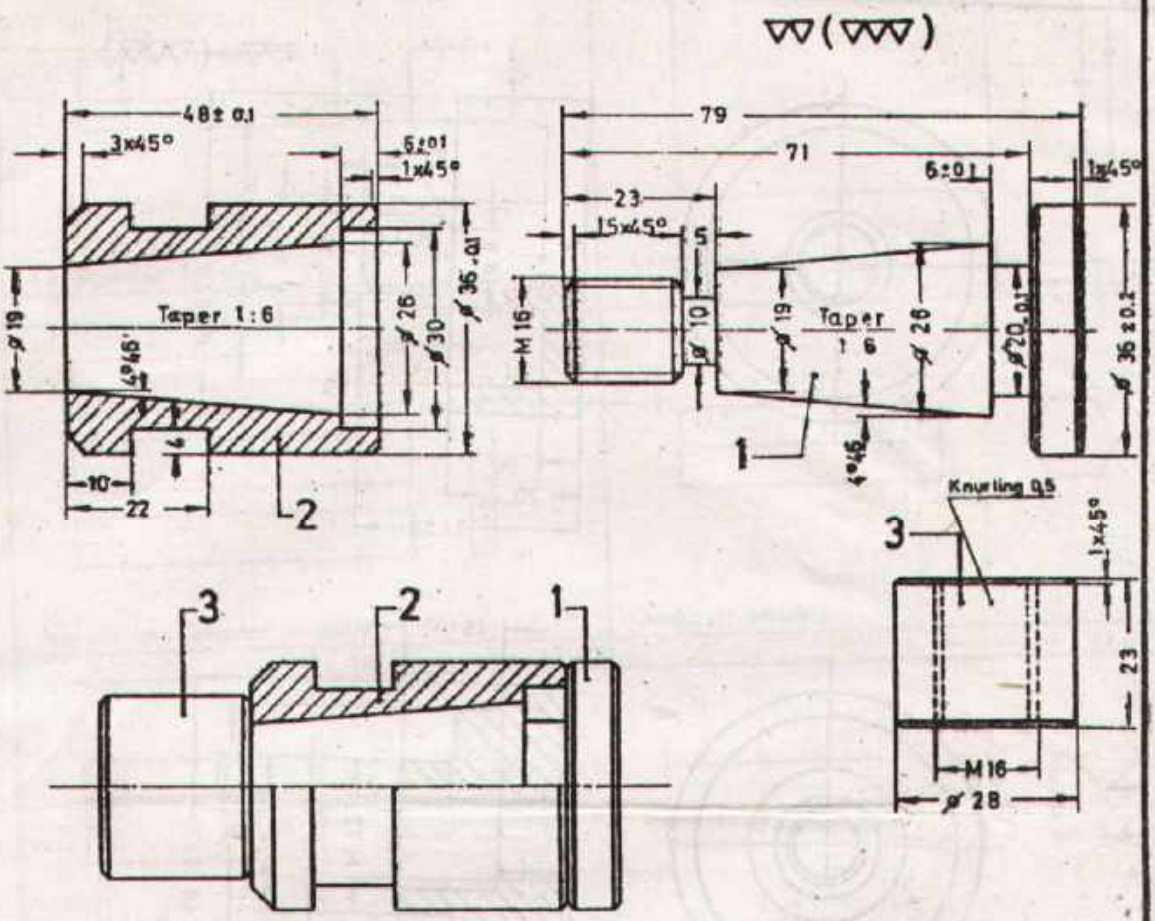
35^{H7}	$^{0.025}_{0}$
25^{H7}	$^{0.021}_{0}$

SCALE 1:1.	DRILL SPINDLE SLEEVE	MP/ 2.3/3.2.2/11
MAT. MILDSTEEL		TURNING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



SEQUENCE OF OPERATION

1. Hold part No. 1 between centres and turn the outer ø, grooves, cut thread M 16 and taper 1 : 6.

2. Hold part No. 2 in three-jaw chuck.
   Drill hole ø 18.5. Do not disturb the setting angle adjusted for external taper and turn internal taper with the same setting.

3. Turn and knurl part No. 3.
   Drill and cut thread.

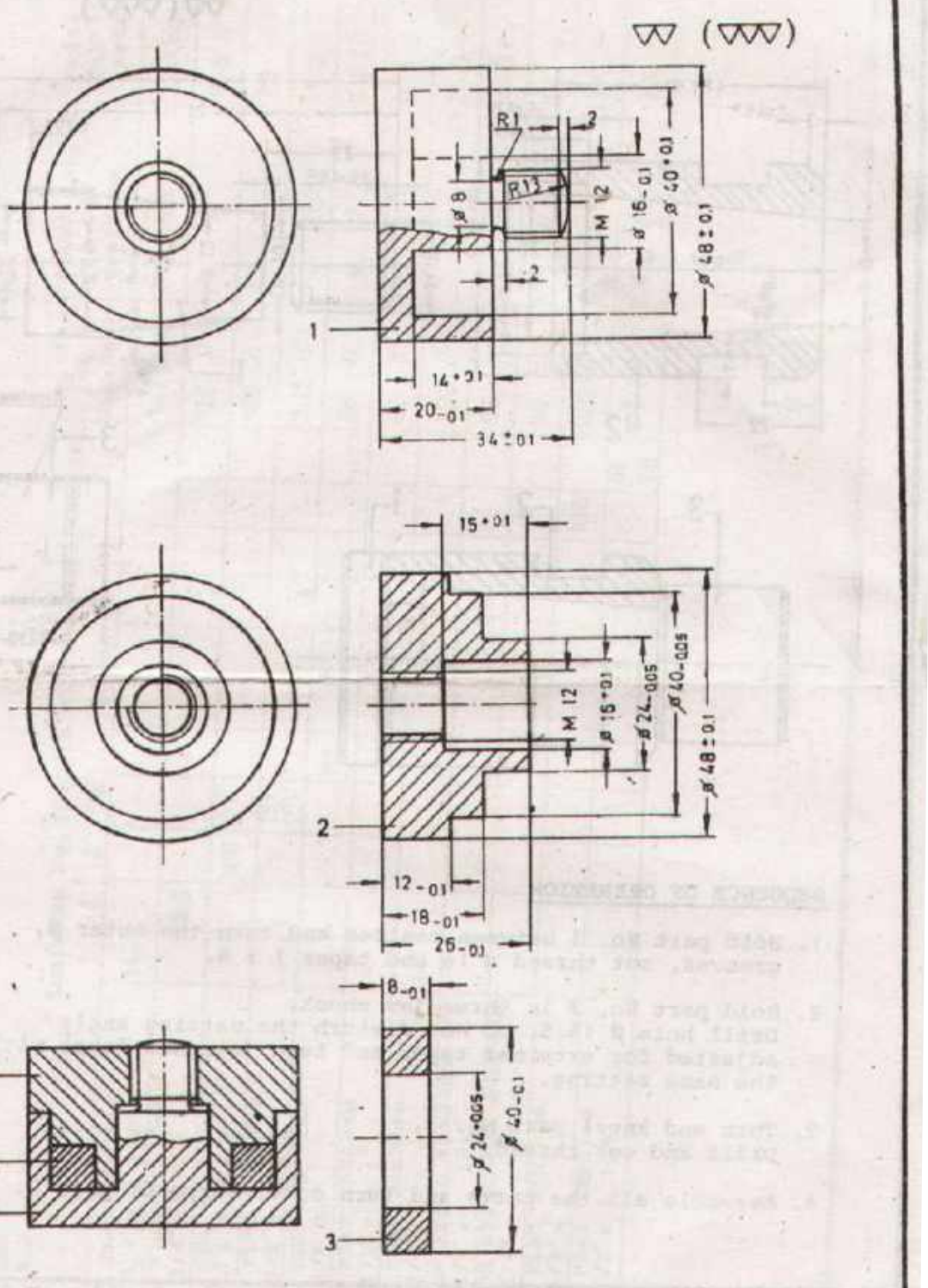
4. Assemble all the parts and turn outer shape of part 2.

SCALE 1:1	SHANK SCREW WITH TAPER	MP/ 2.3/ 3.2.2/12
MAT. MILDSTEEL		TURNING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



SCALE 1:1	FITTING EXERCISE	MP/ 2.3/ 3.2.2/13 TEST
MAT. MILDSTEEL		TURNING II

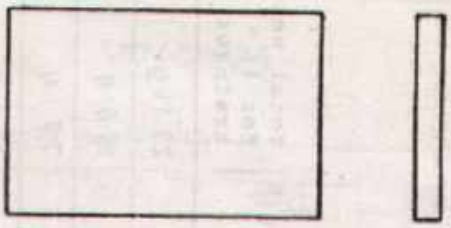
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

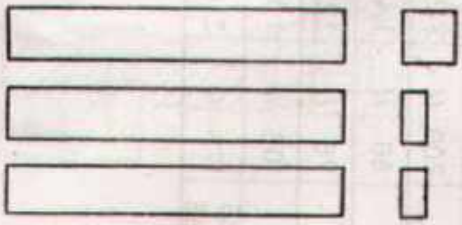
Longitudinal shaping

1 → 32.4/2



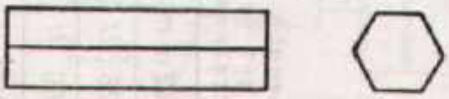
Longitudinal shaping

2 → 32.4/1



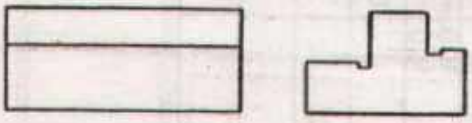
Square and angular shaping

3 / 3a → 32.4/3



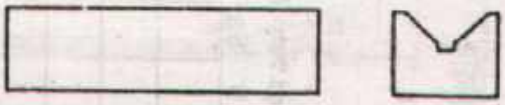
Angular shaping

4 → 32.4/4



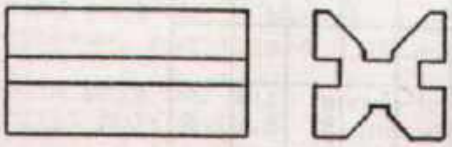
Step and angular shaping

5 / 5a → 32.4/5



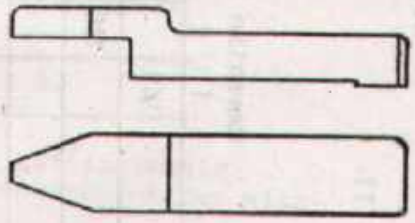
Vee shaping

6 → 32.4/6



Vee and slot shaping

7 → 32.4/7



Form and step shaping

8

In addition to the exercises shown above, the trainees have to make parts which are needed for the training centre.

TRADE TRAINING II	LAYOUT	MP/2.1/3.2.3 SHAPING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

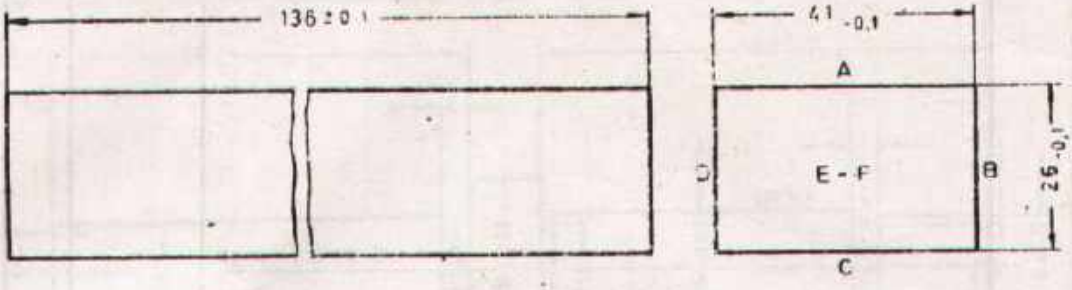
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MATERIAL REQUIRED

TRADE TRAINING II — MACHINIST

SHAPING II
No. 3.2.3/1to9

	Exercise No. (Length given in millimeter) 1	2	3	3a	4	5	5a	6	7	8	9	Length per trainee	Total length for 16 trainees	Total weight for 16 trainees
M.S. FLAT 44x28mm 1 3/4" x 1 1/8"	142											142 m m	2.3 meter	23.1kg
M.S. FLAT 82x12mm 3 1/4" x 1/2"		126										126 //	2.1 //	16.6 //
M.S. SQ. 19x19mm 3/4" x 3/4"sq.			166									166 //	2.7 //	7.7 //
M.S. FLAT 34x12mm 1 3/8" x 1/2"				151 151								302 //	4.9 //	16.2 //
M.S. ROUND ø 32mm 1 1/4" DIA.					86							86 //	1.4 //	9.0 //
M.S. FLAT 63x19mm 2 1/2" x 3/4"						96						96 //	1.2 //	15.0 //
M.S. FLAT 50x16mm 2"x3/4"							100 100					200 //	3.2 //	24.0 //
CARBON STEEL 41x32mm 1 5/8" x 1 1/4"								86				86 //	1.4 //	14.0 //
CARBON STEEL SQ. 44x44mm 1 3/4" x 1 3/4" sq.									76			76 //	1.22 //	9.4 //
M.S. FLAT 38x25mm 1 1/2" x 1"										106		106 //	1.7 //	13.0 //
M.S. FLAT 38x31mm 1 1/2" x 1 1/4"											86 86	172 //	2.8 //	13.2 //



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 136 ± 0.1
2. 25 - 0.1
3. 41 - 0.1
4. Angle A - B
5. Angle C - D
6. Angle A B C D - E
7. Angle A B C D - F
8. Parallel surface
9. Plane surface
10. Smoothness all over

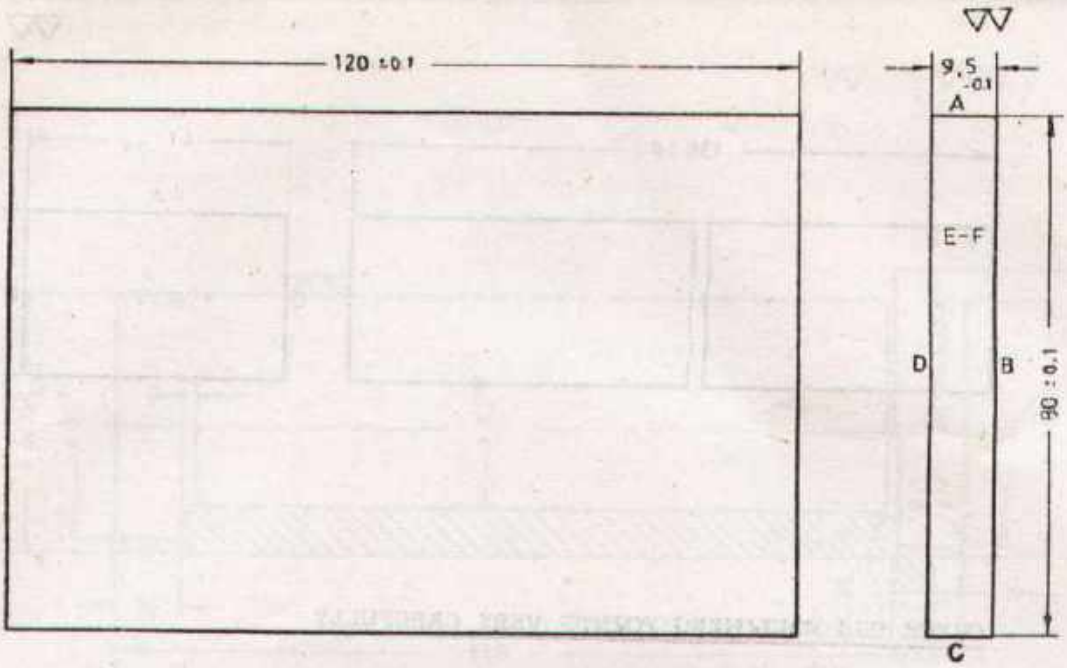
Use parallel distance pieces when chucking the workpiece in the vice !

SCALE 1:1	RECTANGLE PIECE	MP/ 2.3/ 3.2.3/1
MAT. MILD STEEL		SHAPING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 120 ± 0.1
2. 80 ± 0.1
3. 9.5 - 0.1
4. Angle A - B
5. Angle C - D
6. Angle A B C D - E
7. Angle A B C D - F
8. Parallel surface
9. Plane surface
10. Smoothness all over

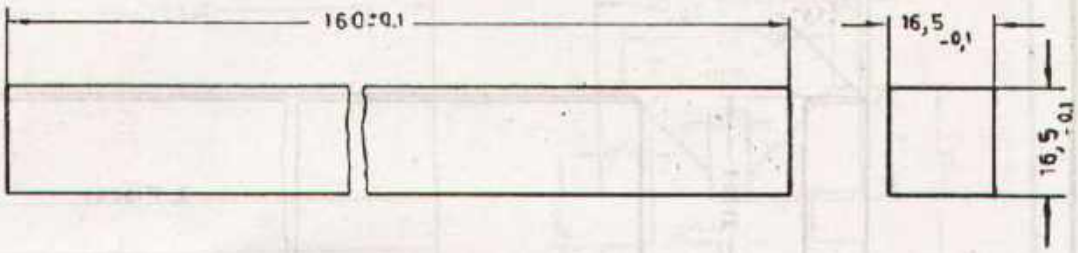
Remove all burrs before you check the dimensions !

SCALE 1:1	PLATE	MP/2.3/3.2.3/2
MAT. MILD STEEL		SHAPING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 16.5 - 0.1
2. 16.5 - 0.1
3. Smoothness and right angle
4. Smoothness all over

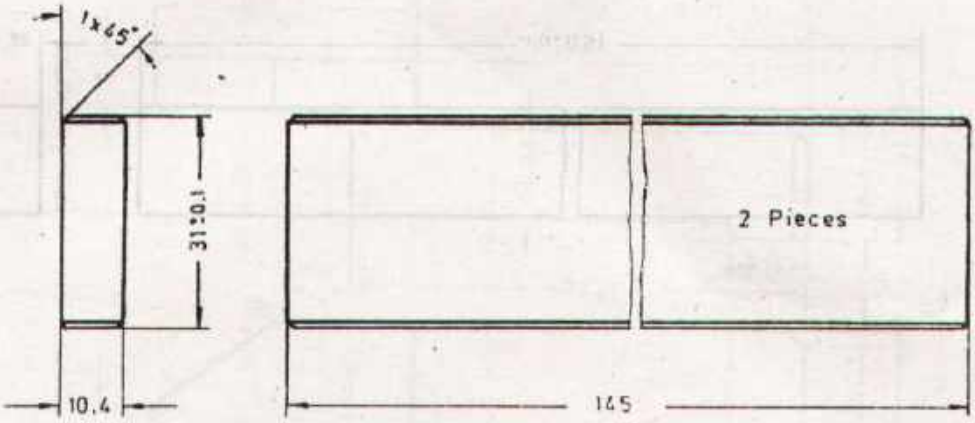
SCALE 1:1	SQUARE PIECE	MP/2.3/3.2.3/3
MAT. MILD STEEL		SHAPING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

TOLERANCE ± 0.1



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 31 ± 0.1
2. 10.4 ± 0.1
3. Smoothness and right angle
4. Smoothness all over

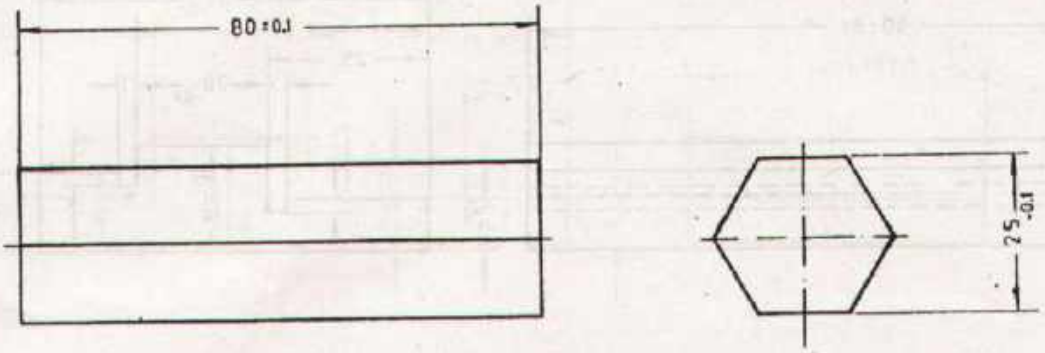
Chamfers are to be made by shaping with the roughing tool.

SCALE 1:1	PARALLEL PIECES	MP/2.3/ 3.2.3/3a
MAT. L.C. STEEL		SHAPING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 25 - 0.1
2. 25 - 0.1
3. 25 - 0.1
4. Parallel surface and accuracy
5. Smoothness all over
6. 25 - 0.1
7. 25 - 0.1
8. 25 - 0.1
9. Parallel surface and accuracy .
10. Smoothness all over

The distance between all three pairs of parallel surfaces must be precisely equal !

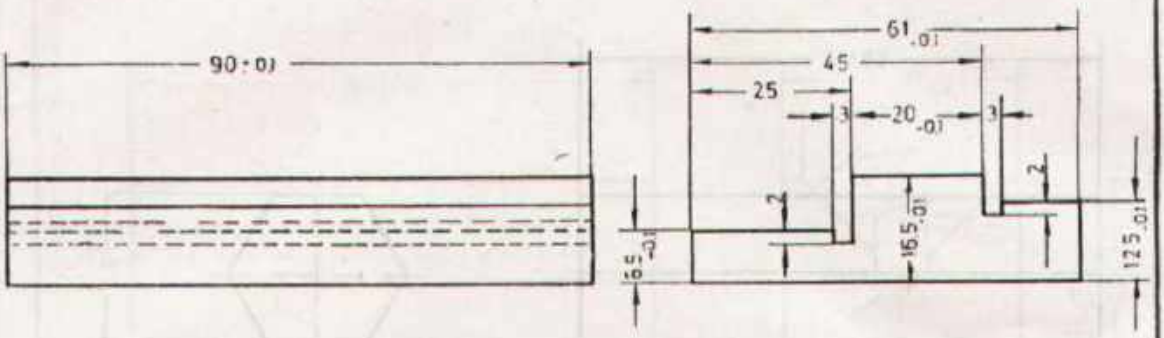
SCALE 1:1	HEXAGON	MP/2.3/ 3.2.3/4
MAT. MILD STEEL		SHAPING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

TOLERANCE 0.1



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 90 ± 0.1
2. 61 - 0.1
3. 20 - 0.1
4. 16.5 - 0.1
5. 125 - 0.1
6. 85 - 0.1
7. Accuracy and right angle of stepped sides.
8. Accuracy and right angle of outside surface.
9. Smoothness of stepped sides.
10. Smoothness all over.

Grind the grooving tool according to width of grooves !

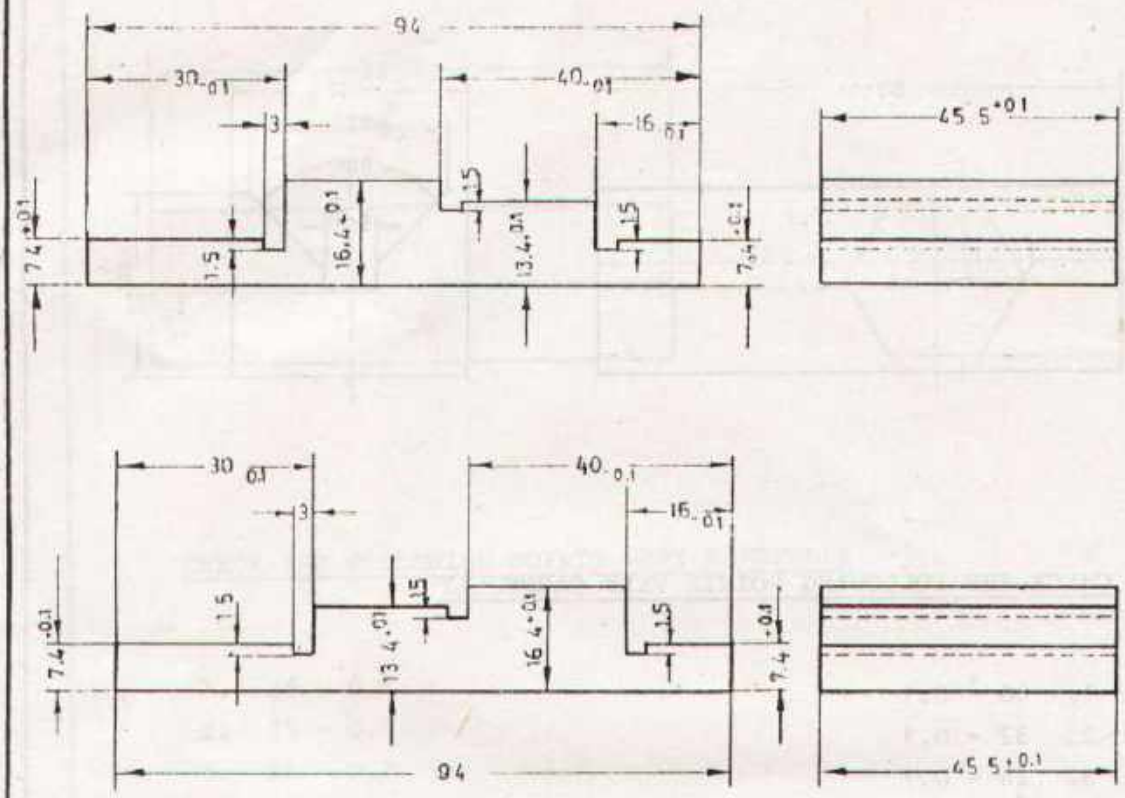
SCALE 1:1	SLIDE RAIL	MP/2.3/3.2.3/5
MAT. MILD STEEL		SHAPING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

Tolerance ± 0.1



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 94 x 45.5 + 0.1
2. 16.4 + 0.1
3. 40 - 0.1 x 13.4 + 0.1
4. 16 - 0.1 x 7.4 + 0.1
5. 30 - 0.1 x 7.4 + 0.1
6. Accuracy and right angle of stepped sides
7. Smoothness all over

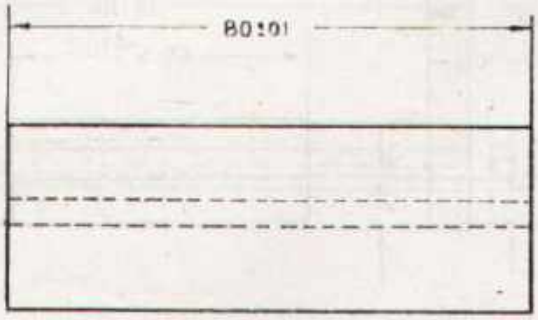
SCALE 1:1	PARTS OF SNAP GAUGE	MP/2.3/ 3.2.3/5a
MAT. CARBON STEEL		SHAPING II

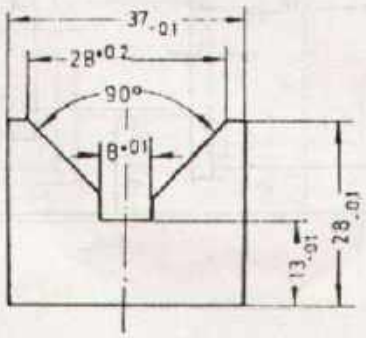
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

TOLERANCE ± 01





CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 80 ± 0.1
2. 37 - 0.1
3. 28 - 0.1
4. 28 + 0.2
5. 13 - 0.1
6. 8 + 0.1
7. Accuracy of angle 90° and notch
8. Smoothness of angle 90° and notch
9. Right angle and parallel surface all over
10. Smoothness all over

Start the work with cutting the 8 mm wide groove to its full depth !

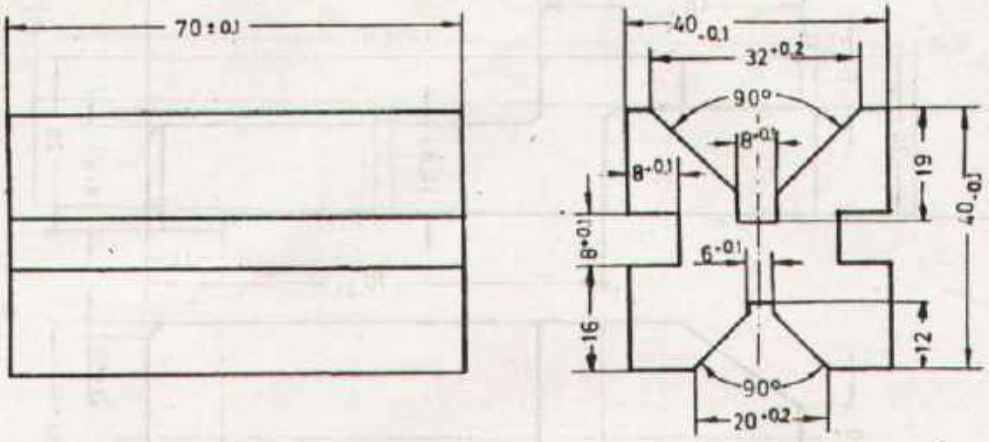
SCALE 1:1	V - BLOCK	MP/2.3/3.2.3/6
MAT: CARBON STEEL		SHAPING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

TOLERANCE ± 0.1



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 70 ± 0.1
2. 40 - 0.1
3. 40 - 0.1
4. 8 + 0.1
5. 8 + 0.1
6. 8 + 0.1
7. 6 + 0.1
8. Accuracy of angle 90° and notch
9. Right angle and parallel surface all over
10. Smoothness all over

All grooves must be precisely parallel !

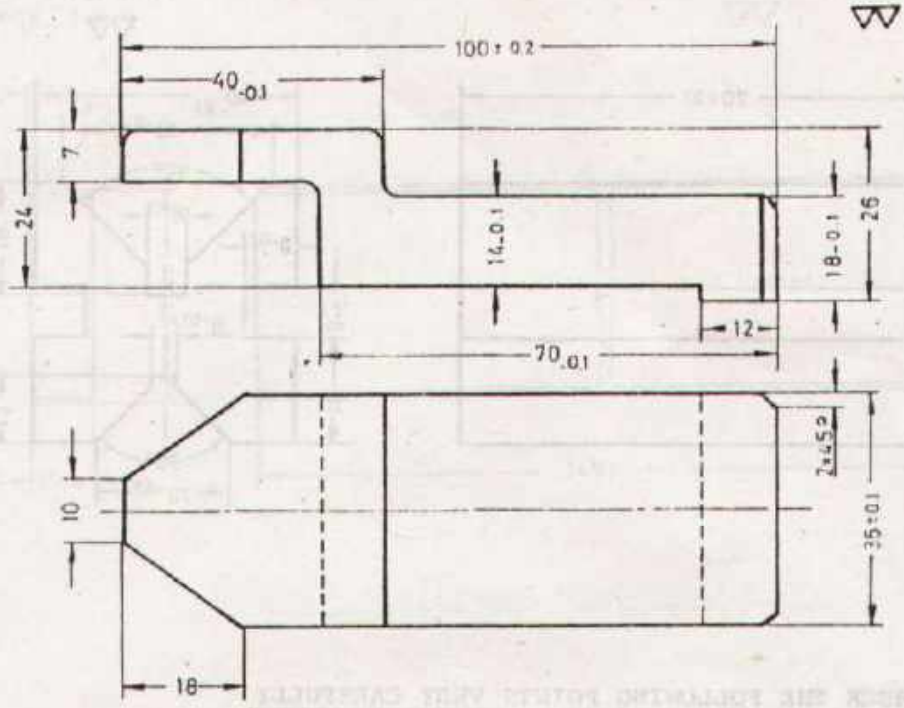
SCALE 1:1	V.- BLOCK	MP/2.3/ 3.2.3/7
MAT. CARBON STEEL		SHAPING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

TOLERANCE 0.1



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 100 ± 0.2
2. 70 - 0.1
3. 40 - 0.1
4. 36 ± 0.1
5. 18 - 0.1
6. 14 - 0.1
7. 24 ± 0.1
8. Parallel surface all over
9. Right angle surface all over
10. Smoothness all over

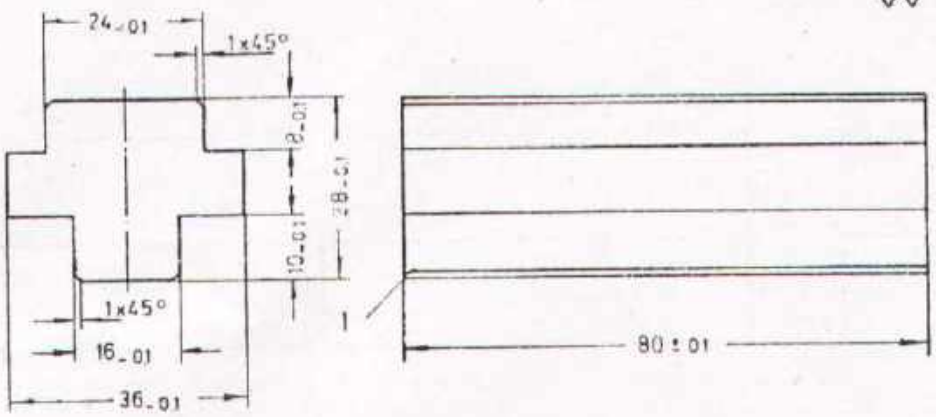
Mind the marking lines during machining operations !

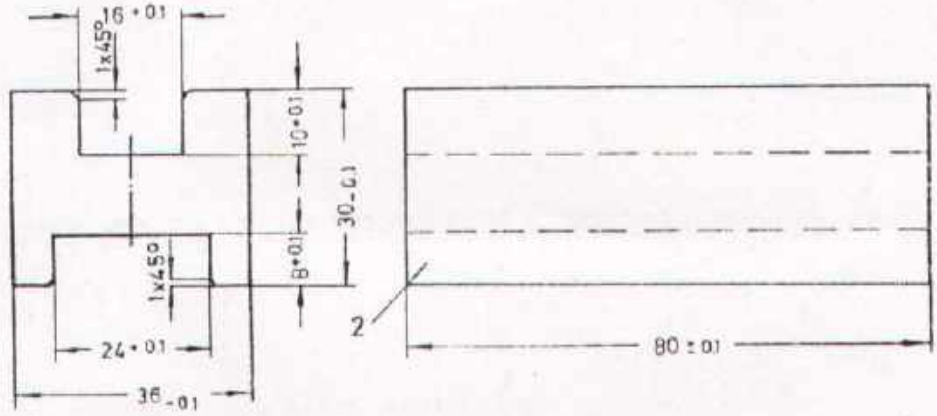
SCALE 1:1	CLAMPING TOOL	MP/2.3/3.2.3/8
MAT: MILD STEEL		SHAPING II

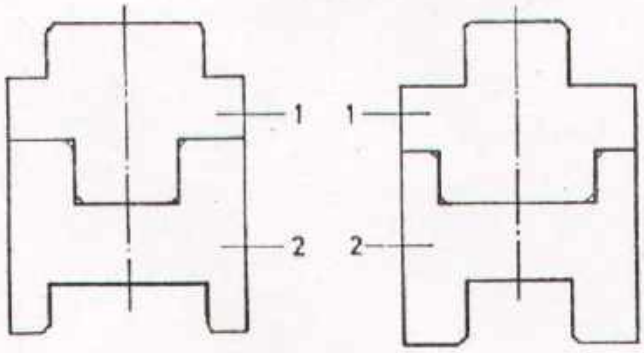
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST





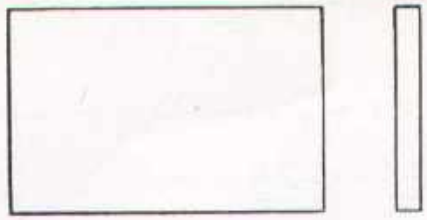


SCALE 1:1	FITTING PIECE WITH SLEEVE SOCKET	MP/2.3/3.2.3/9 TEST
MAT: MILD STEEL		SHAPING II

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

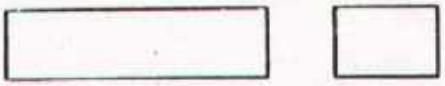
PAN-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



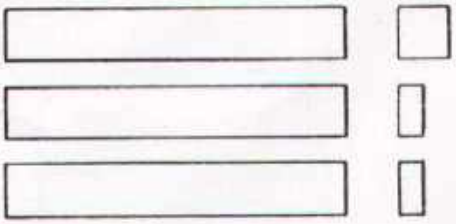
Flat & parallel grinding

3.2.3/3 → 1



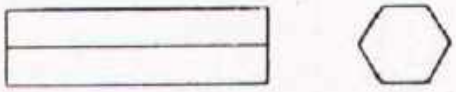
Longitudinal grinding

3.2.3/1 → 2



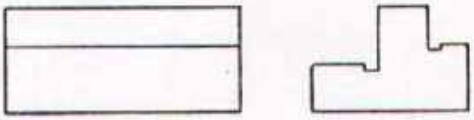
Square & parallel grinding

3.2.3/3 → 3 / 3a



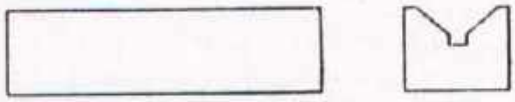
Angular & longitudinal grinding

3.2.3/4 → 4



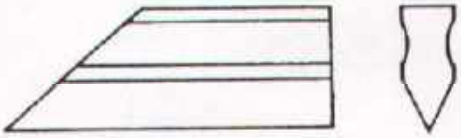
Step & parallel grinding

3.2.3/5 → 5 / 5a



Vee & longitudinal grinding

3.2.3/6 → 6



Angular grinding

4.2.1/3 → 7

Square & vee grinding

3.2.3/7 → 8

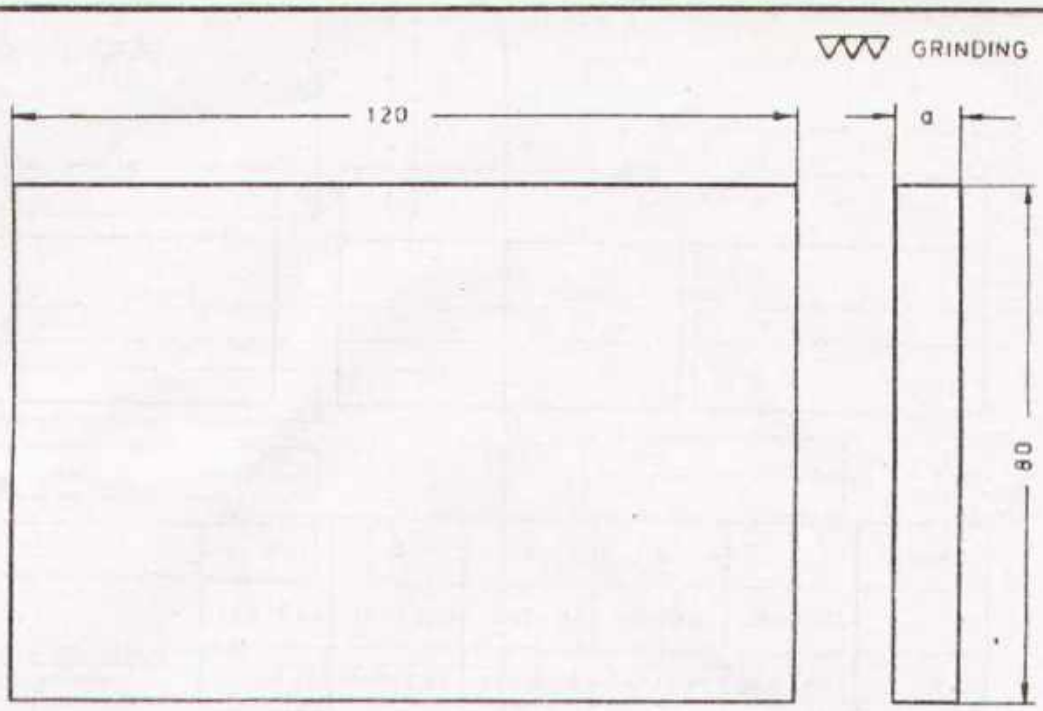
In addition to the exercises shown above, the trainees have to make parts which are needed for the training centre.

TRADE TRAINING II	LAYOUT	MP/ 21/ 3.2.4 SURFACE GRINDING

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



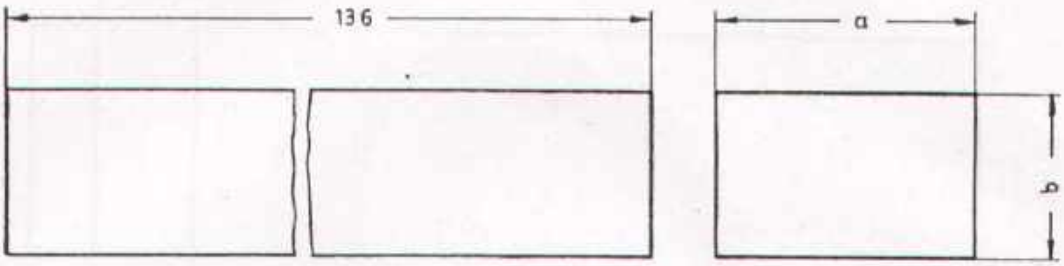
No	1	2	3	4	5	6	7	8	9	10
a	9,0 ±0.1	8,5 ±0.05	8,2 ±0.05	7,9 ±0.03	7,6 ±0.03	7,4 ±0.02	7,2 ±0.02	7,0 ±0.01	6,8 +0.01	6,6 -0.01

CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 9.0 ± 0.1
2. 8.5 ± 0.05
3. 8.2 ± 0.05
4. 7.9 ± 0.03
5. 7.6 ± 0.03
6. 7.4 ± 0.02
7. 7.2 ± 0.02
8. 7.0 ± 0.01
9. 6.8 + 0.01
10. 6.6 - 0.01

SCALE 1:1	MEASURING EXERCISE	MP/2.3/3.2.4/1
MAT.: MILD STEEL	from 3.2.3/3	SURFACE GRINDING
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING PAK-GERMAN TECHNICAL TRAINING PROGRAMME		MACHINIST

GRINDING



No	1	2	3	4	5
a	40,8±0.05	40,6±0.05	40,4±0.02	40,2±0.02	40,0±0.01
b	25,8±0.05	25,6±0.05	25,4±0.02	25,2±0.02	25,0±0.01

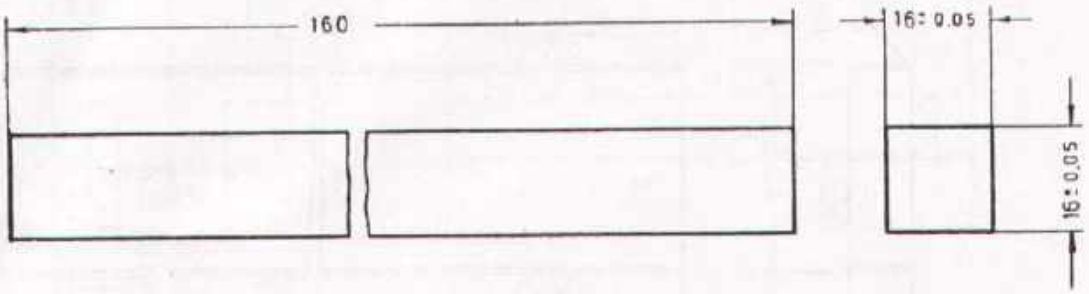
CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 40.8 ± 0.05
2. 25.8 ± 0.05
3. 40.6 ± 0.05
4. 25.6 ± 0.05
5. 40.4 ± 0.02
6. 25.4 ± 0.02
7. 40.2 ± 0.02
8. 25.2 ± 0.02
9. 40.0 ± 0.01
10. 25.0 ± 0.01

Remove all burrs before you check the dimensions !

SCALE 1:1	MEASURING EXERCISE	MP/2.3/3.2.4/2
MAT.: MILD STEEL	from 3.2.3/1	SURFACE GRINDING
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING		MACHINIST
PAK-GERMAN TECHNICAL TRAINING PROGRAMME		

GRINDING



CHECK THE FOLLOWING POINTS VERY CAREFULLY

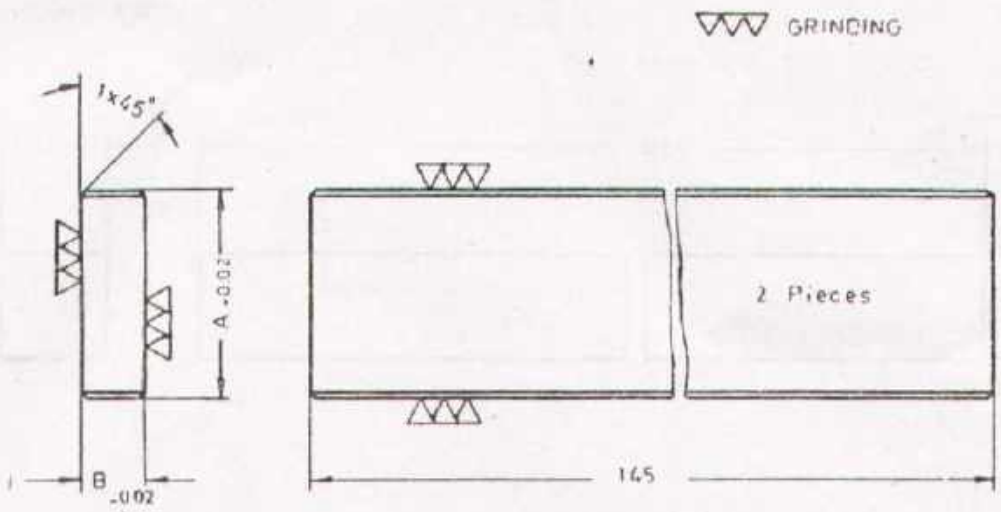
1. 16 ± 0.05
2. 16 ± 0.05
3. Accuracy and right angle
4. Smoothness all over

SCALE 1:1	SQUARE PIECE	MP/2.3/3.2.4/3
MAT: MILD STEEL	from 3.2.3/3	SURFACE GRINDING

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



A	B	No. of Pieces
30	10	2
29	10	2
28	9,5	2
27	9	2

CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. Dimension A
2. Dimension B
3. Smoothness and right angle

   To ensure equal size of both pieces grind them together.

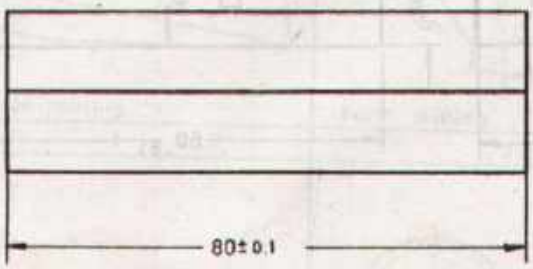
SCALE 1:1	PARALLAL PIECES	MP/2.3/3.2.4/3a
MAT.: L.C.STEEL	from 3.2.3/3a	SURFACE GRINDING

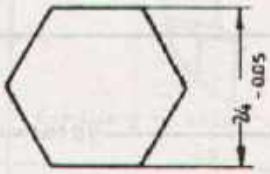
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

GRINDING





CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 24 - 0.05 - Piece No. 1
2. 24 - 0.05 - Piece No. 1
3. 24 - 0.05 - Piece No. 1
4. Parallel surface and accuracy - Piece No. 1
5. Smoothness all over - Piece No. 1
6. 24 - 0.05 - Piece No. 2
7. 24 - 0.05 - Piece No. 2
8. 24 - 0.05 - Piece No. 2
9. Parallel surface and accuracy - Piece No. 2
10. Smoothness all over

Finish the first piece completely before starting to grind the second one !

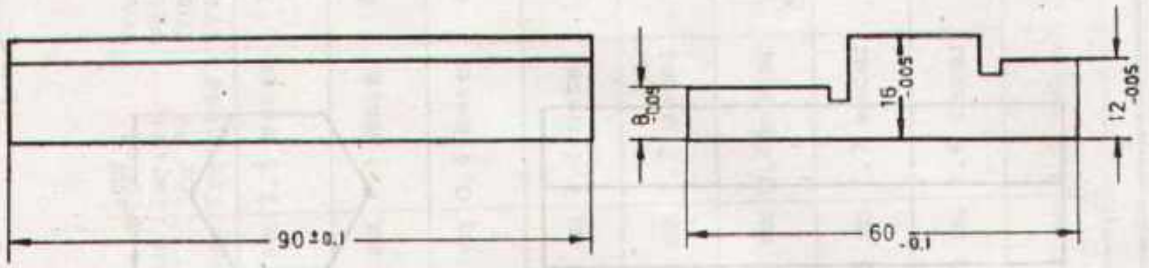
SCALE 1:1	HEXAGON	MP/2.3/3.2.4/4
MAT: MILD STEEL	from 3.2.3/4	SURFACE GRINDING

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

GRINDING



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 60 - 0.1
2. 16 - 0.05
3. 12 - 0.05
4. 8 - 0.05
5. Smoothness of plane surface 60 mm
6. Smoothness of plane surface 16 mm
7. Smoothness of plane surface 12 mm
8. Smoothness of plane surface 8 mm
9. Parallel surface and accuracy
10. Smoothness all over

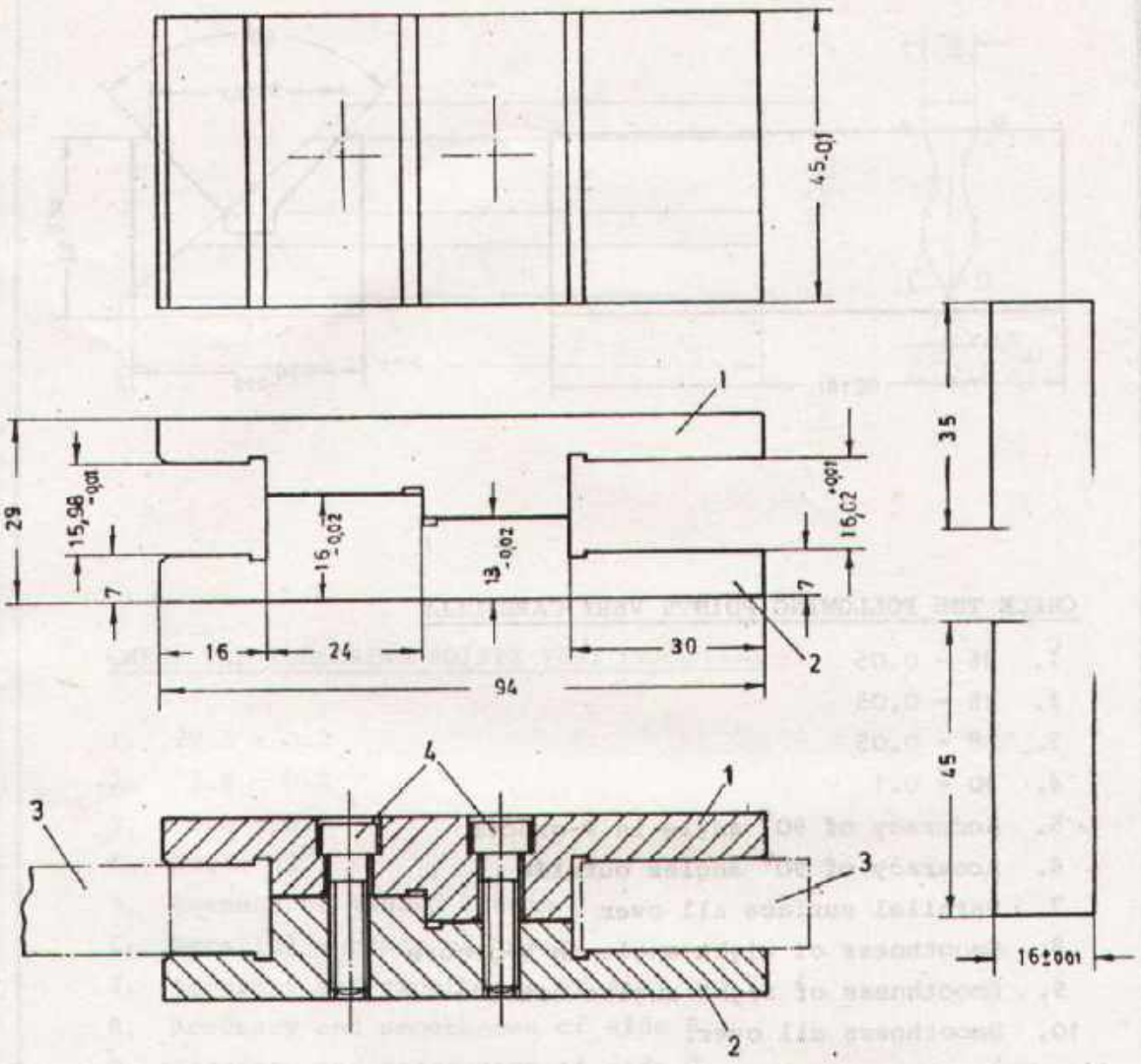
When grinding the lower surface use suitable distance pieces to chuck the job !

SCALE 1:1	SLIDE RAIL	MP/2.3/3.2 4/5
MAT: MILD STEEL	from 3.2.3/5	SURFACE GRINDING

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



2	Allen screw		4	M 6x 20
1	Test piece	Low Carb. st.	3	
1	Snap Gauge No. 1	Low Carb. st.	2	
1	Snap Gauge No. 2	Low Carb. st.	1	
Qty.	DENOMINATION	MATERIAL	NO.	REMARKS

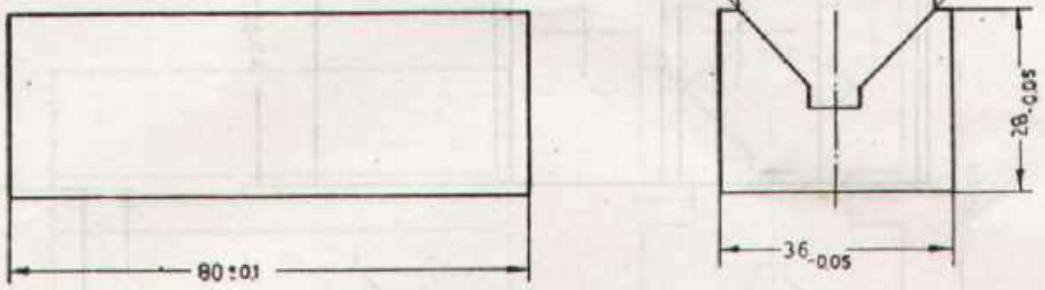
SCALE 1:1	SNAP-GAUGE	MP/2.3/3.2.4/5a
MAT.:	from 3.2.3/5a FOR TRAINING PURPOSE ONLY	SURFACE GRINDING

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

GRINDING



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 36 - 0.05
2. 28 - 0.05
3. 28 - 0.05
4. 30 $\pm$ 0.1
5. Accuracy of 90° angle in V-groove
6. Accuracy of 90° angles outside
7. Parallel surface all over
8. Smoothness of right angle in V-groove
9. Smoothness of right angles outside
10. Smoothness all over.

Check the grinding wheel for proper dressing and cleanliness !

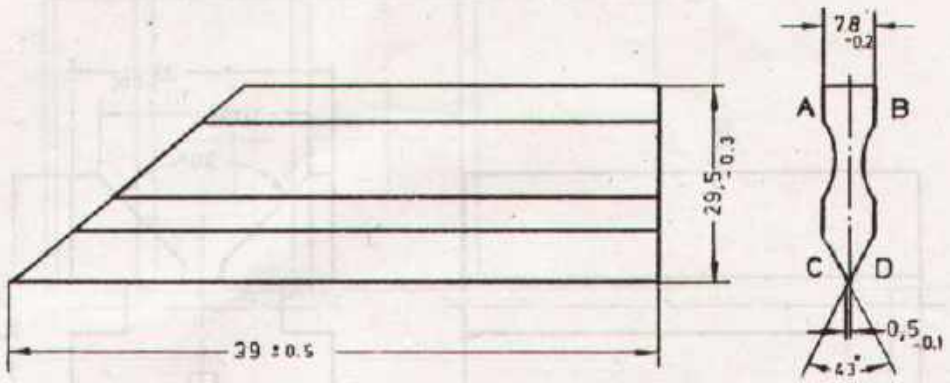
SCALE 1:1	V - BLOCK	MP/2.3/3.2.4/6
MAT. CARBON ST.	from 323/6	SURFACE GRINDING

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

GRINDING



CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 29.5 - 0.3
2. 7.8 - 0.2
3. 0.5 - 0.1
4. Angle 43°
5. Eveness of gauged length
6. Parallel surface all over
7. Accuracy and smoothness of side A
8. Accuracy and smoothness of side B
9. Accuracy and smoothness of side C
10. Accuracy and smoothness of side D

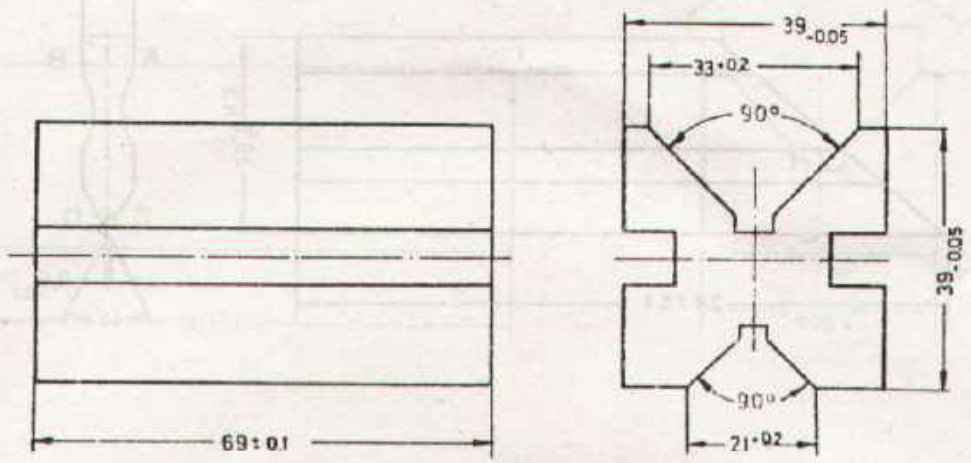
Distortions of the piece caused by the heat treatment must be straightened before grinding it !

SCALE 1:1	STRAIGHT EDGE	MP/2.3/3.2.4/7
MAT.: CARBON ST.	from 4.2.1/3	SURFACE GRINDING

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

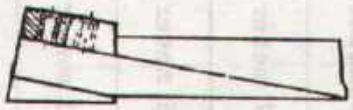


CHECK THE FOLLOWING POINTS VERY CAREFULLY

1. 69 ± 0.1
2. $39 - 0.05$
3. $39 - 0.05$
4. $33 + 0.2$
5. $21 + 0.2$
6. Right angle 90° x 33
7. Right angle 90° x 21
8. Parallel surface of right angle 90° x 33
9. Parallel surface of right angle 90° x 21
10. Smoothness all over

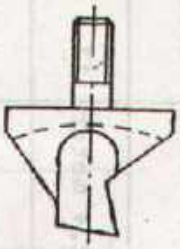
The V-grooves must be precisely parallel !

SCALE 1:1	V - BLOCK	MP/2.3/3.2.4/8
MAT: CARBON ST.	from 3.2.3/7	SURFACE GRINDING



Angular milling

1

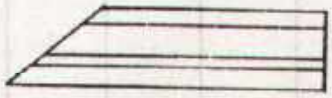


Form milling

2 → 4.3.2/4

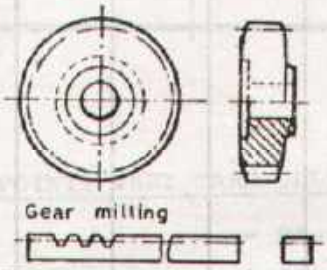
Exercising of known operation

2a



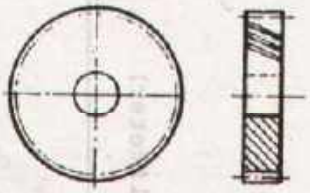
Form & angular milling

3 → 3.2.4/7



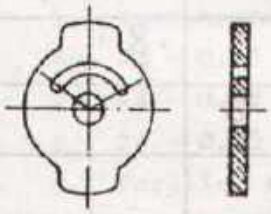
Gear milling

3.2.4/3 → 4 2.3.3/11



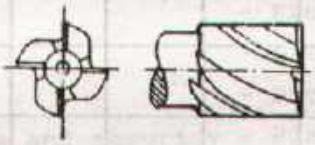
Helical gear milling

3.2.2/1a → 5 2.3.3/11



Working on round table

6

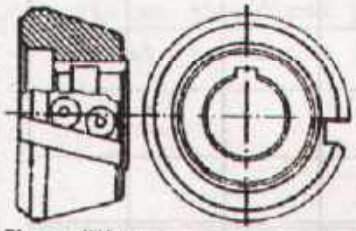


Flute milling

7

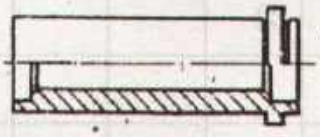
Flute milling

3.1.1/5 → 8



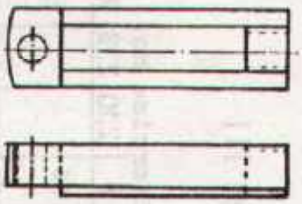
Slot milling

4.1.2/8 → 9 → 4.3.2/3



Rack & keyway milling

3.2.2/11 → 10



Internal recess milling

11/11a/11b → 4.3.2/5

In addition to the exercises shown above, the trainees have to make parts which are needed for the training centre.

TRADE TRAINING III	LAYOUT	MP/2.1/4.2.1 MILLING III

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MATERIAL REQUIRED

TRADE TRAINING III

MACHINIST

MILLING III

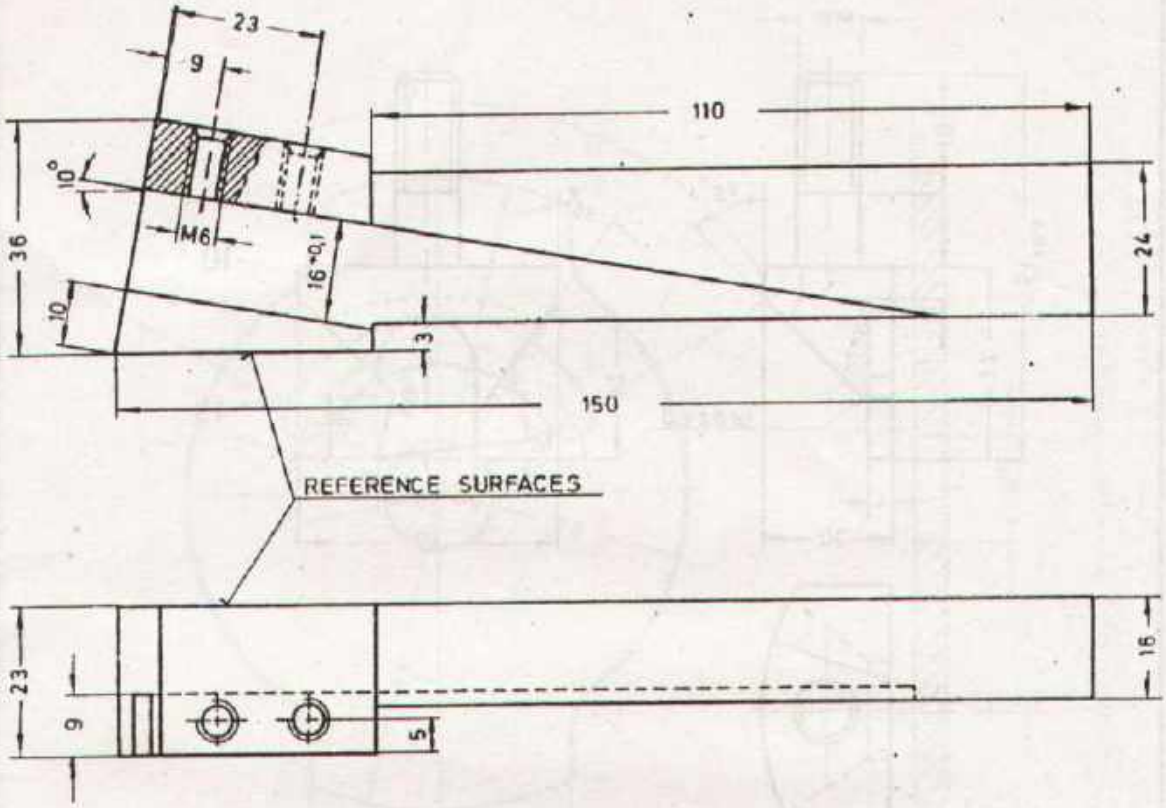
No. 4.2.1/1 to 11

(Length given in Millimeter)

Exercise No.	1	2,10	2.13	2a	3	4,1	6	7	11	Length per Trainee	Total length for 16 Trainees	Total weight for 16 Trainees
M.S.Flat 38 x 25 mm (1 1/2" x 1")	156									156 mm	2.5 meter	19.0 kg
M.S.Flat 44 x 22 mm (1 3/4" x 7/8")		68								68 mm	1.1 meter	8.6 kg
H.S.Steel 16 x 6 mm (5/8" x 1/4") "FLAT"			25							25 mm	0.4 meter	0.35 kg
H.C.Steel 31 x22 mm (1 1/4" x 7/8") FLAT				150						150 mm	2.4 meter	13.4 kg
H.C.Steel 32 x10 mm (1 1/4" x 3/8) FLAT					106					106 mm	1.7 meter	4.2 kg
Cast Iron Ø 76 mm (3" DIA)						28				28 mm	0.45meter	16.2 kg "CASTING"
M.S.Flat 82x6.4 mm (3 1/4" x 1/4")							105			105 mm	1.7 meter	7.0 kg
H.S.Steel Ø 19 mm (3/4" DIA)								100		100 mm	1.6 meter	3.8 kg
M.S.Flat 44 x 26 mm (1 3/4" x 1")									142	142 mm	2.3 meter	20.5 kg

TOLERANCE ± 0,1 UNLESS
OTHERWISE STATED

Milling



SEQUENCE OF OPERATION

1. Machine reference surfaces
2. Mill the shank 24 x 16
3. Mill angular surfaces and tool slot

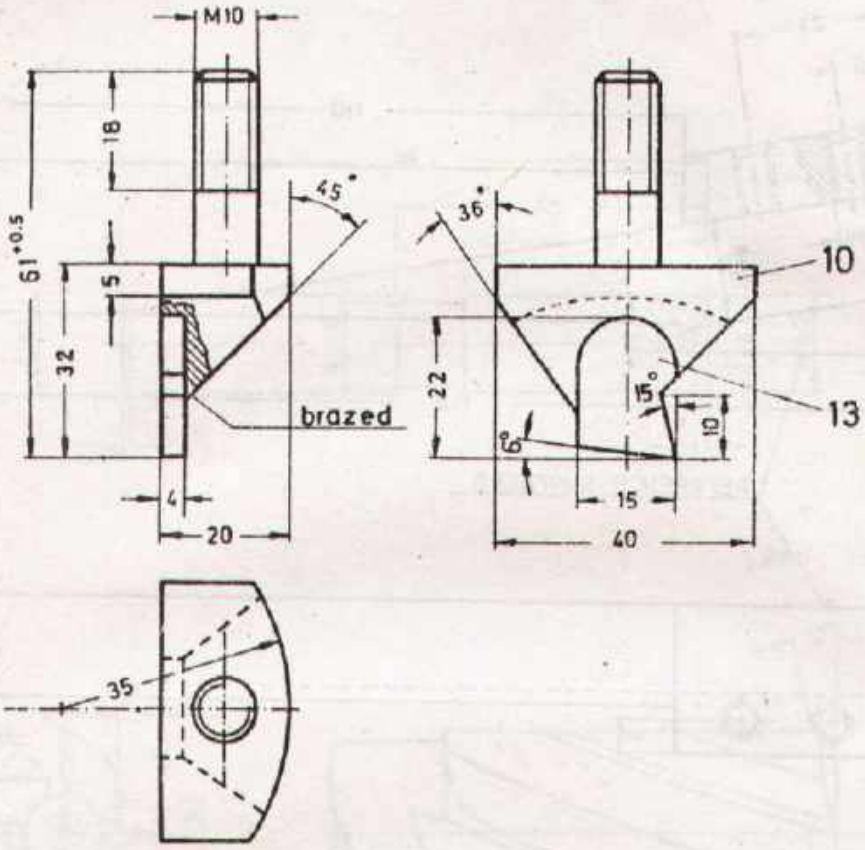
SCALE 1:1	TOOL HOLDER	MP/2.3/4.2.1/1
MAT: MILD STEEL		MILLING III

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

For all dimensions 0.1
unless otherwise stated



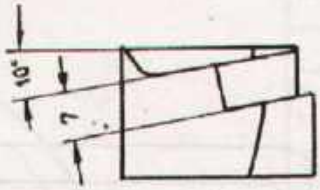
Qty	NAME	Part No	Material	Remarks
1	Tool bit	13	High speed st.	
1	Tool holder	10	Mild steel	

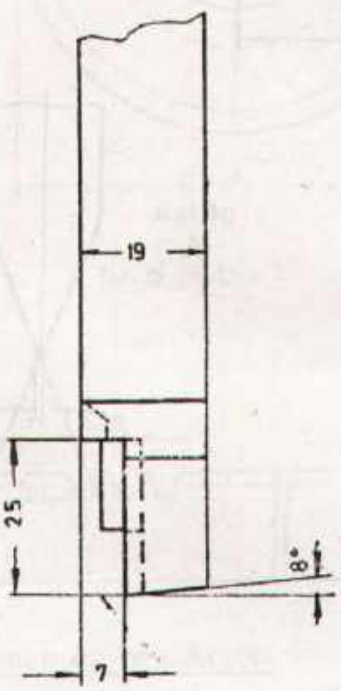
SCALE 1:1	CIRCULAR CUTTER PARTS-10.13	MP/2.3/4.2.1/2
MAT:		MILLING III

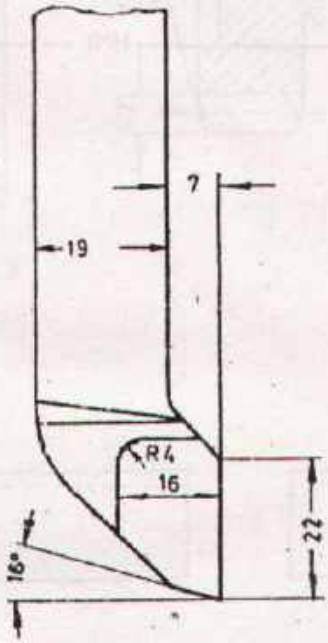
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

Milling







SCALE 1:1	SIDE TURNING TOOL	MP/2.3/4.2.1/2a
MAT: H.C. STEEL		MILLING III

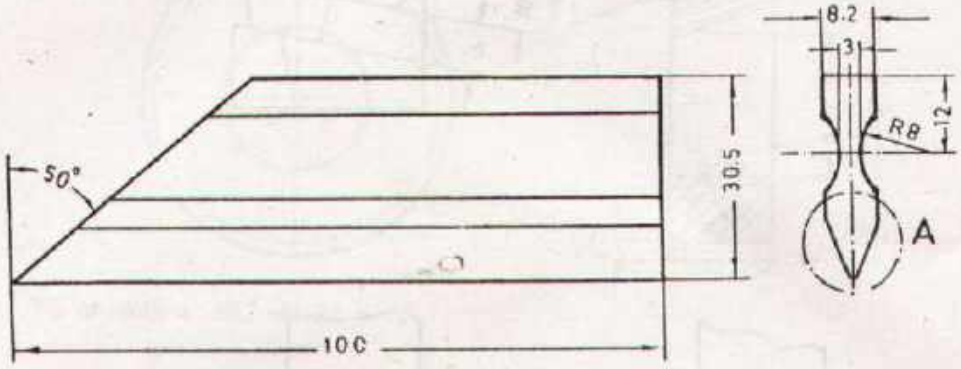
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

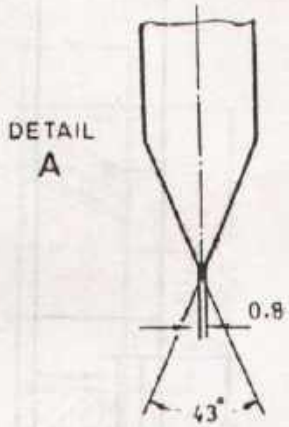
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

▽▽

Tolerance ± 0.1
unless otherwise stated.





SEQUENCE OF OPERATION

1. Mill to dimensions 8.2 x 30.5 x 100
2. Mill the radius 10 with the radius milling cutter
3. Mill the 43° angle faces by turning the vertical head
4. Mark and mill the 50° angle

SCALE 1:1	STRAIGHT EDGE	MP/23/42.1/3
MAT. H.C.STEEL		MILLING III

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

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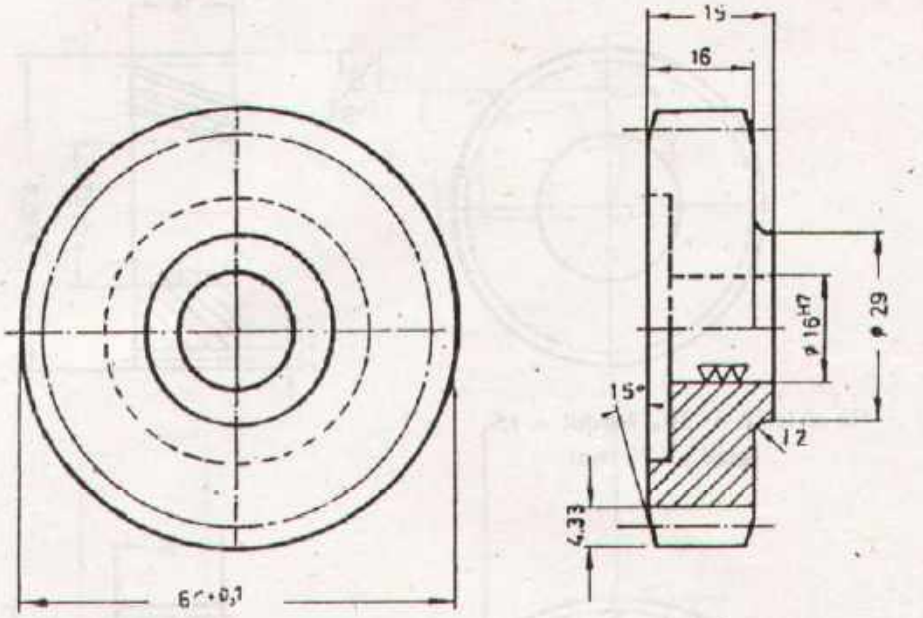
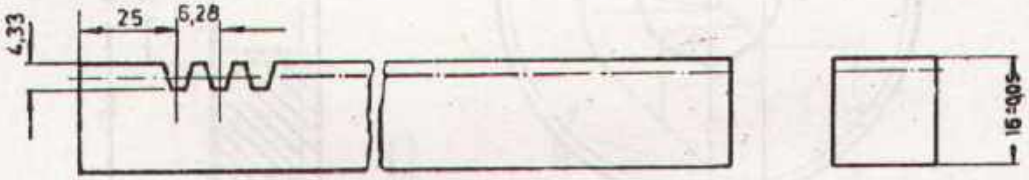


No. of teeth = 31 Modul = 2



SEQUENCE OF OPERATION

1. Check diamter of raw piece.
2. Hold on milling mandrel.
3. Check the workpiece for true running.
4. Select module cutter according to no. of teeth required.
5. Clamp dividing-head spindle while milling.

Rack

1. Check height 16 ± 0.05
2. Mount machine vice precisely at right angle using the dial test indicator.

SCALE 1:1	GEAR-WHEEL AND RACK	MP/2 3/4.2.1/4
MAT: CAST IRON	Rack from 3.2.4/3	MILLING III

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

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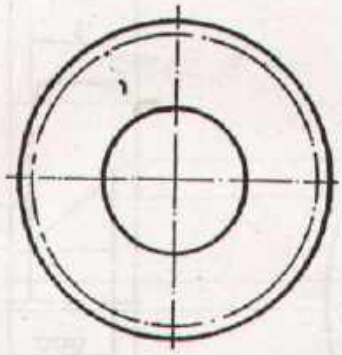
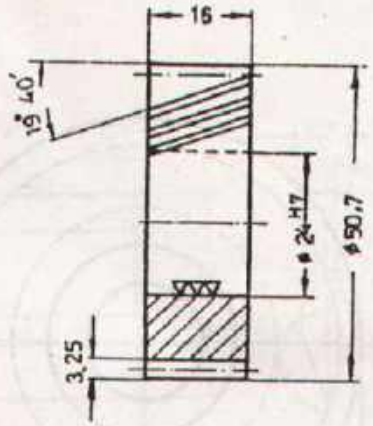
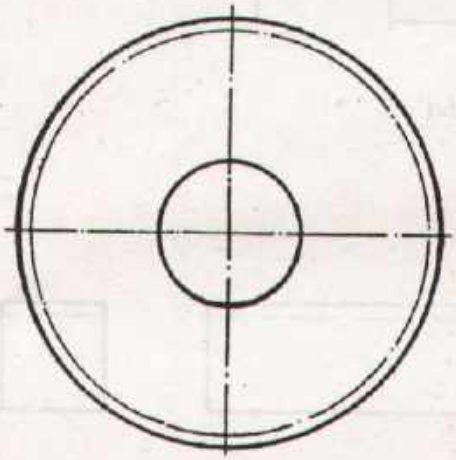
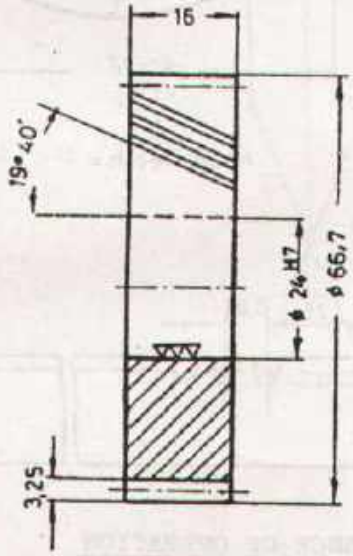




No of teeth = 30, Modul = 1,5
lead = 420 mm





No of teeth = 40, Modul = 1,5
lead = 560 mm

SEQUENCE OF OPERATION

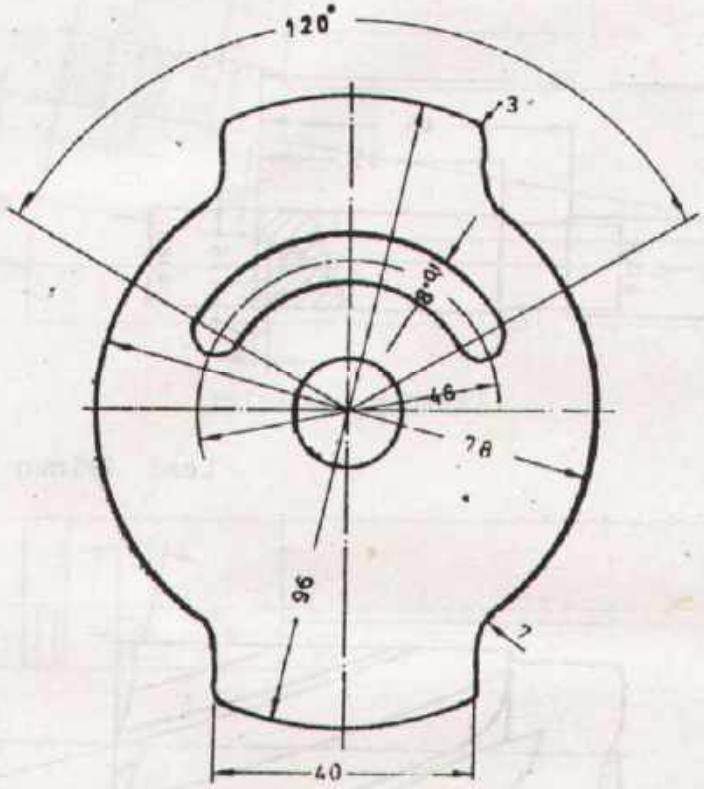
1. Check raw piece for correct diameters !
2. Hold on milling mandrel !
3. Check the workpiece for true running (dial test-indicator) !
4. Mind right or left hand helix.

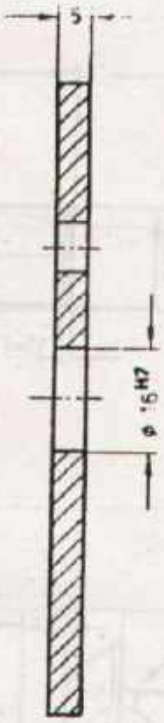
SCALE 1:1	HELICAL-GEAR WHEELS	MP/2.3/4.2.1/5
MAT CAST IRON	from 3.2.2/1a	MILLING III

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST





SEQUENCE OF OPERATION

1. Mark, drill and ream bore 16^{H7}
2. Clamp workpiece on rotary table using a centre bolt to ensure true running.

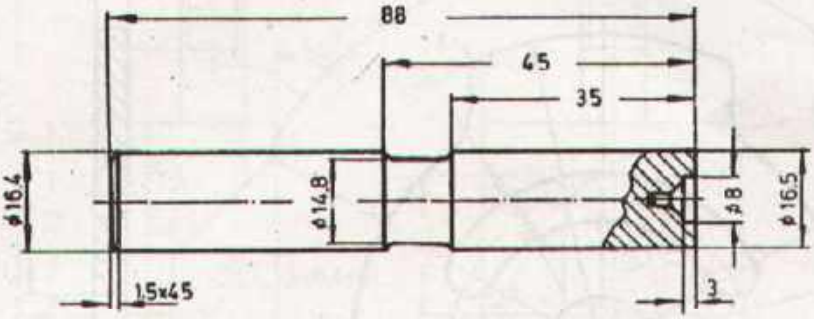
SCALE 1:1	DISK CAM	MP/2.3/4.2.1/6
MAT. MILD STEEL		MILLING III

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

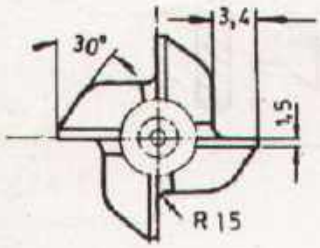
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

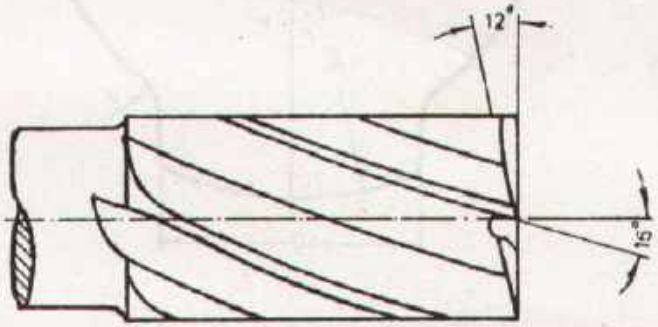
MACHINIST

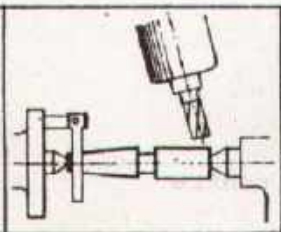
Univ: Milling



Lead 195 mm





1		INDEXING HEAD TAILSTOCK SHANK END MILL Ø 12 - 14 MM	MOUNTING OF THE INDEXING HEAD AND TAILSTOCK AS WELL AS GEARS FOR HELICAL MILLING LEAD 195 MM
2			TO GET A PROPER CLEARANCE CUT, SWIVEL THE VERTICAL HEAD TO AN ANGLE OF 18° AS SHOWN IN THE SKETCH. MILLING OF THE FLUTE AND CLEARANCE ANGLE 30°.

SCALE 1:1	STRAIGHT SHANK END MILL CUTTER	MP/2.3/4.2.1/7
MAT. H.S.STEEL		MILLING III

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

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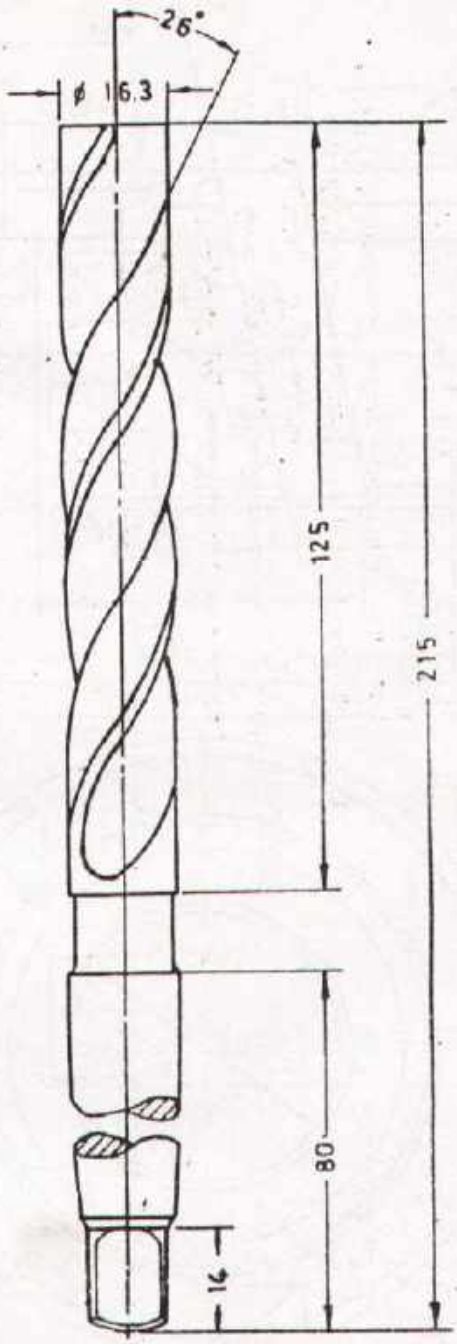
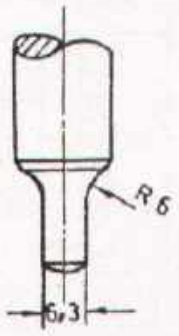
MACHINIST



Lead = 100 mm

SEQUENCE OF OPERATION

1. Clamp the workpiece in the divid. head chuck and mill the flat tang by using an end mill cutter diam. 12
2. Hold the workpiece with the taper in the divid. head and set the tailstock.
3. Set the gears for a lead of 100 mm and swivel the machine table for the helix angle of 26°.
4. To mill the helix use the special form-cutter for twist drill helixes.

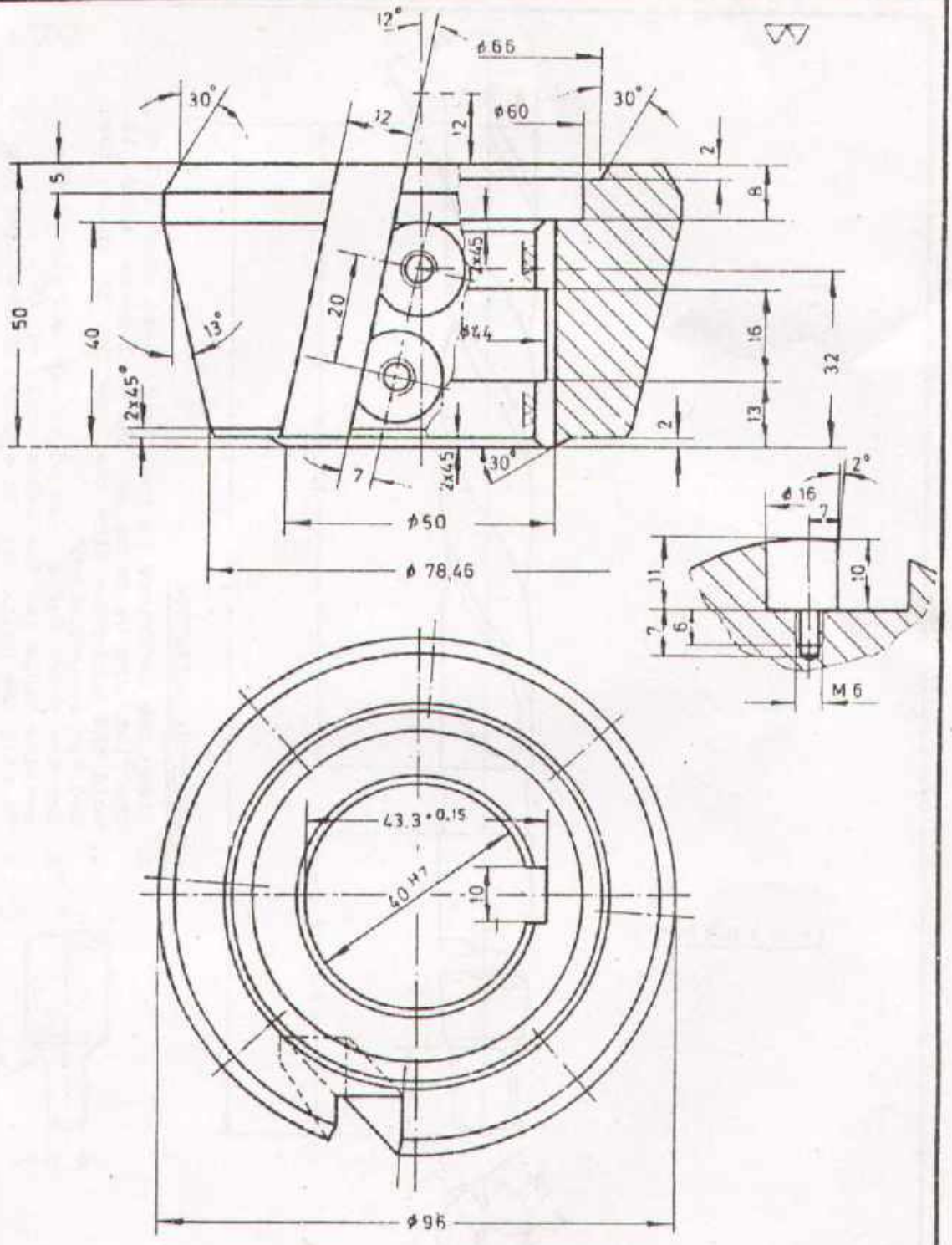


SCALE 1:1	Twist Drill	MP/2.3/4.2.1/8
MAT. H.S. STEEL		MILLING III

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

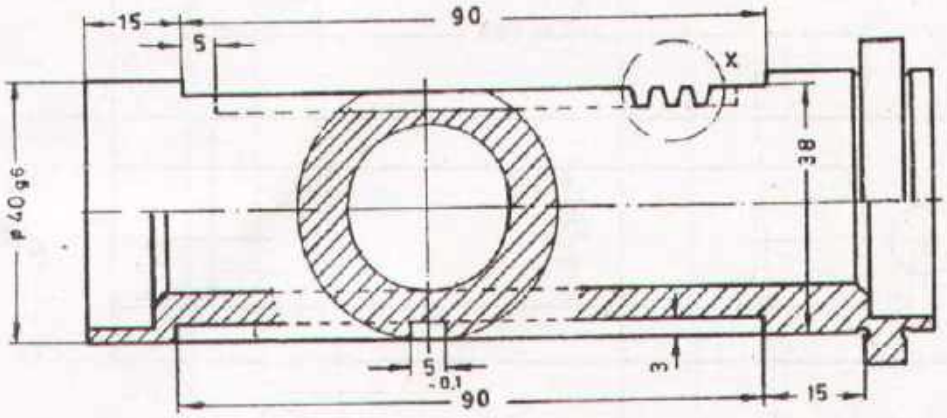


SCALE 1:1	MILLING HEAD BODY	MP/2.3/4.2.1/9
MAT: MILD STEEL	from 4.1.2/8	MILLING III

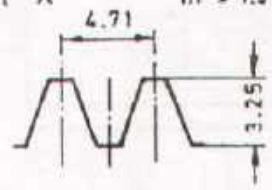
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



Detail X m = 1.5

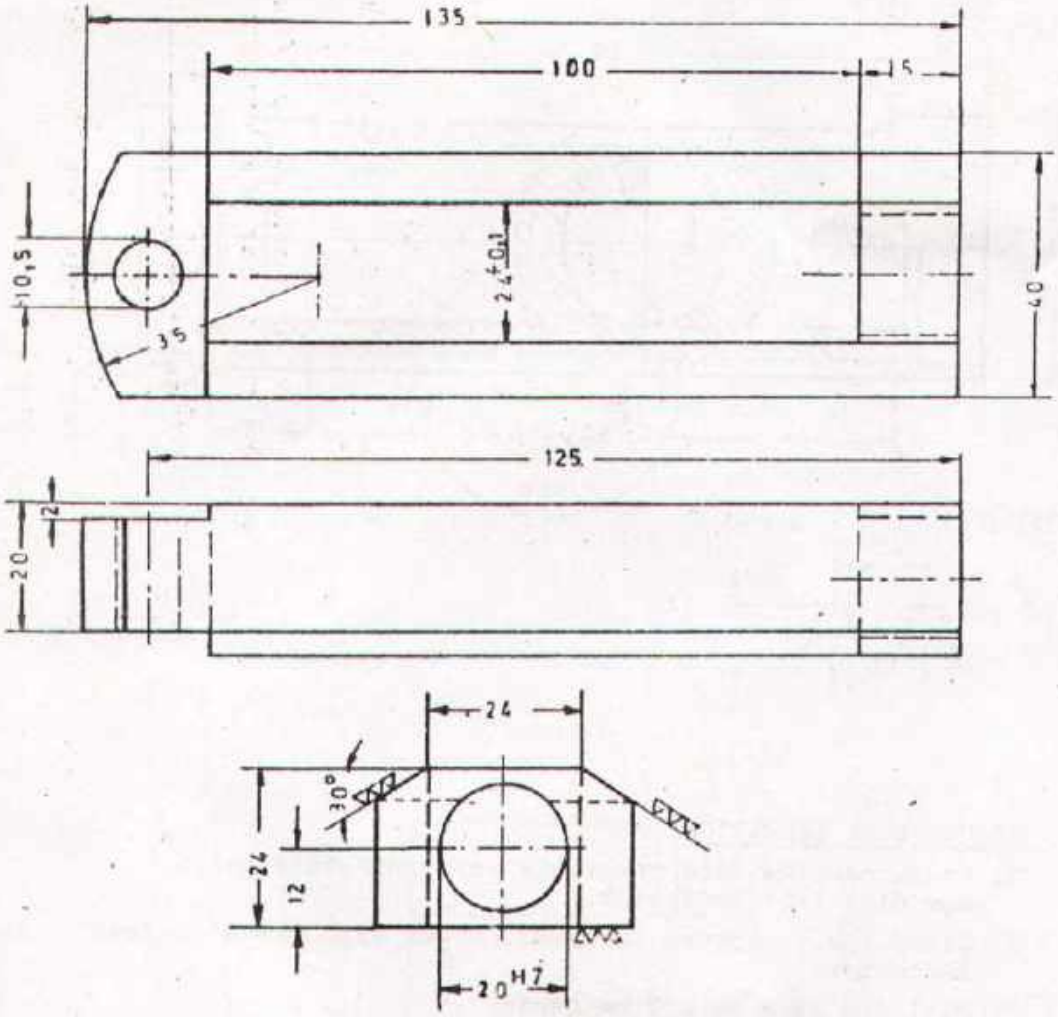


SEQUENCE OF OPERATION

1. Mount machine vice precisely at right angle using the dial test indicator.
2. Clamp the workpiece in level. Check with the dial test indicator.
3. Mill the face 90 x 2 mm depth.
4. Select the required modul cutter and mill the teeth.
5. The movement of the table according to the pitch has to be checked with the dial test indicator.
6. Set the vertical head with the two-lip end mill cutter diam. 8 to mill the keyway.
7. To get the keyway accurately opposite the rack, set the surface of the teeth on parallel pieces.

SCALE 1:1	DRILL SPINDLE SLEEVE	MP/2.3/4.2.1/10
MAT: MILD STEEL	from 3.2.2/11	MILLING III
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING PAK-GERMAN TECHNICAL TRAINING PROGRAMME		MACHINIST

▽▽(▽▽▽) Grinding



SEQUENCE OF OPERATION

1. Clamp the workpiece in the machine vice.
2. Mill the square hole 100 x 24 with the end mill cutter to a size of 98 x 23 mm.
3. Square and finish by slotting to the correct size.
4. By milling the angle of 30° consider the grinding allowance.
5. Drill and ream the hole 20^{H7}

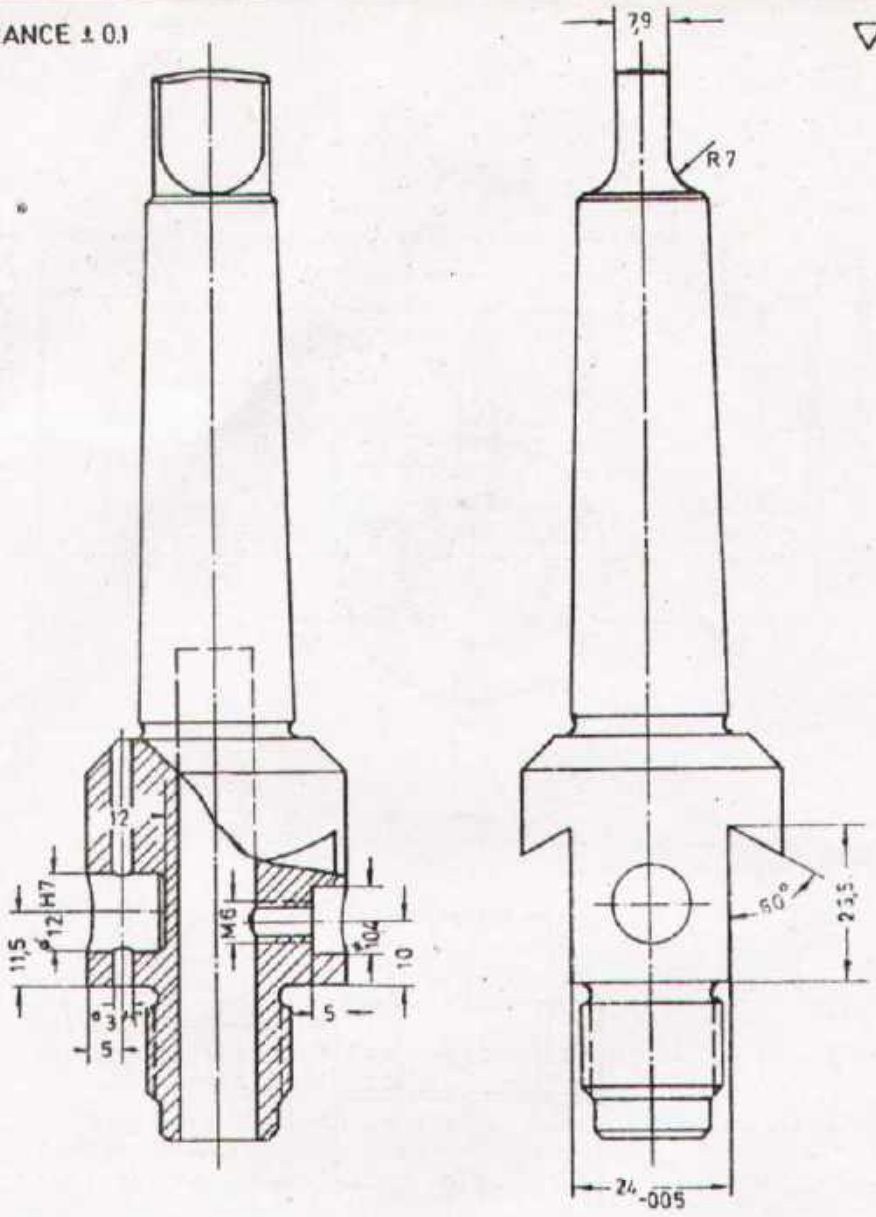
SCALE 1:1	PART OF CIRCULAR-CUTTER	MP/2.3/4.2.1/11
MAT: MILD STEEL		MILLING III

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

TOLERANCE ± 0.1



SEQUENCE OF OPERATION

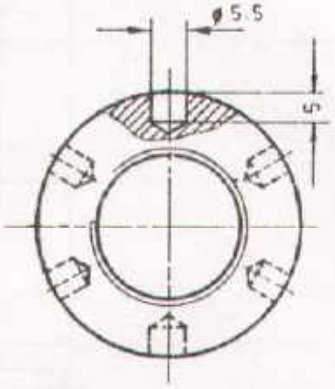
1. Hold the workpiece between centres.
2. Mill the flat tang with the shank end mill cutter diam. 14 mm.
3. Turn the workpiece and hold it with the taper Morse 3 in the dividing head.
4. Mill size 24-0.05 and angle 60 by using an angle mill. cutter.
5. The 12H7 blind hole is to be drilled to a diam. 11.5 mm. To get a straight end of the hole use a drill diam. 11.5 with the cutting lip ground straight.

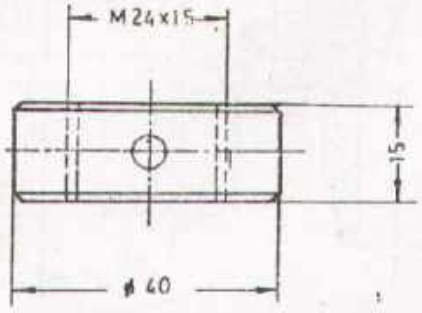
SCALE 1:1	CIRCULAR CUTTER	MP/2.3/4.2.1/11a
MAT. MILD STEEL	from 4.1.2/11	MILLING III

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST





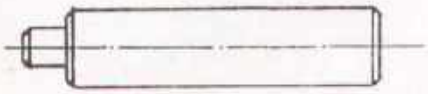
To hold the nut use part no. 1 as a mandrel.

SCALE 1:1	CIRCULAR CUTTER	MP/2.3/4.2.1/11b
MAT. MILD STEEL	from 4.1.2/11 PART NO. 2	MILLING III

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

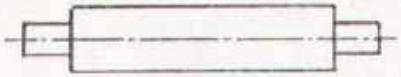
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



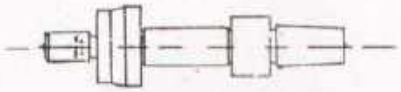
Longitudinal grinding

4.1.1/1 → 1



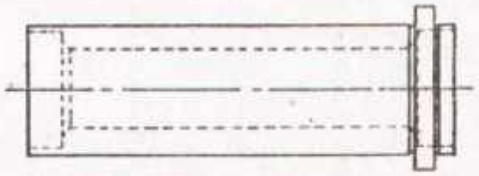
Taper grinding

3.1.1/2 → 2



Longitudinal grinding

3.2.2/5 → 3

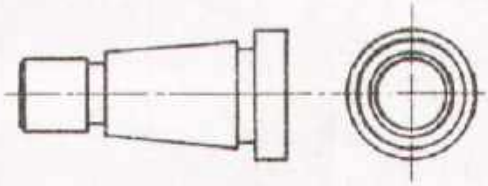


Longitudinal grinding

3.2.2/11 → 4 → 4.2.1/10

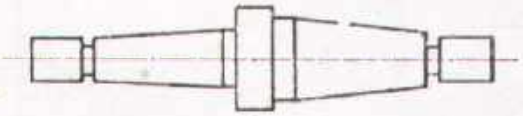
Grinding to high accuracy

3.1.1/14 → 5



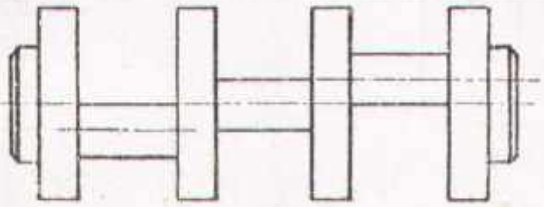
Cylindrical and taper grinding

3.1.2/6 → 6



Taper grinding

3.2.2/10 → 7



Eccentric grinding

4.1.1/10 → 8

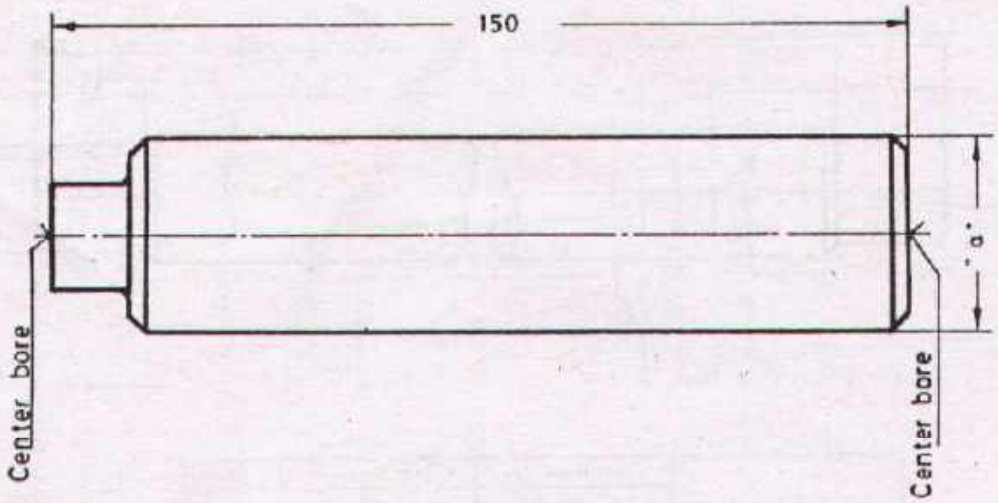
In addition to the exercises shown above, the trainees have to make parts which are needed for the training centre.

TRADE	LAYOUT	MF/2.1/4.2.2
TRAINING III		CIRCULAR GRIND.

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



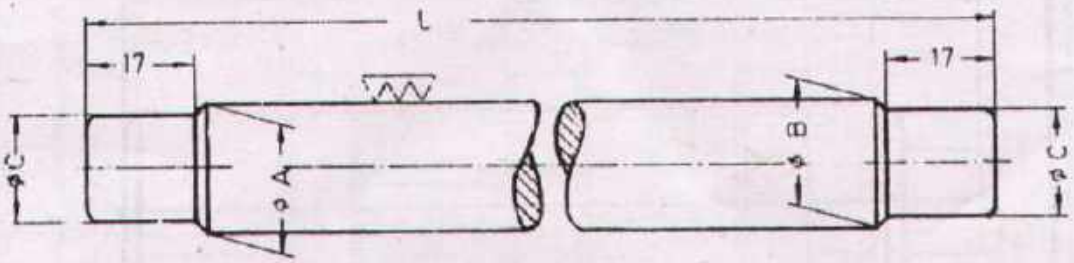
No.	1	2	3	4	5	6	7	8	9	10
"a"	⌀30 ±0,05	⌀29,8 ±0,05	⌀29,6 ±0,03	⌀29,5 ±0,03	⌀29,4 ±0,02	⌀29,3 ±0,02	⌀29,2 ±0,01	⌀29,1 ±0,01	⌀29,0 ,0,01	⌀28,9 ,0,01

CHECK THE FOLLOWING POINTS

		Marks given
1.	Ø 30.0 ± 0.05	
2.	Ø 29.8 ± 0.05	
3.	Ø 29.6 ± 0.03	
4.	Ø 29.5 ± 0.03	
5.	Ø 29.4 ± 0.02	
6.	Ø 29.3 ± 0.02	
7.	Ø 29.2 ± 0.01	
8.	Ø 29.1 ± 0.01	
9.	Ø 29.0 - 0.01	
10.	Ø 28.9 - 0.01	

The surface to'be measured must not be polished with emery cloth.

SCALE 1:1	MEASURING EXERCISE 1	MP/2.3/4.22/1
MAT. MILD STEEL	from C1.1/1	CIRCULAR GRIND.
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING PAK-GERMAN TECHNICAL TRAINING PROGRAMME		MACHINIST



	Dimension A	Dimension B	Dimension C
ø 15	15.04 +0.01	14.98 -0.01	13
ø 16	16.04 +0.01	15.98 -0.01	14
ø 17	17.04 +0.01	16.98 -0.01	14.5
ø 18	18.05 +0.01	17.98 -0.01	15
ø 19	19.05 +0.01	18.98 -0.01	16

CAUTION

Before starting the work the shaft has to be checked for true running and accuracy of size.

For clamping between centres fill up the centre hole with a lubricant.

To find the required swivelling position for the workpiece check the diameters of the mandrel after each cut till the correct ratio (difference of diameter) is obtained.

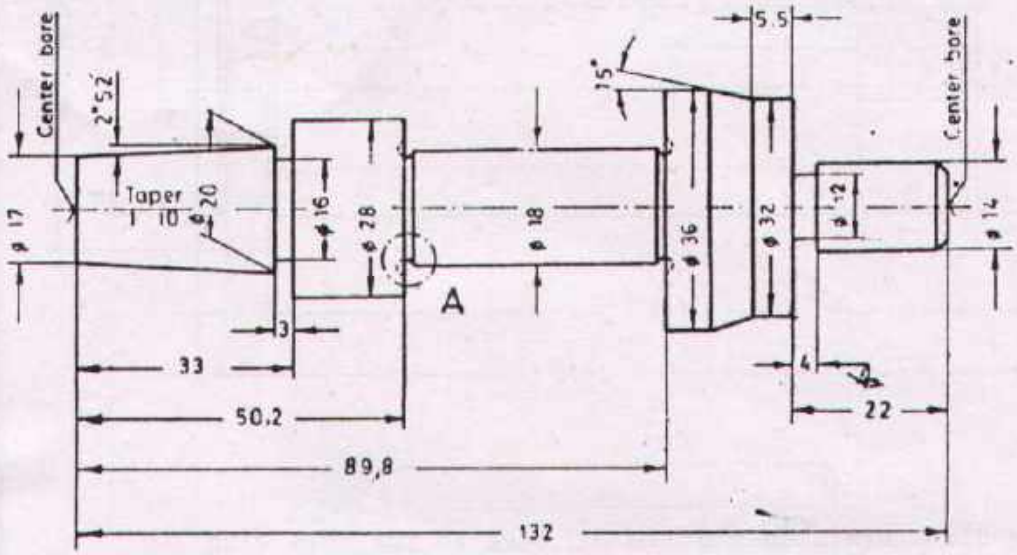
SCALE 1:1	MANDREL	MP/2.3/4.22/2
MAT. L.C STEEL	from 3.1.1/2	CIRCULAR GRIND

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

GRINDING TOLERANCE : 0,02 ▽▽▽
unless otherwise stated



SEQUENCE OF OPERATION

1. Hold between centres and check for true running.
2. Adjust the machine to the required taper angle and grind accordingly.
3. Repeat operation 2 for second taper.
4. Grind the parallel diameters to the required sizes

Caution:-

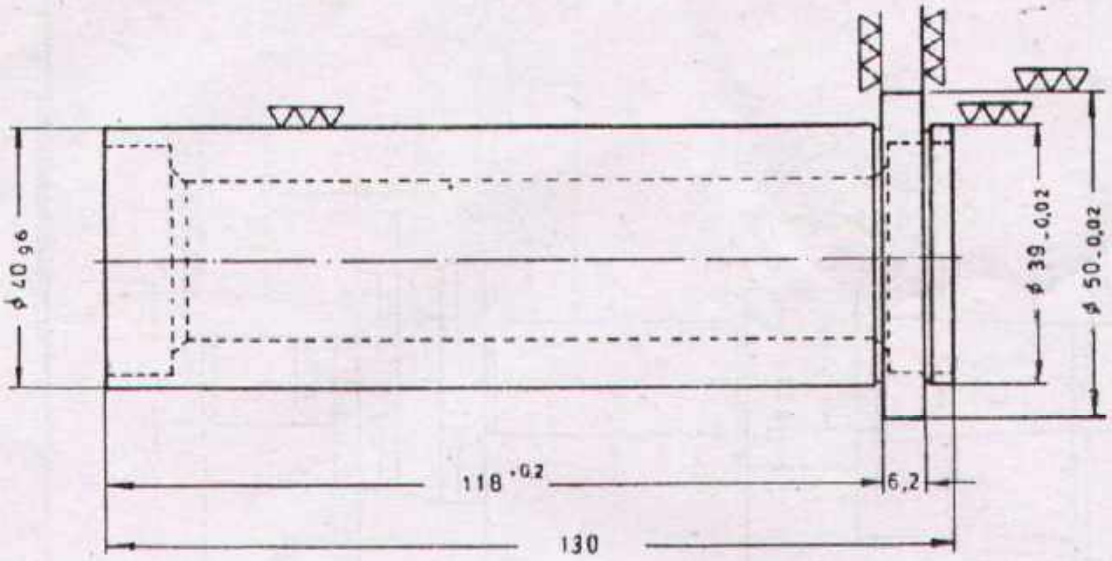
Check parallel diameters with micrometer.
Apply grease at the centre holes.

SCALE 1:1	SPINDLE WITH TAPER from 2.2.2/5	MP/2.3/4.2.2/3
MAT. MILDSTEEL		CIRCULAR GRIND.

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

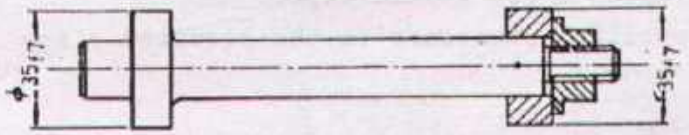
MACHINIST

TOLERANCE ±0,1 UNLESS
OTHERWISE STATED



The diameters 40g6 and 39-0.02 have to run true with the internal diameters 35H7.

Therefore hold the workpiece on a special mandrel which is centering the workpiece on these diameters.

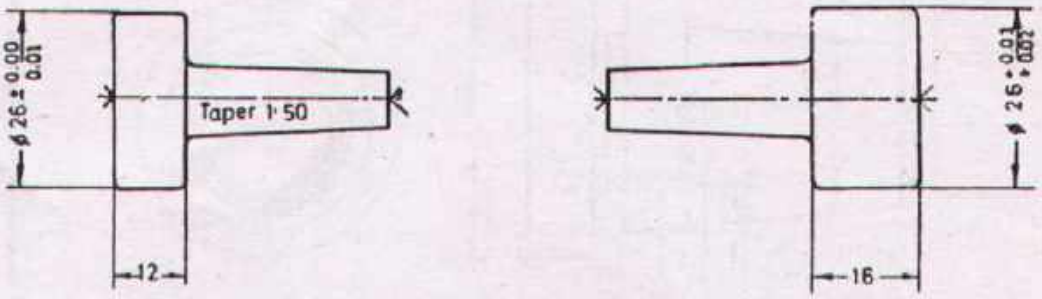


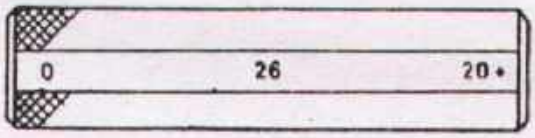
SCALE 1:1	DRILL SPINDLE SLEEVE	MP/2 3/4.2.2/4
MAT: MILD STEEL	from 3.2.2/11	CIRCULAR GRIND

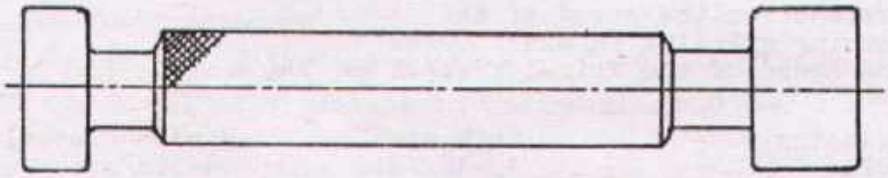
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST







Before starting the work, dress the grinding wheel and check if the machine grinds cylindrically.

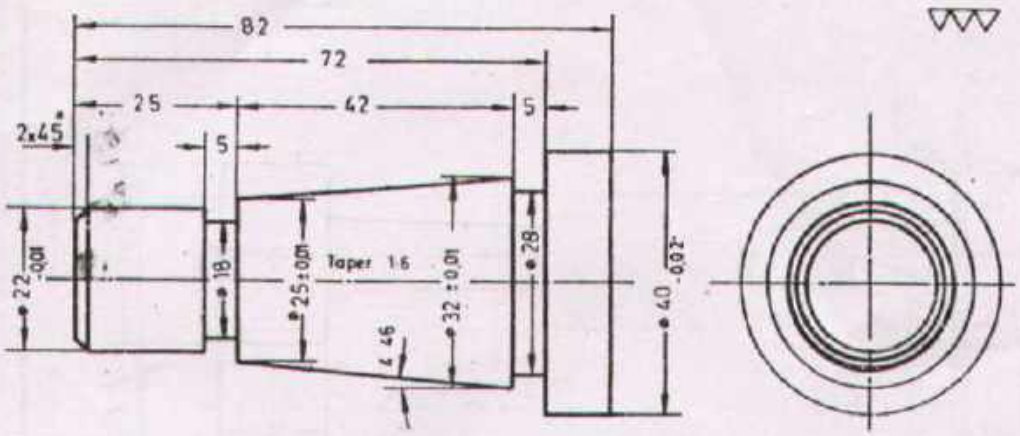
Check the accuracy of the micrometer with the slip gauges before measuring the workpiece.

SCALE 1·1	PLUG GUAGE	MP/2.3/4.2.2/5
MAT. H.C. STEEL	from 3.1.1/14	CIRCULAR GRIND

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



Chuck the workpiece between centres.
Select the "r.p.m" of the workpiece.
Grind the diameters 40-0,02 and 22-0,01
For grinding the taper swivel the upper-table
of the machine to 4°46' (setting-angle).
To check the taper use a taper gauge.

Reference values for the speed of the
workpiece during grinding (m/min), based
on a cutting speed of the grinding wheel of 30m/s.

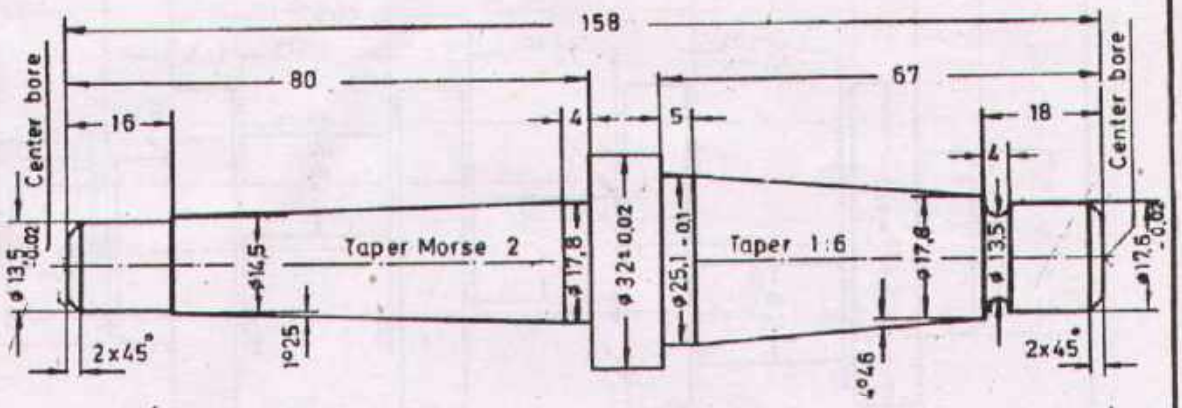
	Soft steel	Hardened steel
External grinding		
Rough grinding	12-18m/min	14-18m/min
Finish grinding	10-14m/min	10-12m/min

SCALE 1:1	SHANK SCREW WITH TAPER	MP/2.3/4.2.2/6
MAT. MILD STEEL	from 3.1.2/6	CIRCULAR GRIND

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

FOR ALL DIMENSIONS ±0.1
UNLESS OTHERWISE STATED



SEQUENCE OF OPERATION

1. Hold the workpiece between centres.
2. Select the r.p.m. of the workpiece.
3. Grind the cyl. diameters.
4. Grind the taper after swivelling the upper table to the respective setting angles.
5. Check the tapers with the taper gauges.

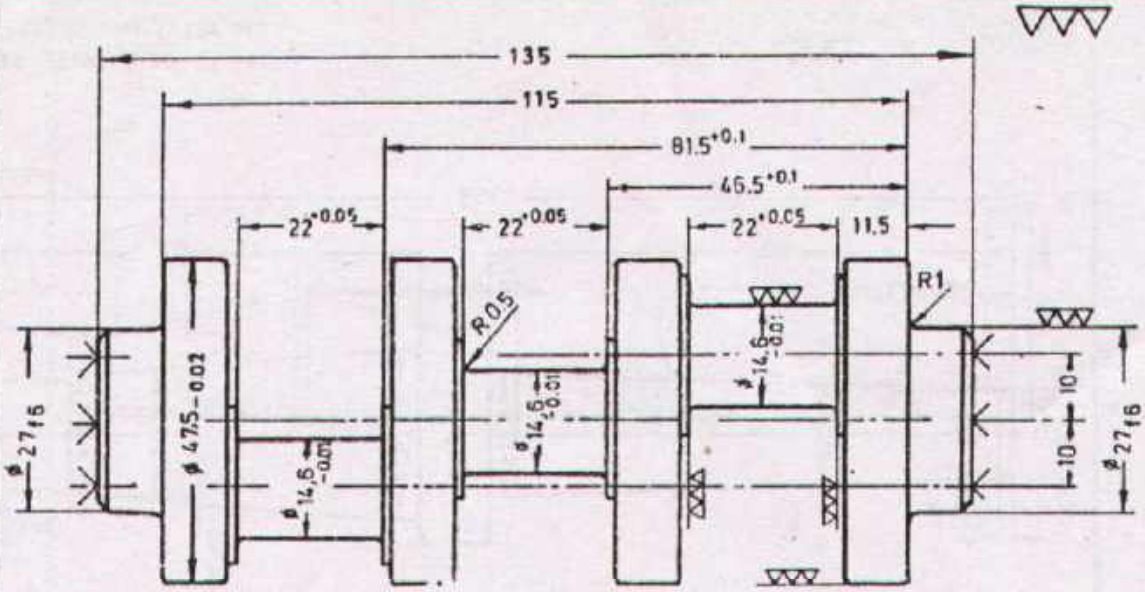
ATTENTION

Specially when grinding long pieces of comparatively small diameters, full attention is to be given to proper cooling by cutting compound. Otherwise the workpiece might be overheated which often results in its deformation.

SCALE 1:1	THREADED BOLT WITH TAPER	MP/2.3/4.2.2/7
MAT. MILD STEEL	from 3.2.2/8	CIRCULAR GRIND.

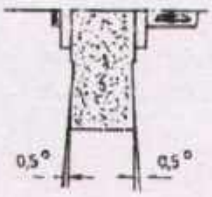
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



SEQUENCE OF OPERATION

1. Clamp the workpiece between centres.
   Make sure centreholes are greased.
2. Select the r.p.m. for the workpiece, grind the diameters $47.5_{-0.02}$ and 27_{f6}.
3. Before grinding the diameters $14.6_{-0.01}$ make sure, to dress the grinding wheel according to the given sketch, as you have to grind the shoulders as well.



To grind the big end diameters $14.6_{-0.01}$ clamp in accordance with their centres.

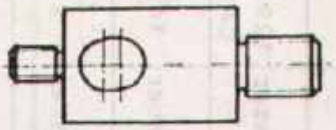
Check the distance $22^{+0.05}$ between the shoulders with a slip gauge.

SCALE 1:1	CRANK SHAFT	MP/2.3/4.2.2/8
MAT: MILD STEEL	from 4.1.1/10	CIRCULAR GRIND

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

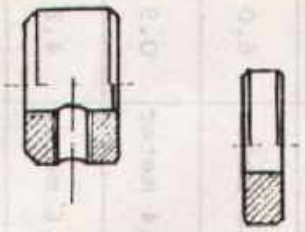
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST



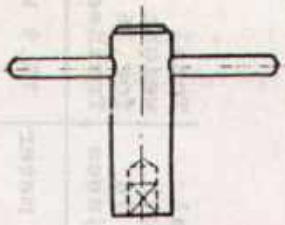
Longitudinal turning

1 → 12



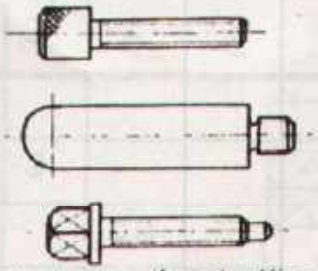
Facing, drilling, thread cutting

2 → 12



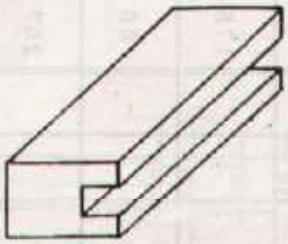
Longitudinal turning

3 → 12



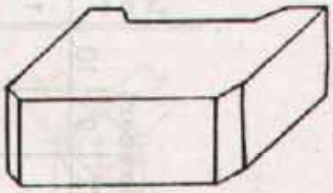
Step turning, thread cutting

4/4a → 12



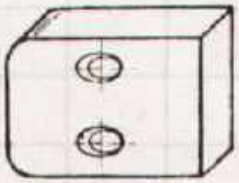
Parallel and square shaping

5 → 11



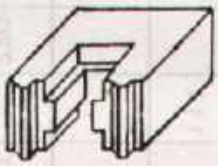
Parallel and recess shaping

6 → 8



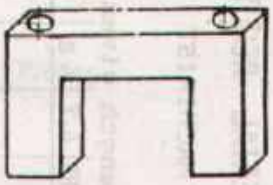
Square shaping

7 → 12



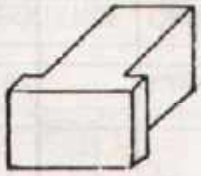
Form milling

6 → 8 → 12



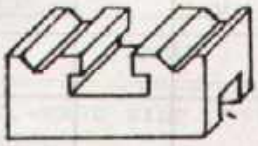
Recess milling

9 → 12



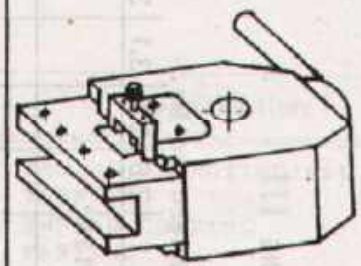
T-Form milling

10 → 12



V-Groove and T-Slot milling

5 → 11 → 12



Assembling

12

TRADE TRAINING III	LAYOUT WORK SHOP PROJECT	MP/ 2.1/4. 2. 3 TOOLPOST
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING PAK-GERMAN TECHNICAL TRAINING PROGRAMME		MACHINIST

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

TRADE TRAINING III

MATERIAL REQUIRED

MACHINIST

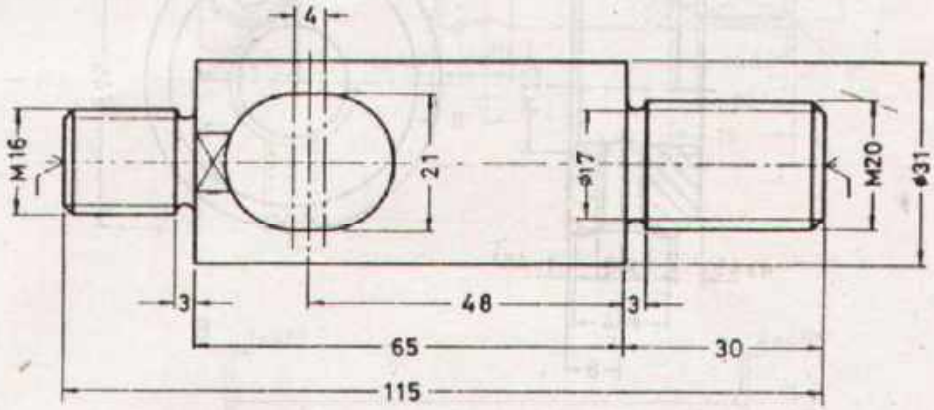
WORKSHOP PROJECT

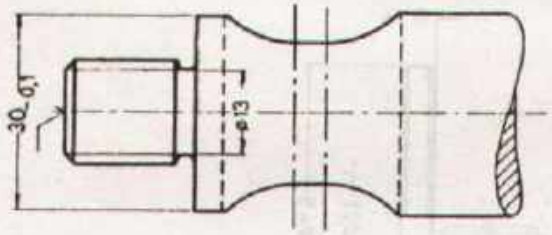
No. 4.2.3/1 to 10

	Exercise No. (Length given in Millimeter)														Length per Trainee	Total length for 16 Trainees	Total weight for 16 Trainees
	1	2,6	2.5	3,1	3,2	4,9	4,10	4,7	4a	5	6	7	9	10			
M.S.Round Ø 35 mm (1 3/8" DIA)	126														126 mm	2.1 meter	15.9 kg
M.S.Round Ø 50 mm (2" DIA)		26	10											72	108 mm	1.8 meter	27.5 kg
M.S.Round Ø 18 mm (3/4" DIA)				62				114							176 mm	3.0 meter	6.0 kg
M.S.Round Ø 10 mm (3/8" DIA)					86										86 mm	1.4 meter	0.9 kg
M.S.Round Ø 13 mm (1/2" DIA)						56	11		220						287 mm	4.6 meter	4.8 kg
M.S.Squ. 50x50 mm (2" squ.)										116					116 mm	1.9 meter	37.7 kg
Cast Iron 68x130mm (2 3/4" x 5 1/4") FLAT											118				118 mm	1.9 meter	129.7 kg "CASTING"
M.S.Flat 18 x 50 mm (3/4" x 2")												61 61			122 mm	2.0 meter	14.2 kg
M.S.Flat 15 x 22 mm (5/8" x 7/8")													61		61 mm	1.0 meter	2.6 kg

4 ▽▽

Tolerance ± 0,1mm
unless otherwise stated





The hole 21 x 25 mm has to be made during assembling.

Check the threads with the Thread ring gauges.

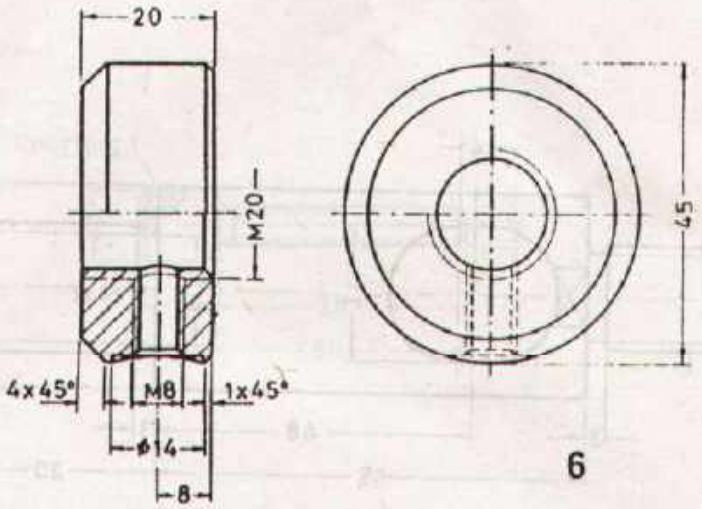
SCALE 1:1	SPINDLE (For tool post)	MP12.3/4.2.3/1
MAT.: MILD STEEL		WORKSHOP PROJECTS

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

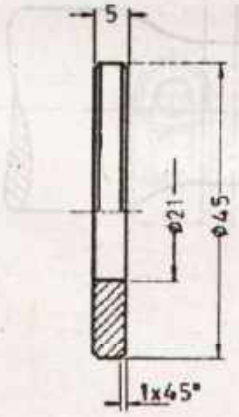
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

Tolerance ± 0,1 mm
unless otherwise stated



6



5

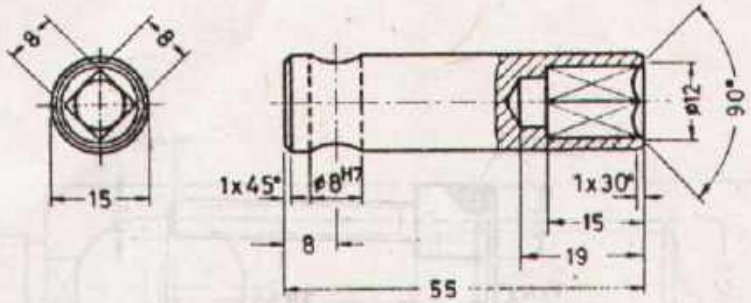
Make sure that the faces of part 6 are at right angles to the thread.
The thread hole M8 has to be made during assembling.

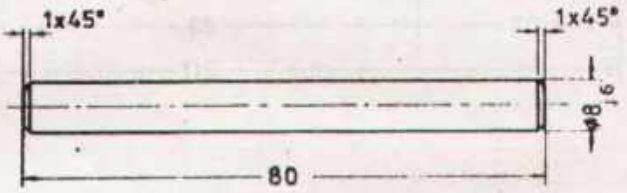
SCALE 1:1	NUT & WASHER (For tool post)	MPV 23/423/2
MAT. MILD STEEL		WORKSHOP PROJECTS

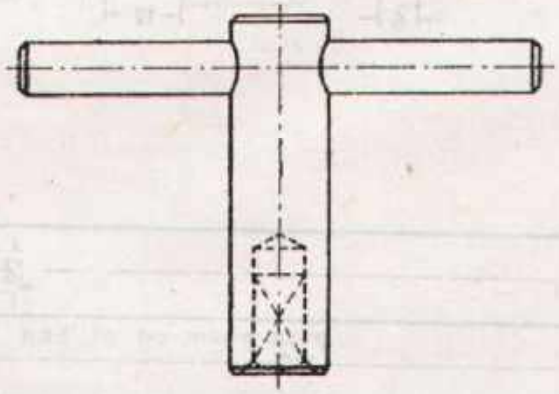
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

Tolerance ± 0,1 mm
unless otherwise stated







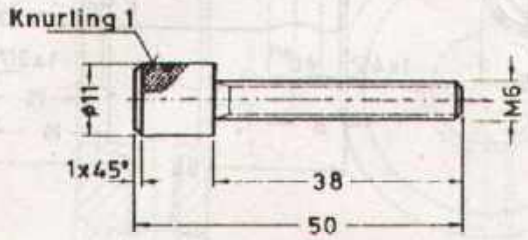
$8^{H7} = {}^{+0,015}_{0}$	
$8_{j6} = {}^{+0,007}_{-0,002}$	

SCALE 1:1	SPANNER (For tool post)	MP/ 2.3/4.2.3/3
MAT. MILD STEEL		WORKSHOP PROJECTS

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING
PAN-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

Tolerance ± 0,1 mm
unless otherwise stated.



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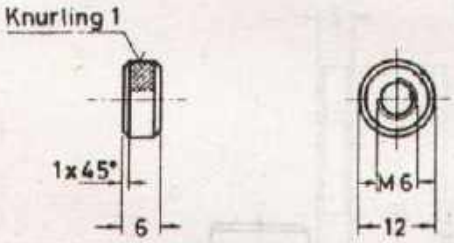

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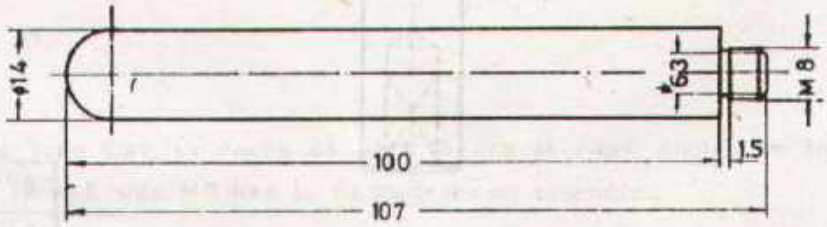


7

SCALE 1:1	ADJUSTING SCREW & LEVER (For tool post)	MP/2.3/4 2.3/4
MAT. MILD STEEL		WORKSHOP PROJECTS

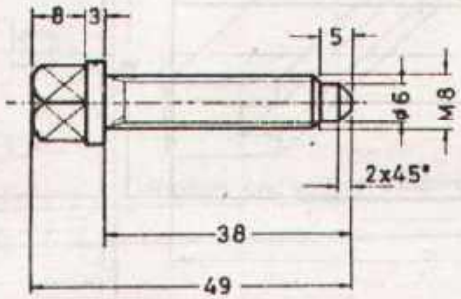
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

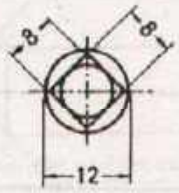
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

12 ▽▽

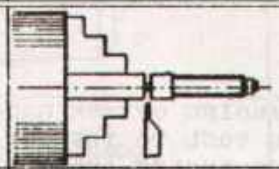
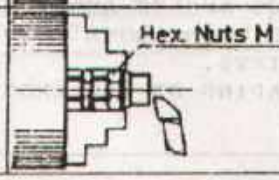
Tolerance ± 0,1 mm
unless otherwise stated





4 Pieces

SEQUENCE OF OPERATIONS

No.	Symbol	Tools	Description
1		R.-HAND SIDE CUTTING TOOL R.-HAND ROUGHING TOOL DIE M8 PARTING TOOL	FACING, LONGITUDINAL TURNING, THREAD CUTTING PARTING
2		TWO HEX. NUTS M8 RIGHT-HAND SIDE CUTTING TOOL	CLAMPING THE THREADED PART IN 3-JAW CHUCK BY THE HELP OF 2 HEX.NUTS. FACING TO LENGTH AND STEP TURNING.

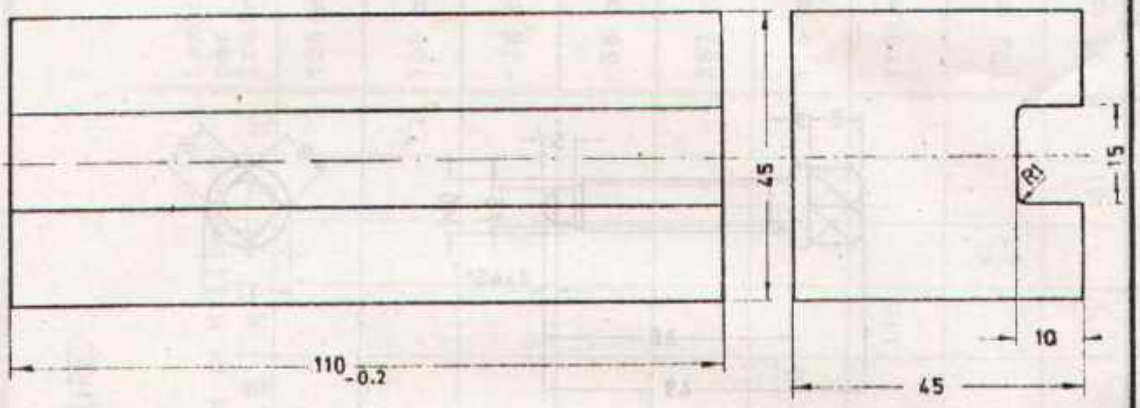
SCALE 1 : 1	CLAMPING BOLT (For tool post)	MP/23/4.23/4a
MAT. MILD STEEL		WORSHOP PROJECTS

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

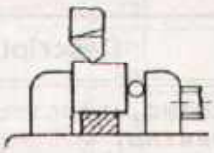
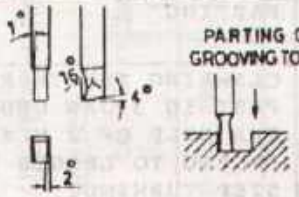
MACHINIST

2 ▽▽

Tolerance ± 0.1
unless otherwise stated.



SEQUENCE OF OPERATIONS

No	Symbol	Tools	Description
1		STRAIGHT LEFT-HAND ROUGHING AND FINISHING TOOL	SHAPING TO THE DIMENSION 45 x 45 AND LENGTH 110
2		GROOVING TOOL GRINDING GAUGE	GRINDING OF THE GROOVING TOOL TO THE CORRECT ANGLES AND 1 MM RADIUS ON BOTH CUTTING POINTS. SHAPING OF THE GROOVE.

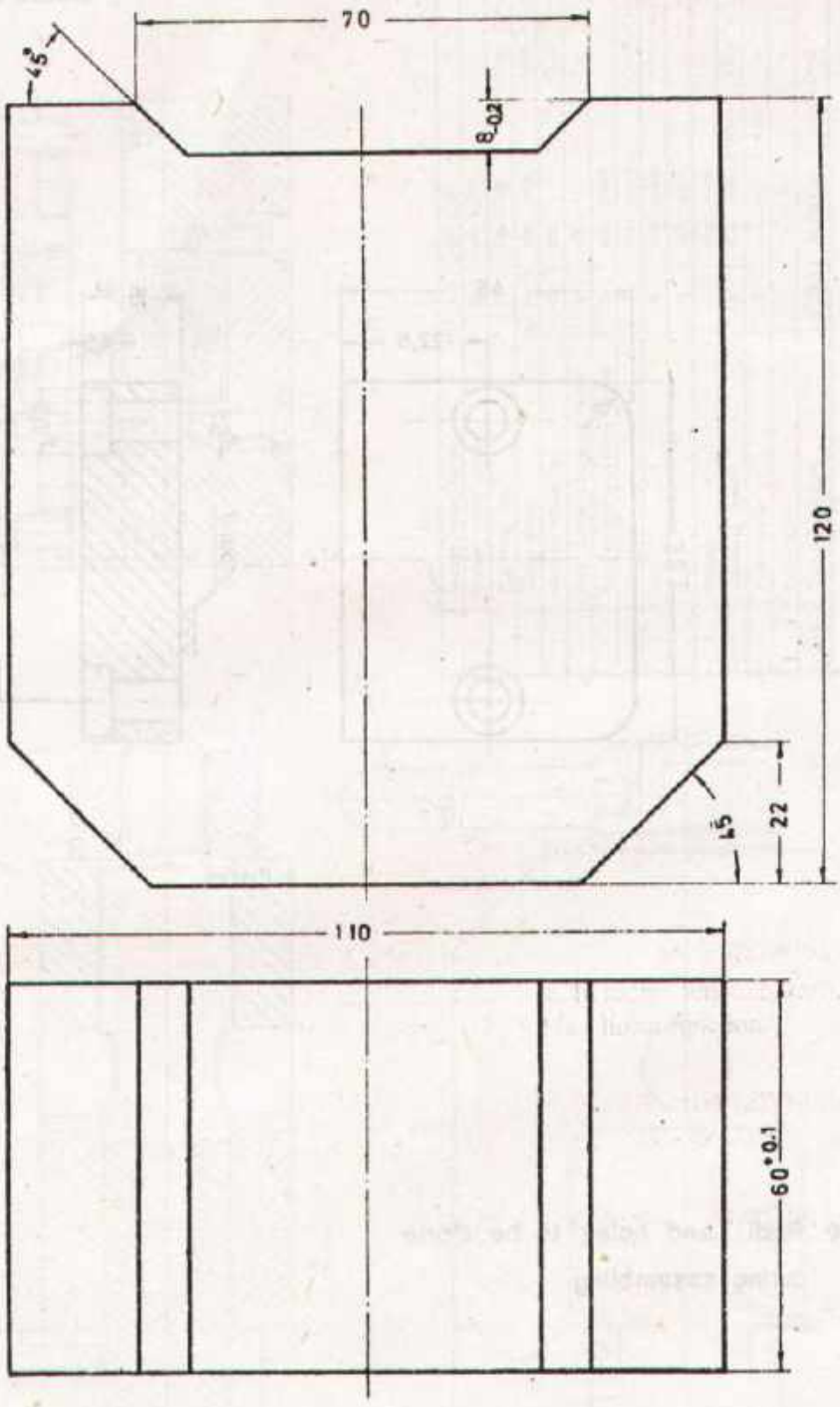
SCALE 1:1	TOOL HOLDER (For tool post)	MP/23/423/5
MAT: MILD STEEL		WORKSHOP PROJECTS

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

1 ▽

Tolerance ± 0.1
unless otherwise stated.



SCALE 1:1	BASE PLATE (For tool post)	MP/23/4.2.3/6
MAT: CAST IRON		WORKSHP PROJECTS

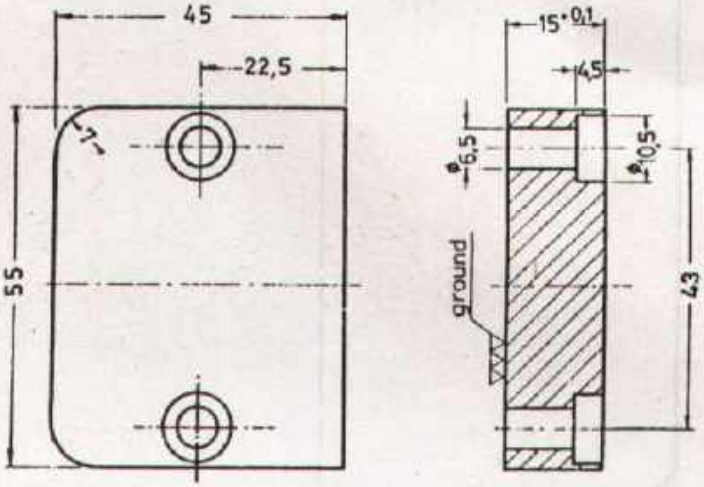
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

11 ▽ (▽▽ ground)

Tolerance ± 0,1mm
unless otherwise stated



2 Pieces

Note: Radii and holes to be done during assembling

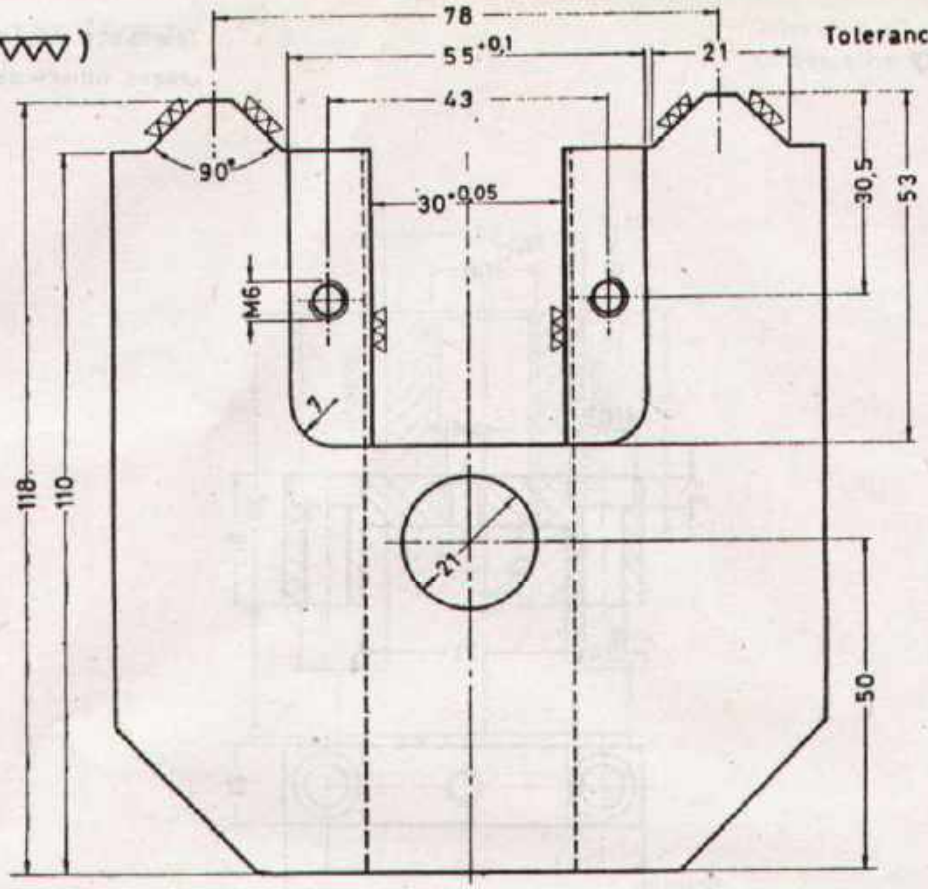
SCALE 1:1	GUIDE PLATE (For tool post)	MP/2.3/4.2.3/7
MAT. MILD STEEL		WORKSHOP PROJECTS

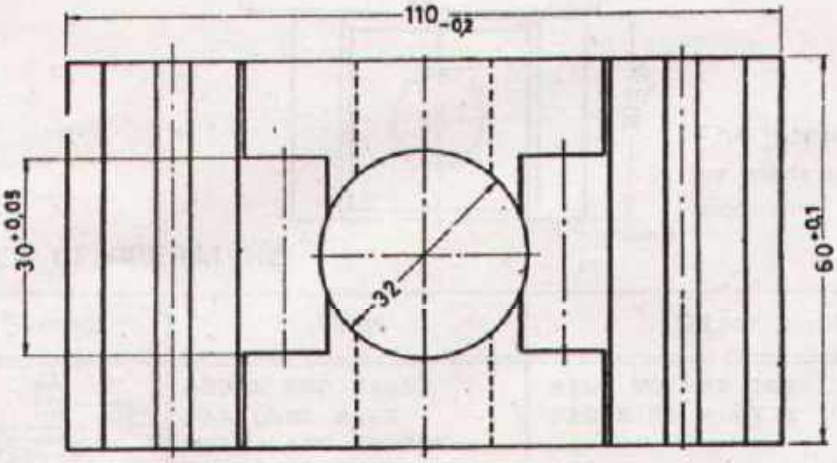
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

1 ▽ (▽▽)

Tolerance ± 0,1mm





Holes and threads have to be done during assembling.

SCALE 1:1	BASE PLATE (For tool post)	MP/23/423/8
MAT. CAST IRON	from Ex.6	WORKSHOP PROJECTS

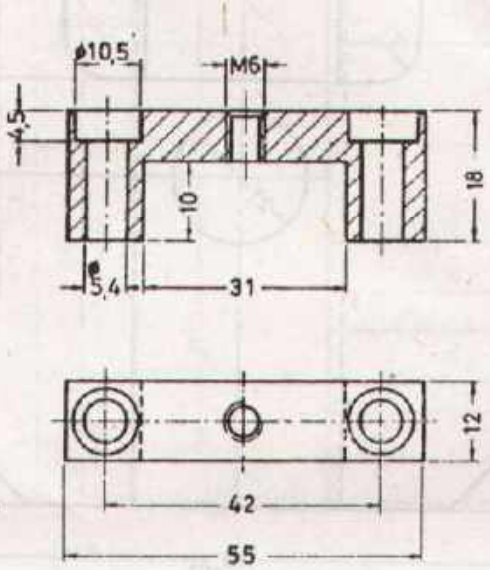
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

8 ▽▽

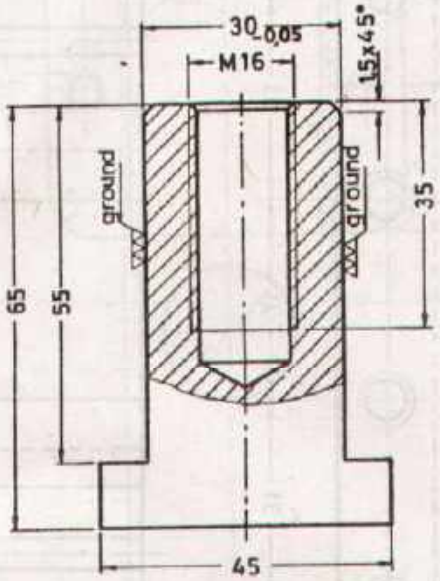
Tolerance ± 0,1mm
unless otherwise stated

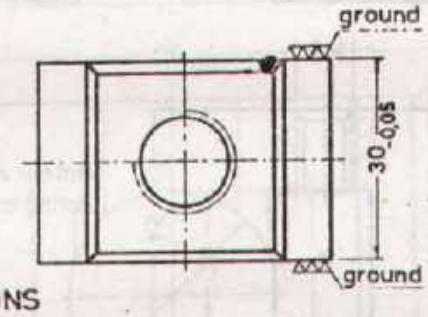


SCALE 1:1 MAT. MILD STEEL	TOOL HOLDER ADJUSTING BRIDGE (For tool post)	MP/23/4 23/9 WORKSHOP PROJECTS
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING PAK-GERMAN TECHNICAL TRAINING PROGRAMME		MACHINIST

3 $\sqrt{}$ ($\sqrt{}^{\text{ground}}$)

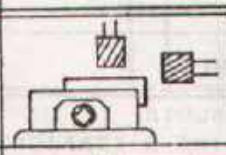
Tolerance ±0,1mm
unless otherwise stated





The thread hole will be made during assembling

SEQUENCE OF OPERATIONS

No.	Symbol	Tools	Descriptions
1		SHELL END MILL PARALLEL BARS MEASURING INSTRUMENTS	MILL TO THE OUTSIDE DIMENSIONS 65 x 45 x 30.4
2			RECLAMP AND MILL THE STEP MIND THE GRINDING ALLOWANCE

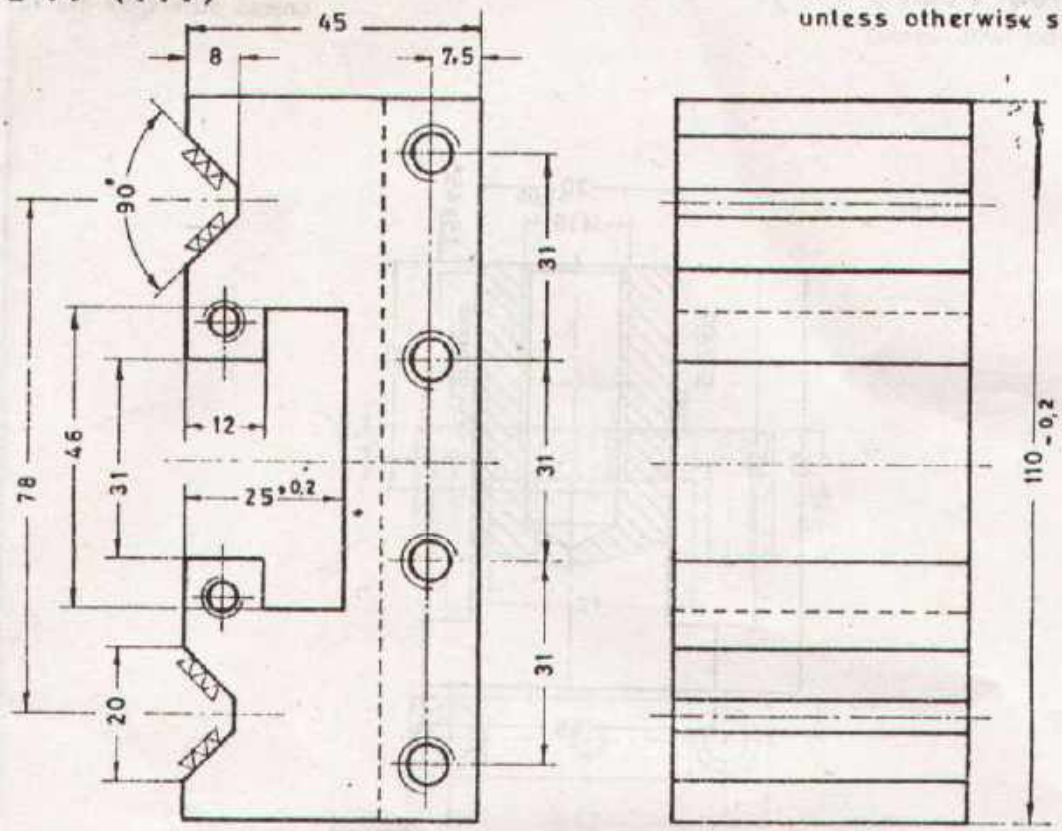
SCALE 1:1	CLAMPING PIECE (For tool post)	MP/2.3/4.2.3/10
MAT. MILD STEEL		WORKSHOP PROJECTS

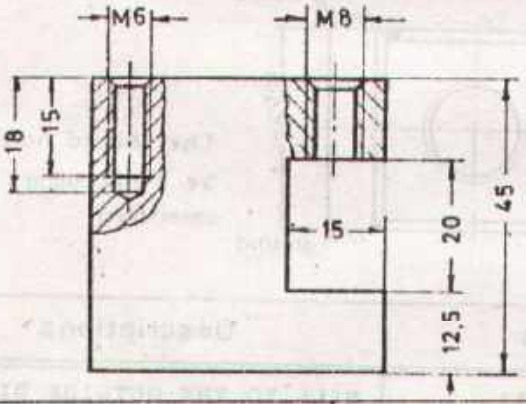
DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST

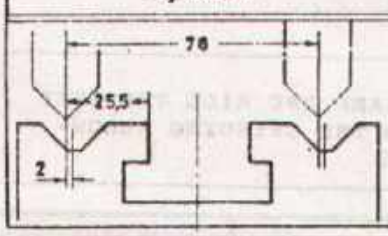
2 ▽ (▽▽)

Tolerance ±0,1
unless otherwise stated





Holes and threads have to be done during assembling

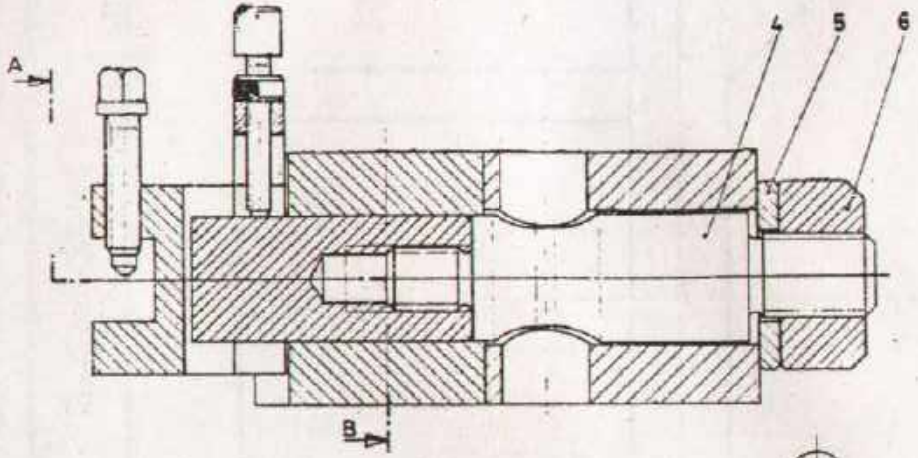
Symbol	Description
	MARKING OF THE T- AND V-SLOTS. MILLING OF T-SLOT, BY USING A STRAIGHT SIDE AND T-SLOT MILLING CUTTER, MOUNTING A 90° DOUBLE ANGLE CUTTER. MILLING OF THE V-SLOTS AS SHOWN IN THE SKETCH. MILLING OF THE SLOT 15 x 20 MM.

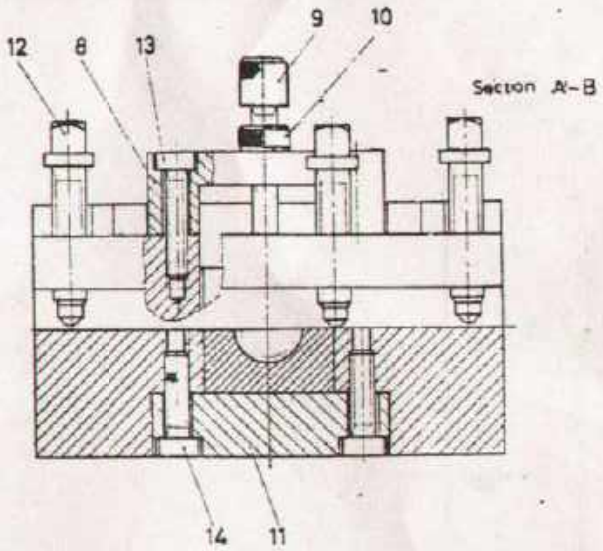
SCALE 1:1	TOOL HOLDER	MP/ 2.3/4 2.3/11
MAT. MILD STEEL	from Ex. 5 (For tool post)	WORKSHOP PROJECTS

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

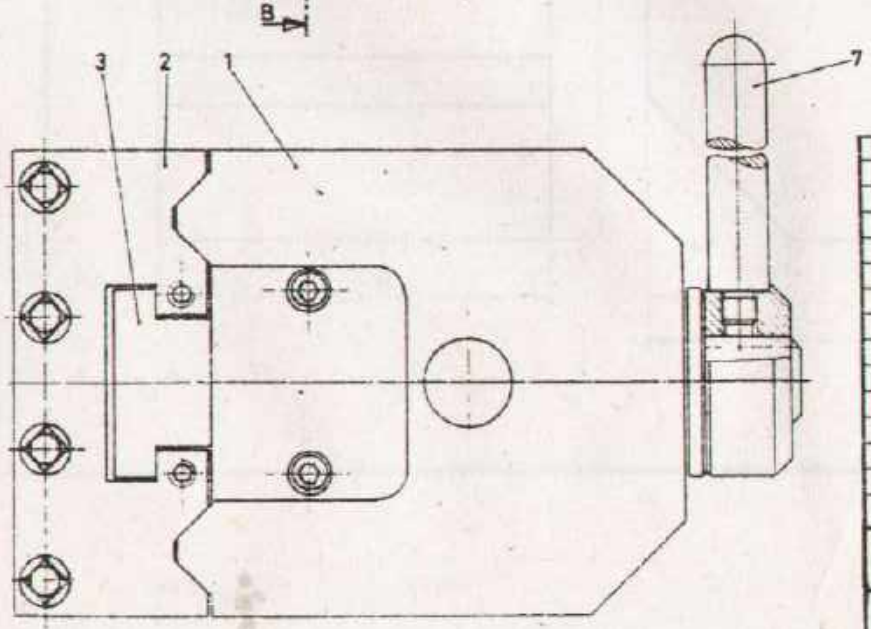
PAK-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST





Section A–B



Qty.	Denomination	P.No.	Material / Remarks	
4	Socket head screw	14	M5 x 25	
2	Socket head screw	13	M6 x 20	
4	Clamping bolt	12	M8 x 38	From Turning
2	Guide plates	11	Mild steel	From Shaping
1	Knurled chuck nut	10	M6	From Turning
1	Tool holder adjusting screw	9	M6 x 38	〃 〃
1	Tool holder adjusting bridge	8	Mild steel	
1	Lever	7	Mild steel	From Turning
1	Nut	6	Mild steel	From Turning
1	Washer	5	Mild steel	〃 〃
1	Spindle	4	Mild steel	〃 〃
1	Clamping piece	3	Low carbon steel	From Milling
1	Tool holder	2	Low carbon steel	〃 〃
1	Base plate	1	Cast iron	〃 〃

TOOL POST

Mp/2.3/4.2.3/12
ASSEMBLING

DEVELOPMENT CELL FOR SKILLED LABOUR TRAINING

INDO-GERMAN TECHNICAL TRAINING PROGRAMME

MACHINIST