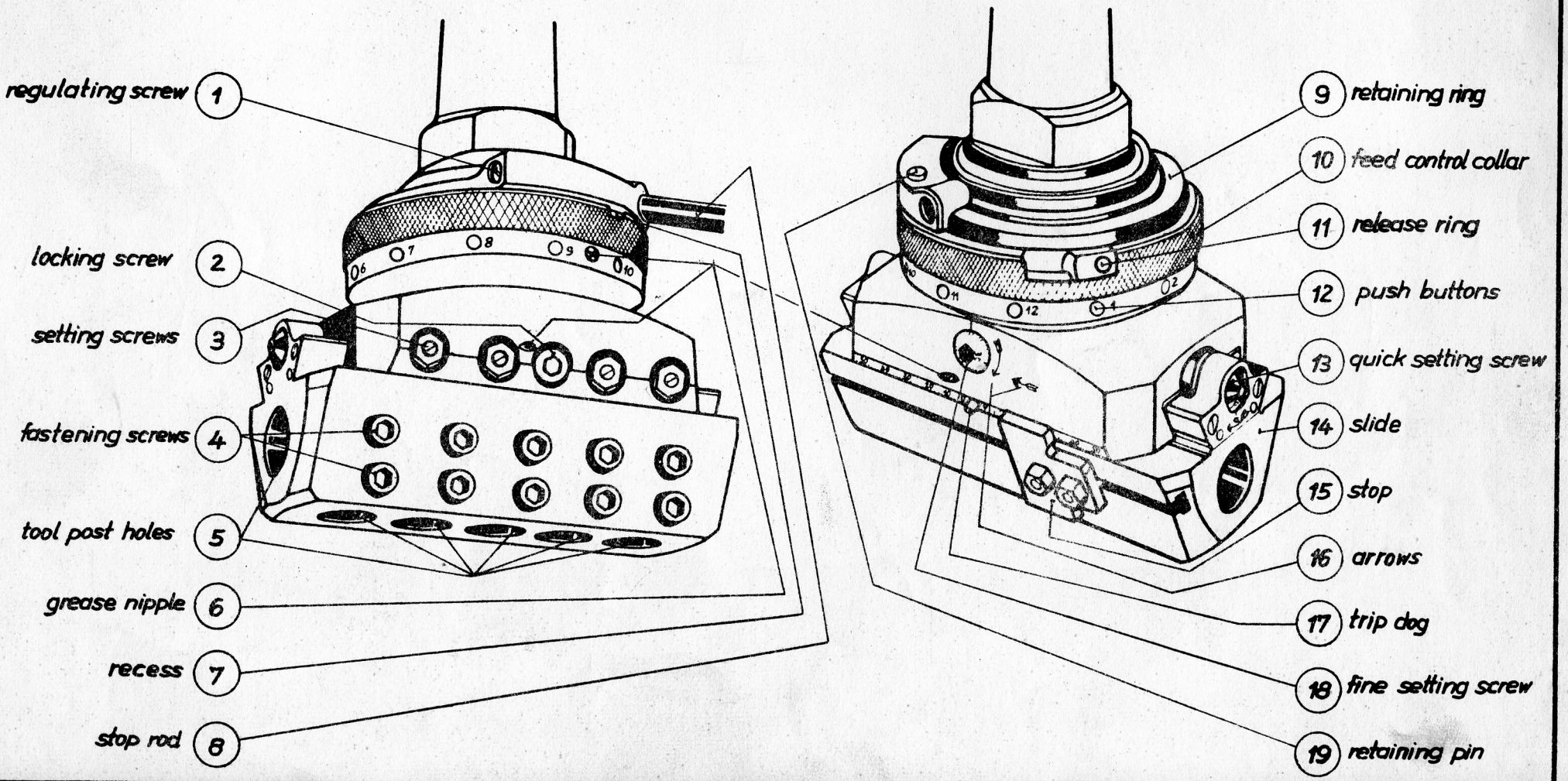
Illustration pertaining to Operating Instructions for "WOHLHAUPTER" Universal Facing and Boring Heads UPA 4, UPA 4-s5, UPA 5, UPA 5-s6, UPA 6, UPA 6-s7.



C o n t e n t s

of Operating Instructions for WOHLHAUPTER Facing and Boring Heads UPA 4 to UPA 6-S 7

Operating Instructions
for
"WOHLHAUPTER" Universal Boring and Facing Heads
Models UPA 4, UPA 4-S5, UPA 5, UPA 5-S6, UPA 6 and UPA 6-S 7
with 12 self-acting slide feeds
automatic end release
and rapid return by hand.

A. Purpose: With the aid of WOHLHAUPTER MASTERHEADS it has become possible to carry out operations such as facing, boring, turning, recessing, undercutting, forming and - provided the machines are equipped with lead screws - even threading. If the cross feed of the head is combined with a suitable axial feed of the machine, it is even possible to carry out taper turning or taper threading; in both cases the taper angle depends on the available feeds.

Thanks to this versatility, the range of applications of boring mills, radial drills, lathes, milling machines, jig borers, transfer units and other machine tools can be greatly increased by using our Universal Boring and Facing Heads.

B. The mounting of the Head must be carried out very carefully. The shank of the head is inserted into the machine spindle and secured with a cotter pin, draw-in rod or cap nut against the possibility of falling out.

C. Max. admissible speeds:

UPA 4 to UPA 5-S6	700 rpm
UPA 6 to UPA 6-S7	600 rpm

D. Lubrication: We recommend lubricating the head by means of a ball bearing grease of medium consistency, the dropping point being near to 200° Cel. (ESSO make Beacon M 200, SHELL Alvania grease 3 or other brands of similar quality). Drive and dovetail joint are greased through grease nipple (6) on the feed control collar (10) as well as through the two nipples (6) on the body of the head. Needless to add, proper lubrication is of utmost importance.

NOTE: Millimeter-values in brackets are not a conversion of the inch-values, but apply to heads with metric graduation.

I. Turning Inside and Outside Diameters

(cf. Annexe 1 in front)

Cylindrical turning is performed without engaging the cross feed; accordingly, do not hold feed control collar (10) during rotation of the head. None of the 12feed buttons must be pushed in so as not to block the fine-setting screw. For release of the push buttons refer to Section II f.

a) To adjust the quick-setting screw of slide (14) push T-handle wrench firmly, i.e.approx. 1/2" (12 mm) into the hole provided at the dial side of the screw, thus releasing the screw locked by index pin at either of the positions 0,2 or 4; Thereupon, relock quick-setting screw (13) proceeding as follows

Withdraw T-handle wrench by about 5/16" (8 mm) before turning the screw up to the following number.

Adjustment of the quick-setting screw may be impeded by long boring bars; in that case, use wrench extension on models UPA 4 to UPA 5-S6, whilst proceeding in the manner described below when dealing with models UPA 6 to UPA 6-S7:

push hexagonal bolt full length into opening at the dial end of the quick-setting screw (13) and, thereupon, adjust screw from opposite end with the aid of T-handle wrench. By turning quick - setting screw (13) in direction of arrow, movement of slide (14) will likewise follow the arrow, and vice versa in case of rotation in the opposite sense.

1 graduation of quick setting screw (13) corresponds to a slide feed of .04" = .08" in dia. (1 mm = 2 mm in dia.)

1 revolution of quick setting screw corresponds to a slide feed of .12" = .24" in dia. (3 mm = 6 mm in dia.)

b) For setting of slide (14) true to diameter adjust fine setting screw (18) with the aid of the T-handle wrench. Turning in direction of arrow results in analogous adjustment of the slide (14) or vice versa. With any model of the UPA 4 to UPA 6-S7 range supplied with standard feeds of from .0008" to .0096" (0.02 to 0.24 mm) corresponds

1 graduation of the fine-setting screw (18) to a slide feed of .00025" = .0005" in dia.(0,005 mm = 0,01 mm i.dia.)

With models UPA 4 to UPA 5-S6

1 revolution of fine-setting screw (18) corresponds to a slide feed of .008" = .016" in dia.(0,2 mm = 0,4 mm in dia.)

With models UPA 6 to UPA 6-S7

1 revolution of fine-setting screw (18) corresponds to a slide feed of .004" = .008" in dia. (0,1 mm = 0,2 mm in dia.)

Heads made to special design and fitted with 12 feeds of either larger or smaller values are built with fine-setting screws of correspondingly modified scale of divisions.

Stop (15) may be shifted alongside stop pin (17) and clamped so that a preset scale division can, at any time, be easily located. (cf.page 8, sect. d 2 and d 11).

c) Slide-locking screw (2) serves to secure and release respectively slide (14), before and after adjustment.

II. Facing, Recessing, Undercutting.

(cf. Annexe 1 in front)

Whenever engaging the power cross feed (cf. Sect.g), feed collar (10) must be given a full turn by hand, contrary to the sense of rotation of the machine spindle; or, should this be impossible because of the fine-setting screw having been adjusted before by T-handle wrench, turn feed collar in opposite direction.

a) Be careful when facing of the head being rigidly fastened on the machine spindle. Slide-locking screw (2) must not be tightened so as to ensure a neat sliding fit of slide (14) throughout its length. Smooth movement of the slide is obtained by adjustment of setscrews (3) and tested by rotating the quick-setting screw (13).

b) Return of slide after facing is engaged as follows, whilst machine is at rest: T-handle wrench is fully inserted into quick-setting screw (13) and turned contrary to the direction of the arrow. Thereupon allow retaining pin to snap again into recess. For more ample details on quick-setting screw (13) see page 3 sect. I,a.

c) The 12 self-acting slide feeds are engaged by pushing in 12 feed buttons (12). Each button provides a slide feed of .0008" (0.02 mm) per revolution. To obtain, for instance, a feed of .0048" (0.12 mm) 6 buttons must be pushed. It is desirable that the feeds are evenly distributed over the periphery of collar (10). Referring to the example quoted above, the buttons (12) carrying the numbers 2, 4, 6, 8, 10 and 12 should, accordingly, be actuated.

d) Increase of Feed Rate. To increase the feed simply requires pushing more buttons (12) (each button providing a feed of .0008" (0.02 mm) per rev.) This can be done without stopping the machine.

e) Decrease of feed rate.
Release all buttons (12) before re-actuating as many as required to give the desired smaller feed. (For release of buttons refer to next paragraph).

f) Release of the 12 feed buttons (12)

1. Couple control collar (10) with retaining ring (9) by engaging retaining pin (19) with recess (7) of collar (10).
2. Insert stop rod (8) into retaining ring (9) and hold it firmly whilst pressing the thumb on retaining pin (19).
3. Insert T handle wrench (or hexagonal bolt in case of UPA 6 and UPA 6-S7) into hole in release ring (11), pushing it sharply against stop rod (8). All feed buttons will thus be released.

g) The automatic facing traverse of the slide is engaged by pushing one or several buttons (12) and keeping the feed control collar (10) stationary during rotation of the head.

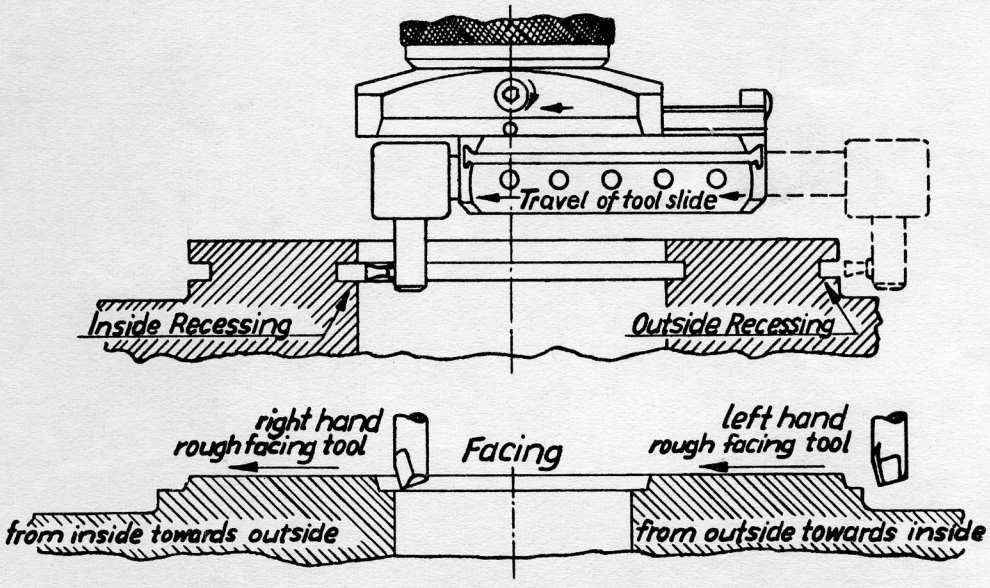
Note: Pay attention to encircled 1st paragraph of this page!

h) Stopping feed collar (10). Feed collar (10) can be kept stationary by adopting either of two methods:

1. by hand, holding the knurled portion of the body,
2. by means of stop rod (8), the latter method being preferable.

The method sub 2 consists in retaining ring (9) being coupled with feed collar (10) by pushing retaining pin (19) into recess (7) of collar (10); thereupon, stop rod (8) is placed into retaining ring (9) either holding it or permitting it to rest against a stop on the machine.

i) Direction of facing traverse. By keeping feed collar (10) stationary during r.h. rotation of the head, fine setting screw (18) and slide (14) move in the direction of the arrows (16); during l.h. rotation of the head, screw (18) and slide (14) move in the opposite direction to the arrows. The drawing below serves to show that it is not necessary for the direction of the facing traverse to be determined by reversing the machine. Actually, although the slide moves in one direction only, operation can take place from the centre of the component outwards, as well as from an outside diameter towards the center. To do so, the tool post holes (5) of the slide (14) need merely be provided with left and right hand tools as required.



k) The automatic end release of the facing traverse takes place as soon as the stop (15) reaches the stop pin (17) or in the event of excessive cutting pressure developing due to dull, or broken tool bits. When holding the feed control collar (10), it will slip out of the fingers as soon as the end release occurs, the collar (10) revolving with the head. When keeping the feed control collar (10) stationary using the stop rod (8), the automatic end release takes place as follows. The retaining pin (19) is automatically lifted, thereby releasing the feed control collar (10) and enabling the latter to revolve together with the head. As a result, the facing traverse is disengaged.

l) The sensitiveness to release of the retaining pin (19) can be regulated by the regulating screw (1) to the cutting pressure determined by tensile strength, cross section of chip and cutting speed. The regulating screw should be tightened only as far as necessary in order to ensure maximum releasing accuracy and long life of the release mechanism.

Should the stop release be used for turning diameters to close limits, subsequent to the facing operations, follow instructions on page 6, Sect. n.

m) Releasing retaining pin (19). In order to release the retaining pin (19) before reaching the end of the slide feed, hold feed control collar (10) and knock sharply, in direction of rotation, against the stop rod (8) which is inserted in retaining ring (9).

n) Setting the Stop for Precision End Release. The stop must be set and bolted to the slide in such a way as to cause Cross Feed to disengage instantaneously upon the predetermined diameter having been produced by the cutting tool.

Tighten Regulating screw as little as possible so as to keep release pressure between stop and stop pin at the lowest possible level.

To produce an exact ratio between cutting tool and end release it is recommended to ascertain the amount of deviation to be eliminated by a test release.

For this reason, after coarse setting of the stop, which must be tightly secured in position, a test release of the Cross Feed is made. This permits ascertaining of the actual turning diameter produced by the tool with the present setting of the cross feed. The stop must then be adjusted by half the difference between the desired and the actual diameter obtained by the first trial release. Proceed as follows:

1) Stop nuts should not yet be removed, but slide should be moved back until a sliding fit of a gage block to be determined e.g. 1/8", between stop and stop pin has been secured.

2) With the aid of the slide locking screw, secure slide in this position, thus preventing it from changing position on adjustment of the stop.

3) Calculate new gage block, proceeding as follows:

   a) Should the diameter obtained be smaller than the diameter required, the new gage block would have to be 1/8" plus 1/2 of the difference ascertained.

   b) Should the diameter obtained be larger than the required diameter, the new gage block would have to correspond to 1/8" less 1/2 the amount of the difference.

4) Now loosen stop nuts, adjust stop and secure again in position when sliding fit for new gage block has been obtained.

5) Remove gage block, loosen slide locking screw.

At this point, the end release is set on the value desired and, provided no further re-adjustment of the stop is carried out, end releases will take place at a tolerance of .002" on the diameter (0.05 mm ∅).

III. Taper Turning

on machines with axial feeds (cf. Annexes 2a and 3)

Taper turning is accomplished by a combination of the cross feed of the head with the axial feed of the machine spindle and/or the machine table, in such a way that both feeds will act together right from the first revolution without admitting any lost motion. Adjust slide (14) of the head very carefully by means of setscrews (3) for smooth running. In no event must the slide be locked by screw (2).

a) Calculation of feeds and taper angles. The feed diagram as per Annexe 2a enables to read the feeds of head and machine required for the production of a given taper angle and reduction respectively or, vice versa, taper angle and/or reduction pertaining to predetermined feeds. As the diagram reveals, a machine feed of 0.005486" (0,137 mm) would be required when using the smallest feed of the head, i.e. 0.0008" (0.02 mm), in order to produce a taper angle of $\alpha/2 = 8°17'50"$. However, cutting performance would be unsatisfactory by applying such a large machine feed. So as to be in a position to produce small tapers below 20° by using as small a machine feed as possible, we supply special heads fitted with 12 extra fine feeds. This is limited to a taper of 1:50 ($\alpha/2 = 34'23"$) requiring an axial machine feed of 0.005" (0.12 mm). Special diagrams 2b, 2c, etc. are available for such heads.

b) Mounting the toolbit (Annexe 3)
As shown by Figs.1 and 2, the head, during clockwise rotation of the machine, will feed in one direction only (feed direction).
Nevertheless, it is possible to turn inside or outside tapers which will either grow larger or smaller towards the lower end. If the bit as per Fig. 1 is mounted in direction of feed, the internal taper will grow larger towards the bottom; the same bit (cf.Fig.2), however, will produce an inside taper growing smaller at the lower end, if mounted contrary to the feed direction. External tapers requiring in case of clockwise rotation a L.H. cutting tool, will show the taper reduction from top to bottom when the tool is mounted in direction of feed, or vice versa should the tool be mounted in the opposite sense.

When mounting the bit, pay attention that the cutting edge will be set exactly in line with the center line of the 3 tool post holes (5) (corresponding to the "height between centers" of a lathe). Any deviation of the toolbit from the centerheight results in inaccuracies of the taper to be produced. (cf. Annexe 3, Sect.b "Height adjustment of cutting tool").

c) Setting of toolbit for turning true to diameter (Depth adjustment).
According to Fig. 1, the tool must be adjusted in the direction of the feed which is best achieved by turning the quick-setting screw (13) to the right until the desired diameter is roughly set. Once the quick-setting screw (13) locked in one of the three indexing positions, turn the fine-setting screw (18) likewise in the direction of arrow until the desired diameter is set.

According to Fig. 2, the tool is adjusted in the opposite direction of the feed; so as to compensate for backlash, the quick-setting screw is turned to the left beyond the diameter to be produced and allowed to register. Thereupon, by adjustment of fine-setting screw (18) in direction of arrow, is the toolbit withdrawn to the diameter actually to be produced. At the end of the setting, control collar (10) must, in any event, be turned through one full revolution contrary to the sense of rotation of the machine spindle or, if impossible, in the opposite direction, whilst the machine is at rest.

d) Taper Turning Operation.

1) Locate and align component and fasten UPA 4 in the conventional way as for cylindrical turning. Mount the tool bit and set it true to diameter as on page 7, Sections b and c.

2) Secure setting for turning diameter by screwing stop (15) after a sliding fit has been obtained of a gauge block of any length to be determined e.g. 3/8" (10 mm) between stop pin (17) and face of stop (15), and the gauge block been removed. The clamped stop serves for starting point of subsequent tool feeds.

3) Depress push buttons as calculated according to page 7, Sect. a). Cf. also g page 4, Sect. c-f.)

4) Depress retaining pin (19) and tighten regulating screw (1) so as to prevent stop pin (9) from springing back during taper turning, and stop (15) from being employed for end release. Do not yet insert the stop rod.

5) Turn axial feed spindle by hand until cutting edge is placed about 0.08 ... 0.12" (2-3 mm) a head of component (cf.Annexe 3, Fig.1 and 2, Distance x). Set dial of axial feed screw for zero and turn screw back so that the cutting edge will somewhat exceed distance x.

6) Engage axial machine feed and have machine run until distance x and/or zero setting of the dial will again coincide with the automatic feed. During this period the machine is best running at low speed, and altogether disengaged shortly before zero setting is accomplished. The exact axial setting for distance x is required as it permits a precise radial setting true to diameter.

7) Give feed control collar (10) one full turn in the direction opposite to rotation to ensure the first engagement with the cross feed (cf. page 4, 1st sentence.) Insert stop rod (8) and hold it or, preferably, allow it to rest against a stop on the machine.

8) Starting Machine: Simultaneously with the axial feed of the machine the cross feed of the head starts operating, both of which producing the desired taper.

9) Stopping Machine on completion of first cur. Withdraw stop rod (8) and lift toolbit by turning quick-setting screw (13). Disengage axial machine feed and shift by hand to position beyond distance x.

10) Test diameter of taper and ascertain the difference between it and the desired turning diameter.

11) Set turning diameter for the following cut by using stop (15). To begin with, turn quick-setting screw (13) and, subsequently, fine-setting screw (18) with the aid of T-handle wrench, until gauge block of stage 2 e.g. 3/8" (10 mm) will, once more, slide freely between stop pin (17) and stop (15). Thereupon remove gauge block. From the position of departure thus gained, the next cut can be performed according to graduation on both spindles. Instead of reading the feed values from scale, they may also be determined by placing gauge blocks of different lengths between stop (15) and stop pin (17).

To increase a tapered bore by 0.04" (1 mm) for instance, the reference gauge must be increased by half the difference, i.e. 0,02" (0.5 mm) as per Fig.1 or, if Fig.2 applies, decreased by 0.02" (0.5 mm). Stages 6-11 are repeated until the diameter desired has been obtained. Same as the inside tapers (bores) as per drawing, also any outside taper (shanks) can be dealt with in an analogous way.

IV. Thread Cutting.

Into stationary component with WOHLHAUPTER Facing and Boring Heads UPA 4 to UPA 6-S7, on machines having the pitch feeds required.

a) Cutting straight threads

Prior to cutting straight threads, make sure of the cross feed being disengaged, i.e. none of the 12 feed buttons (12) being pushed in, whereas the machine feed (pitch feed) must be in continuous operation. After the tool has been mounted and the pitch feed engaged, operation proceeds by the following stages:

1. After the toolbit is set to coarse limits, quicksetting screw (13) must be secured at a pre-determined figure of the scale; then adjust to precision limit by means of fine-setting screw (18).
2. Start threading and stop machine after the first cut.
3. Lift toolbit by turning quick-setting screw (13).
4. Withdraw toolbit to position of departure by L.H. rotation of machine.
5. Re-set quick-setting screw (13) to scale as per stage 1 and set retaining pin to register again. Then set tool by means of fine-setting screw (18) for the second cut.

   The procedure as outlined is repeated until the required depth and the previously determined limit of the stop (15) are reached.

b) Cutting taper threads.

Whereas the axial movement required for pitch feed is provided by the machine, the radial movement required in addition for producing a tapered thread is obtained by the toolslide feed. Do not clamp the slide by tightening locking screw (2). During thread cutting both the machine feed and the feed of the head must be in continuous engagement.

Same as for taper turning, the sensitiveness to release of retaining pin (19) must be reduced to the minimum by means of regulating screw (1). Stop rod (8) must not be displaced by changing over from clockwise to anti-clockwise rotation from the position held.

Depending on the pitch of thread, taper angles will vary with varying cross feeds. A feed diagram for taper thread will be supplied upon request.

For tool mounting and depth adjustment confer instructions for taper turning, page 7 sections b and c.

The method of operation, however, is the same as for straight thread cutting (page 9, sect. a 1 - 5).

Annexe 2a

machine feed per min. = machine feed per rev. x machine speed

machine feed per rev. = ctg α/4 x toolslide feed per rev.

machine feed inches per min →

machine feed inches per rev. →

machine speed rev. per min →

toolslide feed inches per rev. →

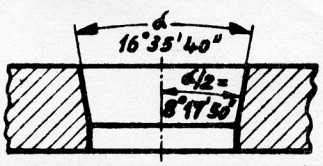
reduction 1: →

taper angle α/2 →

Example:

1) Draw a line from the desired angle, let's say 8°17'50" (ISA steep taper) to point "A".
A toolslide feed of .0008 requires a machine feed of .005486 per rev.

2) Draw a line from machine feed of .005486 per rev. to point "B".
A machine speed of 180 rev. per min results in a machine feed of 0,9874 inch./p.min.



pitch of screw 3/25"	1 feed unit = .0008 per rev.

Gezeichnet	23.4.58	Haug
Geprüft	24.4.58	

Emil Wohlhaupter & Co.
Werkzeugfabrik

Diagram of feeds to produce taper angles of from 5°... 90° when taper turning with "WOHLHAUPTER" Facing and Boring Heads UPA4...UPA6-S7

Annexe 2a

machine feed per min. = machine feed per rev. x machine speed

machine feed per rev. = ctg α/2 x toolslide feed per rev.

machine feed inches per min →

machine feed inches per rev. →

machine speed rev. per min →

toolslide feed inches per rev. →

taper angle α/2 →

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Example:

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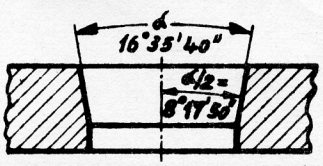

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Geprüft	24.4.58	

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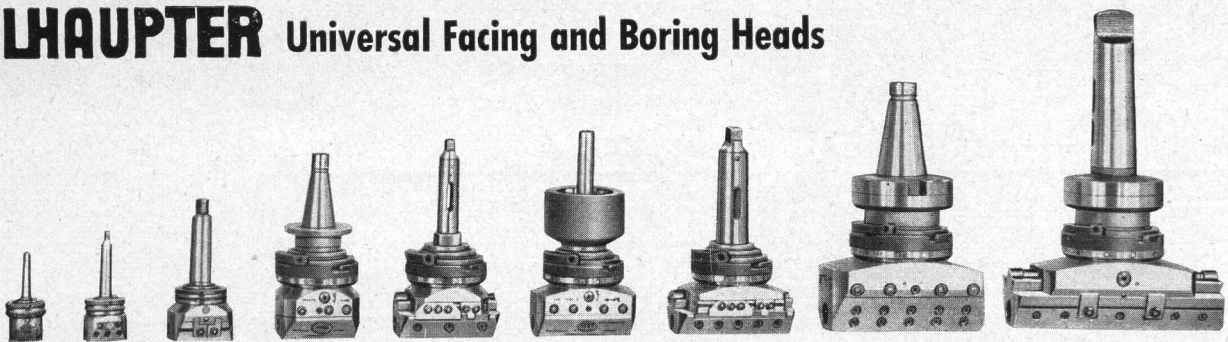
Diagram of feeds to produce taper angles of from 5°... 90° when taper turning with "WOHLHAUPTER" Facing and Boring Heads UPA4...UPA6-S7

PRICE LIST

WOHLHAUPTER Universal Facing and Boring Heads

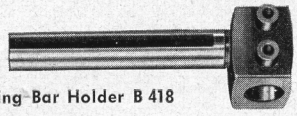


Size	UPA 1	UPA 2	UPA 3	UPA 4	UPA 4 - S 5	UPA 5	UPA 5 - S 6	UPA 6	UPA 6 - S 7
	with standard Morse taper shanks							without shank	
Price apiece									
Extra charge	for special shanks such as steep taper, metric taper and other special type tapers upon request							Price for standard Morse taper shank no. 6 with tang and transverse slot, without driver faces. Other shanks upon request	

Extra equipment

In order to obtain the facing ranges and boring depths mentioned in the leaflet, the following extra equipment requires to be used.

Boring Bar B 412

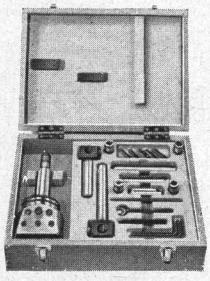


Boring Bar Holder B 418

Clamping Sleeve Sp 4 - 22:18

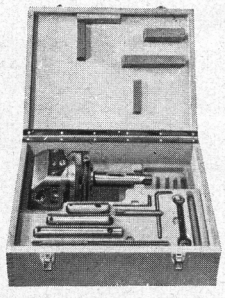
For the heads	UPA 1	UPA 2	UPA 3	UPA 4 and 4 S 5	UPA 5 and 5 S 6	UPA 6 and 6 S 7
1 piece of each	no. of order / price	no. of order / price	no. of order / price	no. of order / price	no. of order / price	no. of order / price
Boring bars	**Boring tools**		B 306 =	B 408 =	B 408 =	B 612 =
	A 03 f =	A 05 f =	B 309 =	B 412 =	B 412 =	B 620 =
	A 03 g =	A 05 g =	B 312 =	B 416 =	B 416 =	B 626 =
Tool holder and boring bar holder		Tool holder	BH 308 =	BH 410 =	BH 513 =	BH 620 =
		St 200 =	BH 312 =	BH 418 =	BH 523 =	BH 636 =
Tool holder and boring bar holder for extended mounting				2 pieces BH 410 =	2 pieces BH 410 =	2 pieces BH 612 =
1 set of clamping sleeves (for small boring tools)		**SP 2:**	**SP 3:**	**SP 4:**	**SP 5:**	**SP 6:**
		1/2" : 5/16"	3/4" : 5/16"	7/8" : 5/16"	7/8" : 5/16"	1 1/4" : 7/8"
		1/2" : 3/8"	3/4" : 3/8"	7/8" : 3/8"	7/8" : 3/8"	1 1/4" : 7/8"
			3/4" : 1/2"	7/8" : 1/2"	7/8" : 1/2"	7/8" : 1/2"
			3/4" : 5/8"	7/8" : 5/8"	7/8" : 5/8"	7/8" : 5/8"
				7/8" : 3/4"	7/8" : 3/4"	7/8" : 3/4"
Total price of the complete set of extra equipment	SZ 1 =	SZ 2 =	SZ 3 =	SZ 4 =	SZ 5 =	SZ 6 =
High speed steel square tool bits Price of 1 set = 4 pieces		1/4" □ x 1.57 VD 6 =	1/4" □ x 1.57 VD 6 =	1/4" □ x 1.57 VD 6 =	1/4" □ x 1.57 VD 6 =	3/8" □ x 2 1/2 VD 10 =

UPA 3



wooden box

containing head and extra equipment

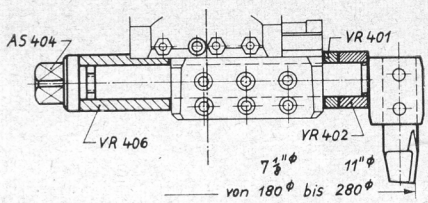


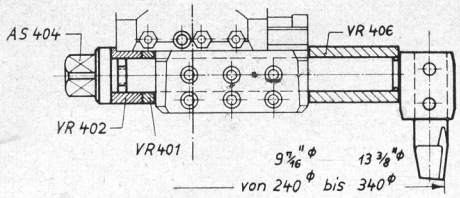
UPA 4

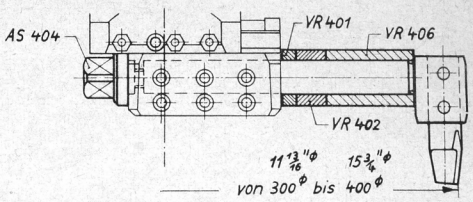
For the heads	UPA 1	UPA 2	UPA 3	UPA 4 and 4 S 5	UPA 5 and 5 S 6	UPA 6 and 6 S 7
designation	HK 111	HK 211	HK 311	HK 411	HK 511	HK 611
Size mm	150×115×75	190×175×70	340×243×95	385×290×133	385×290×133	690×410×230
Weight abt. kg	0,460	0,9	2,5	4,2	4,0	19,2
Price						

No. P 620 E — Printed in Germany

Reinforcing rings for boring bar holders intended to handle great diameters





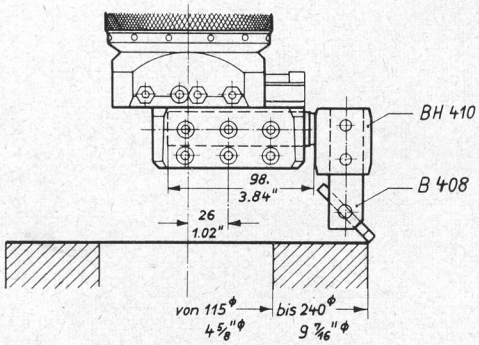


for the heads	UPA 4	UPA 4-S 5	UPA 5	UPA 5-S 6	UPA 6	UPA 6-S 7
	Size Price	Size Price	Size Price	Size Price	Size Price	Size Price
1 ring	VR 401* =	VR 401 =	VR 401 =	VR 401 =	VR 601 =	VR 601 =
1 ring	VR 402 =	VR 402 =	VR 402 =	VR 402 =	VR 602 =	VR 602 =
1 ring	VR 406 =	VR 403 =	VR 402 =	VR 406 =	VR 607 =	VR 607 =
1 ring	— —	— —	VR 406 =	VR 504,5 =	VR 608 =	VR 608 =
1 tightening screw	AS 404 =	AS 404 =	AS 404 =	AS 509 =	AS 606 =	AS 612 =
price of the complete set	VR 4 =	VR 4s5 =	VR 5 =	VR 5s6 =	VR 6 =	VR 6s7 =

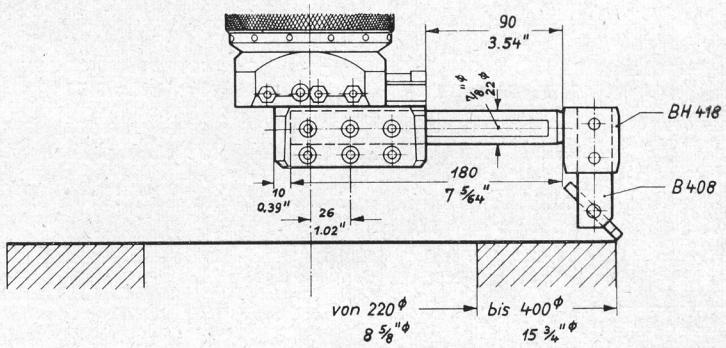
* the figures following the second figure indicate the ring length; thus, VR 406 is 60 mm long

Example showing the use of boring bars and boring bar holders to obtain the diameters and working depths required by means of a UPA 4 head

Boring and facing range



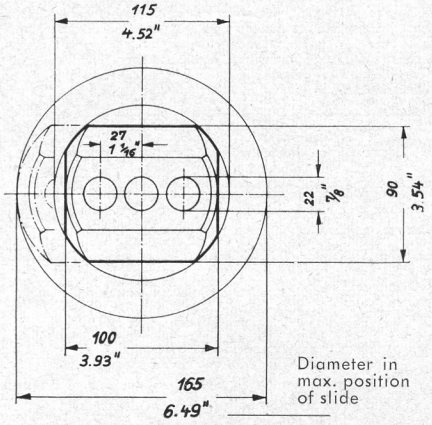
Working range when Boring Bar Holder is adjusted once! up to 8 1/4" ϕ without adjustment!

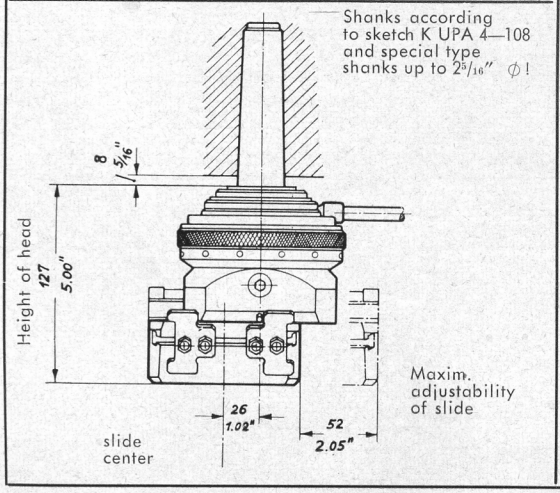


Working range when Boring Bar Holder is adjusted once! up to 12 3/8" ϕ without adjustment!

In a boring and facing range from 0" - 5 1/8"∅ the Boring Bars B 408, B 412 and B 416 are used!

Maxim. diameter of slide





Range of working depth