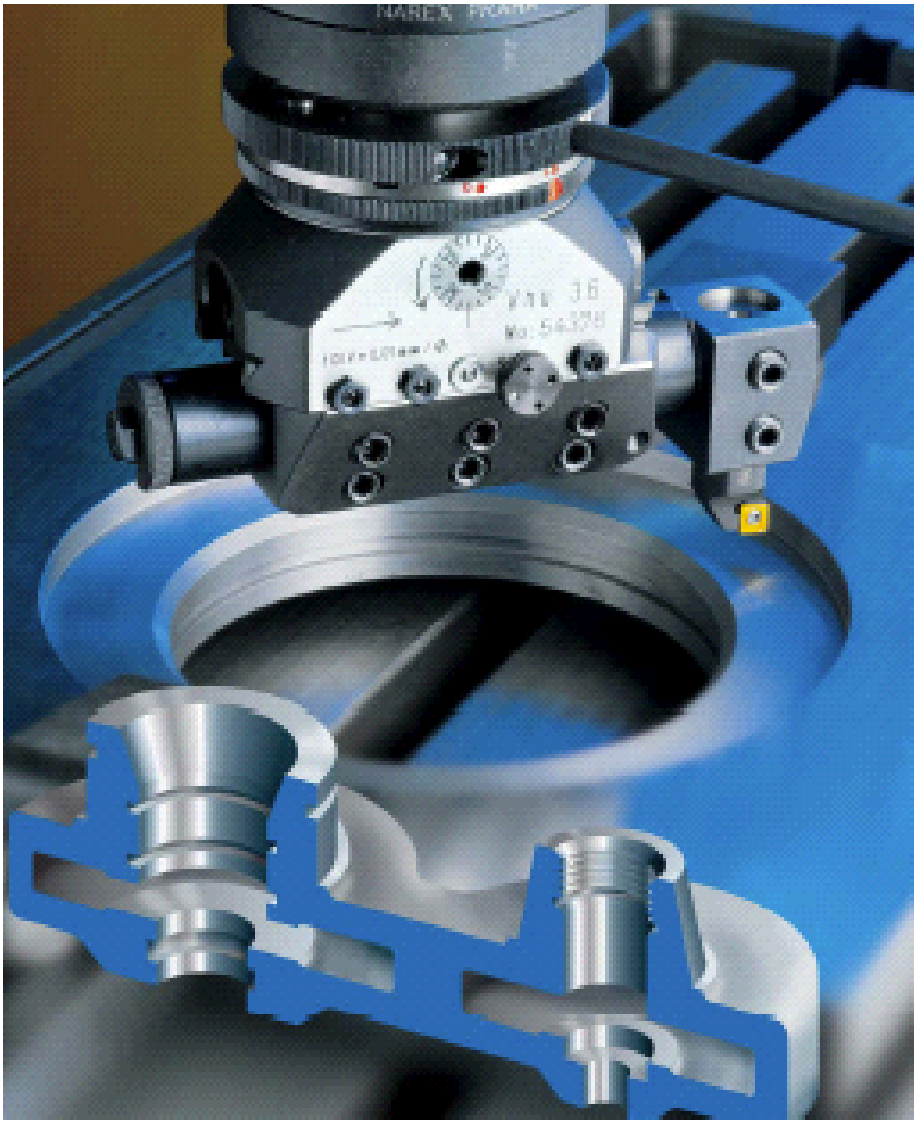
Instruction Manual
No.: 2721005



Vhu

Universal Boring Heads

Producer:

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Summary:

1. Safety Recommendations

- Before using the head read carefully the attached operating instructions for Vhu.
- Before manipulating the full box check the reliability of the lid closure to prevent the box from opening spontaneously and the head from falling out.
- During manual manipulation with the head proceed carefully to avoid injury by the fall of heavy instruments.
- Before using the head make sure all 6 screws (pos. 60) that clamp the flange to the head and all 4 screws (pos. 1) that clamp the exchangeable taper shank to the flange are tightened sufficiently.
- Before mounting the head to the taper cavity of the spindle clean the clamping surfaces both on the taper and in the cavity. Any impurity reduces the boring precision and the stability of clamping and leads to early wearing of these surfaces.
- When mounting the tools to the head ensure their correct orientation. The loading force that could move the slide has to be intercepted by the stable bearing of the motion screw (this is not the one screwed on the slide).
- In clamping the tools, holders and boring bars do not exceed the allowed projection that can be determined in the table of limit dimensions for basic operations on page 10.

- Before starting the spindle with the clamped-on head make sure the selected rotation (rpm) does not exceed the maximum allowed value, and make sure the correct direction is selected and the head is not prevented from free turning.

- Before starting the automatic feed of the slide make sure the safety pin (pos. 5) reliably disconnects and the dogs are properly adjusted and fixed (pos. 25 and 39).

- Hold the stopping bar with suitable support, **holding in hand is NOT RECOMMENDED**.

- Do not engage automatic feed when boring cylindrical holes.

- Proceed very carefully when machining taper surfaces because the safety pin is disabled.

- Use protective glasses when working with Vhu .

2. Delivery Conditions

Universal boring heads are delivered in the following sets: :

- **Vhu** ** - **A** Head of size ** without box and without accessories
- **Vhu** ** - **B** Head of size ** with basic accessories in a box
- **Vhu** ** - **C** Head of size ** with complete accessories without indexable inserts in a box
- **Vhu** ** - **D** Head of size ** with complete accessories with indexable inserts in a box
- **Vhu** ** - **T** Head of size ** with basic accessories and minimum cutting tools in a box

The boring head including other accessory items is preserved with service life of the protective coating for 12 months. Part of the delivery is the instruction manual in the required language version. Unless ordered, the exchangeable taper shank is not part of the delivery unless ordered.

3. List of Accessories

Vhu36 – sets B, C , D a T - basic accessories:

201/1 – holder with screw (D16x132)	1 piece
203/1 – tube - set	1 set = 3 pieces
204/1 – reduction sleeve 10x16	1 piece
206 - screw driver with T hand grip	1 piece
207 - socket bit 6-hr size 4 and 6	1 piece
208 - 208 - screw-driver adapter T 7	1 piece
205 - stopping bar	1 piece

Vhu 36 – sets C, D a { T } - cutting accessories:

{ 301/1 – VPS16-062 FCRK10 (5,5x16x60)	1 piece }
301/2 - VPS 16-073 FCKR10	1 piece
{ 305/1 – DDS 16-050 SCACR 06	1 piece }
{ 305/2 – DDS 16-050 SCACL 06	1 piece }
306/1 – DDS 16-050 SCBCR 06	1 piece
306/2 – DDS 16-050 SCBCL 06	1 piece
{ 302/1 – DDS 16-080 STFCR 11	1 piece }
303/1 – DDS 16-090 STFCR 11	1 piece
304/1 – DDS 16-090 STKCR 11	1 piece
307/1 – VTS 16-075 – 1,5	1 piece
308/1 – VHS 16-1,5 STZCL 11	1 piece
309/1 – VHZ 16-1,5 ST – R16	1 piece
<u>The **D** set is completed with indexable inserts:</u>	
TCMT 110202E – UM 8016	4 pieces
CCMT 060204E – UM 8016	4 pieces

Vhu 56, Vhu 80 a Vhu 110 – sets B, C , D a T - basic accessories:

201/2 – holder with screw (D25x195) Vhu56	1 piece

201/3 – holder with screw (D25x220) Vhu80	1 piece
201/4 – holder with screw (D25x244) Vhu110	1 piece
202/2 – holder	2 pieces
203/2 – tube - set	1 set = 3 pieces
204/2 – reduction sleeve 25/16	1 piece
206 - screw driver with T hand grip	1 piece
207 - socket bit 6-hr size 4 and 6	1 + 1 piece
208 - screw-driver adapter T 7 and T15	1 + 1 piece
205 - stopping bar	1 piece

Vhu 56, Vhu 80 a Vhu 110 – sets C, D a { T } - cutting accessories:

301/2 - VPS 16-073 FCKR10	1 piece
302/1 – DDS 16-080 STFOR 11	1 piece
{ 303/2 – DDS 25-150 STFCR 11	1 piece }
304/2 – DDS 25-150 STKCR 11	1 piece
{ 305/3 – DDS 25-080 SCACR 09	1 piece }
{ 305/4 – DDS 25-080 SCACL 09	1 piece }
306/3 – DDS 25-080 SCBCR 09	1 piece
306/4 – DDS 25-080 SCBCL 09	1 piece
{ 307/2 – VTS 25-085 – 1,5	1 piece }
{ 307/3 – VTS 25-145 – 1,5	1 piece }
{ 308/2 – VHS 25-1,5 STZCL 11	1 piece }
309/2 – VHZ 25-1,5 ST – R16	1 piece
The **D** set is completed with indexable inserts:	
TCMT 110202E – UM 8016	4 pieces
CCMT 09T304E – UM 8016	4 pieces

Vhu 125 a Vhu 160 – sets B, C , D a T - basic accessories:

201/5 – holder with screw (D32x350) Vhu125	1 piece
201/6 – holder with screw (D32x385) Vhu160	1 piece
202/3 – holder	2 pieces
203/3 – tube - set	1 set = 3 pieces
204/4 – reduction sleeve 32x16	1 piece
206 - screw driver with T hand grip	1 piece
207 - socket bit 6-hr size 4 and 6	1 + 1 piece
208 - screw-driver adapter T 7 and T15	1 + 1 piece
205 - stopping bar	1 piece

Vhu 125 a Vhu 160 - sets C, D a { T } - cutting accessories:

301/2 - VPS 16-073 FCKR10	1 piece
302/1 – DDS 16-080 STFOR 11	1 piece
{ 303/3 – DDS 32-180 STFCR 11	1 piece }
304/3 – DDS 32-180 STKCR 11	1 piece
{ 305/5 – DDS 32-100 SCACR 09	1 piece }
{ 305/6 – DDS 32-100 SCACL 09	1 piece }
306/5 – DDS 32-100 SCBCR 09	1 piece
306/6 – DDS 32-100 SCBCL 09	1 piece
{ 307/4 – VTS 32-135 – 1,5	1 piece }
{ 307/5 – VTS 32- 235 – 1,5	1 piece }
{ 308/3 – VHS 32-1,5 STZCL 11	1 piece }
309/3 – VHZ 32- 1,5 ST – R16	1 piece
The **D** set is completed with indexable inserts:	
TCMT 110202E – UM 8016	4 pieces
CCMT 09T304E – UM 8016	4 pieces

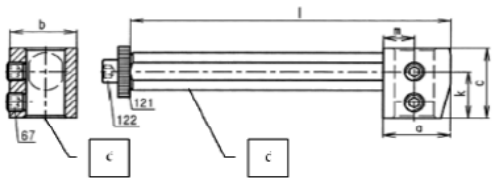
NOTE:

1. If the indexable inserts of Wohlhaupter company were ordered, they are substituted for TCMT type in the **D** set.
2. VBD for threads and recesses are not delivered in the D set.
3. The T set is completed only with the items of tool accessory which are listed in the brackets {}.

4. Vhu Accessories and Their Utilization

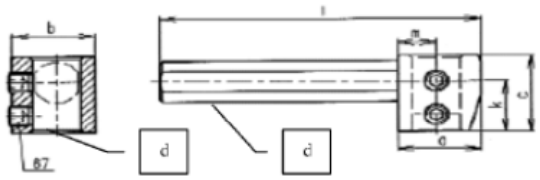
The holder with screw (201) extends the length of the slide and is clamped to its slotted hole to which the holder is inserted from the side of the fixed bearing. The clamping is done with the help of the set of spacing tubes: first, the screw (122) is tightened to the washer (121) and only after that the clamping screws are tightened in the slide (Note 31). The tools are clamped to the holder in the same way as to the slide.

201 HOLDER WITH SCREW



	Code	Description	Dimensions (mm)							kg	67 Screw	122 Screw	121 Washer	For
			a	b	c	d	k	l	m					
1	203 706	VDS 16-132	27	27	30	16	20	132	13	0,28	M 8x1-10	M6-25	6	Vhu 36
2	203 591	VDS 25-195	45	46	46	25	33	195	22,5	0,95	M12x1-15	M12-40	12	Vhu 56
3	203 614	VDS 25-220	45	46	46	25	33	220	22,5	1,1	M12x1-15	M12-40	12	Vhu 80
4	203 638	VDS 25-244	45	46	46	25	33	244	22,5	1,18	M12x1-15	M12-40	12	Vhu110
5	203 669	VDS 32-350	50	56	56	32	39	350	22,5	2,5	M12x1-15	M12-40	12	Vhu125
6	203 683	VDS 32-383	50	56	56	32	39	383	22,5	2,75	M12x1-15	M12-40	12	Vhu160

202 HOLDER



	Code	Description	Dimensions (mm)							kg	67 Screw	For
			a	b	c	d	k	l	m			
1	203 607	VDS 25-195	45	46	46	25	33	160	22,5	0,9	M12x1-15	Vhu 56
2	203 621	VDS 25-220	45	46	46	25	33	185	22,5	1	M12x1-15	Vhu 80, Vhu110
3	203 676	VDS 32-383	50	56	56	32	39	210	22,5	1,7	M12x1-15	Vhu125, Vhu160

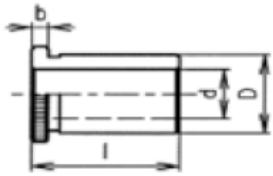
The holder 202 serves for clamping the holder bar (307) - see picture. Holders are clamped in pairs for better interception of cutting forces and for prevention of tool vibrations.

203 TUBE - SET

	Code	Description	pcs/set	Dimensions (mm)		
				d	D	S1/S2/S3/S4
1	301 006	TUBE - SET 16	3	16,2	22	6/12/18
2	301 013	TUBE - SET 25	3	25,2	35	18/16/25
3	301 020	TUBE - SET 32	4	32,2	44	12/24/36/50

The set of spacing tubes serves as a distance tubes set for clamping the holder with screw (201) into the slotted hole in the slide. They are inserted between the holder head and front slide face, the rest of the set is inserted between the rear slide face and the washer (121). A bigger projection of the holder out of the slide than permitted by the length of the **RECOMMENDED**.distance set of spacing tubes is NOT

204 REDUCTION SLEEVE

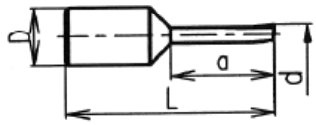


	Code	d x D	l/b	kg	For	
1	301 037	10 x 16	30/5	0,03	Vhu 36	■
2	301 044	16 x 25	42/6	0,09	Vhu 56,80,110	■
3	301 051	20 x 25	42/6	0,06	Vhu 56,80,110	□
4	301 068	16 x 32	56/6	0,25	Vhu 125,160	■
5	301 075	25 x 32	56/6	0,18	Vhu 125,160	■
6	301 082	20 x 32	56/6	0,2	Vhu 125,160	□

■ standard □ for demand

Reduction sleeves serve for clamping tools of smaller diameters that will not fit into the clamping hole of the slide by themselves. The sleeves have a cut-out on one side and need to be turned in the slide hole so that the axis of the clamping screw is perpendicular to the cut-out plane. This will ensure a firm grip of the tool in the sleeve.

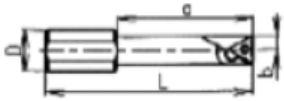
301 BORING TOOL — **FCRK 10 - Ni HF**



	Code	Description	Dimensions[mm] D	d	L	a	kg	From ø
1	203 201	VPS 16 - 062 FCRK 10-Ni HF 658 00550	16	5,5	60	30	0,05	6 mm
2	203 317	VPS 16 - 073 FCRK 10-Ni HF 658 00550	16	9,5	73	43	0,06	10 mm

The boring tools (301) with soldered inserts with positive bit geometry and TiN coated are intended for high-precision boring of holes over Ø 6 mm. Only very small removals are allowed up to 0.05 mm with a quality cut area surface.

302 INSERT HOLDERS — **STFCR 11**



	Code	Description	Dimensions[mm] D	b	L	a	kg	From ø
1	203 324	DDS 16 - 080 STFOR 11	16	5,9	80	53	0,09	12 mm

Code: 203 874 Wohlhaupter form 161 WTI 12 097512
Code: 203 829 TCMT 110202 E - UM 8016
US 2505
7

303 INSERT HOLDER — **STFCR 11**

	Code	Description	Dimensions[mm] D	b	L	kg	From ø
1	203 331	DDS 16 - 090 STFCR 11	16	11	90	0,12	20 mm
2	203 416	DDS 25 - 150 STFCR 11	25	17	150	0,51	32 mm
3	203 492	DDS 32 - 180 STFCR 11	32	22	180	0,97	38 mm

Code: 203 874 Wohlhaupter form 161 WTI 12 097512
Code: 203 829 TCMT 110202 E - UM 8016
US 2505
T 7

304 INSERT HOLDER — **STKCR 11**

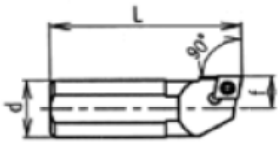
	Code	Description	Dimensions (mm) D	b	L	kg	From ∅
1	203 348	DDS 16 - 090 STKCR 11	16	11	90	0,12	20
2	203 423	DDS 25 - 150 STKCR 11	25	17	150	0,51	32
3	203 508	DDS 32 - 180 STKCR 11	32	22	180	0,97	38

code: 203 874
code: 203 829
Wohlhaupter form161 WTI 12 097512
Pramet TCMT 110202 E - UM 8016
US 2505
T 7

The insert holders (**302,303 ,304**) are equipped with a triangular inserts with 3 bits and a small radius on the tip. This enables high-precision boring even at small removals (0.05 mm). Indexable inserts are normally provided TCMT pressed, if a higher volume is required inserts may be provided ground with

positive bit geometry that allows extremely small removals - up to 0.02 mm while maintaining high quality of the machined surface. It is a product of the company Wohlhaupter with designation „Form 161 WTI 12 097512“.

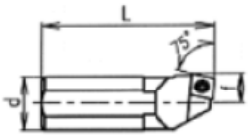
305 INSERT HOLDER **SCACR/L**



	Code	Description	Dimensions[mm] D	L	f	kg	R-right L-left
1	203 355	DDS 16 - 050 SCACR 06	16	50	9	0,06	R
2	203 386	DDS 16 - 050 SCACL 06	16	50	9	0,06	L
3	203 447	DDS 25 - 080 SCACR 09	25	80	14	0,25	R
4	203 461	DDS 25 - 080 SCACL 09	25	80	14	0,25	L
5	203 522	DDS 32 - 100 SCACR 09	32	100	17	0,53	R
6	203 546	DDS 32 - 100 SCACL 09	32	100	17	0,53	L

Code: 203 829	DDS16:	CCMT 060204E - UM 8016	US 2505	T7
Code: 203 843	DDS25,DDS32:	CCMT 09T304E - UM 8016	US - 13	T15

306 INSERT HOLDER **SCBCR/L**



	Code	Description	Dimensions[mm] D	L	f	kg	R-right L-left
1	203 355	DDS 16 - 050 SCBCR 06	16	50	9	0,06	R
2	203 386	DDS 16 - 050 SCBCL 06	16	50	9	0,06	L
3	203 447	DDS 25 - 080 SCBCR 09	25	80	14	0,25	R
4	203 461	DDS 25 - 080 SCBCL 09	25	80	14	0,25	L
5	203 522	DDS 32 - 100 SCBCR 09	32	100	17	0,53	R
6	203 546	DDS 32 - 100 SCBCL 09	32	100	17	0,53	L

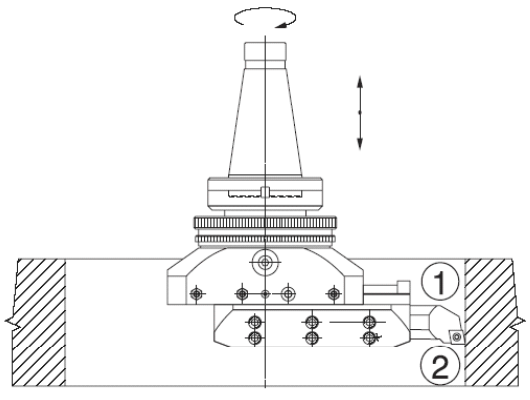
Code: 203 829	DDS16:	CCMT 060204E - UM 8016	US 2505	T7
Code: 203 843	DDS25,DDS32:	CCMT 09T304E - UM 8016	US - 13	T15

The insert holders 305 replace the original direct tools with soldered carbide piece. Together with the insert holders 306 that represent the turning tools they are intended for the following use:

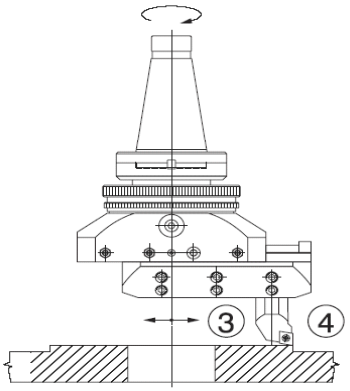
1. Boring of large diameter holes with the head entering the hole.
   - these are SCACL and SCBCL-LEFT holders

2. Facing - use of SCACR and SCBCR-RIGHT holders

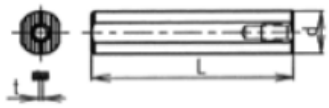
Boring of large diameter holes



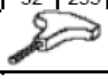
Facing



307 HOLDER BAR **VTS**

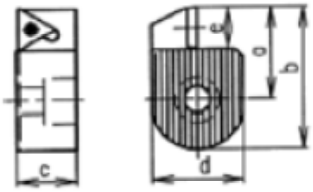


	Code	Description	Dimensions[mm] D	L	t	kg	To
1	203 690	VTS 16 - 075 - 1,5	16	75	1,5	0,11	VHS16,VHZ16
2	203 583	VTS 25 - 085 - 1,5	25	85	1,5	0,31	VHS25,VHZ25
3	203 577	VTS 25 - 145 - 1,5	25	145	1,5	0,51	VHS25,VHZ25
4	203 652	VTS 32 - 135 - 1,5	32	135	1,5	0,78	VHS32,VHZ32
5	203 645	VTS 32 - 235 - 1,5	32	235	1,5	1,4	VHS32,VHZ32

Spare parts:  M6 x 20 07150  4hexagon key

The holder bar (307) replaces the original boring bars. The back face insert holder (308) or the recess/thread insert holder (309) for the clamping of threading or recessing inserts is placed in the front slots and fastened with a screw.

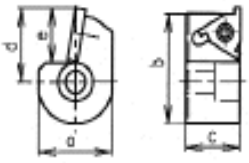
308 BACK FACE INSERT HOLDER **STZCL 11**



	Code	Discreption	Dimensions[mm] D	L	t	kg	To
1	203 690	VTS 16 - 075 - 1,5	16	75	1,5	0,11	VHS16,VHZ16
2	203 583	VTS 25 - 085 - 1,5	25	85	1,5	0,31	VHS25,VHZ25
3	203 577	VTS 25 - 145 - 1,5	25	145	1,5	0,51	VHS25,VHZ25
4	203 652	VTS 32 - 135 - 1,5	32	135	1,5	0,78	VHS32,VHZ32
5	203 645	VTS 32 - 235 - 1,5	32	235	1,5	1,4	VHS32,VHZ32

 Code: 203 289 TCMT 110202 E - UM 8016 US 2505   T 7

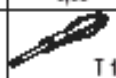
309 RECESS/THREAD INSERT HOLDER **VHZ**



	Code	Description	Dimensions (mm) a	b	c	d	e	kg
1	203 409	VHZ 16 - 1,5 ST - R16	14	27	17	21,5	14,5	0,02
2	203 485	VHZ 25 - 1,5 ST - R16	23	31,5	17	19,5	14,5	0,05
3	203 560	VHZ 32 - 1,5 ST - R16	29	36	17	21,5	14,5	0,08

 TN 16 NR - *** ZZ
*** A = recess width
A: 1,10; 1,60; 2,15; 1,13; 1,85; 2,65

 TN 16 NR *** M - metric threads
*** s = pitch of thread
s: 0,50; 1,00; 1,50; 2,00; 3,00; 0,75; 1,25; 1,75; 2,50

 US 53  T 15

5. Description of Head and Its Function

(picture in Attachment No. 14.4. – cross-section Vhu80)

The basic part of the head is its body (46) in which the dovetail slide (27) is placed perpendicular to the rotation axis. The play between the slideways is delimited with a ruler (18) and three adjusting screws (45) with counter nuts (44). The machine operators DO NOT MANIPULATE with these screws and nuts. The slide-body assembly is reinforced with a screw (19 or 56 inVhu36) that presses the ruler to the slide when tightened. This way, the assembly is better protected against vibration and spontaneous change of pre-set dimension during boring of the cylindrical hole.

ATTENTION! - during manual manipulation (dimension setup or surface working with automatic head feed), the screw has to be slackened.

The feed screw (34) with Tr thread is pivoted on the two friction bearings in the slide. The main bearing is part of the slide, the other one (37) is screwed on. The main bearing intercepts forces that are generated by the cutting tool. Although being pivoted the screw (34) is secured against spontaneous turning by a bar (28) which is pressed by a spring (29) into one of the three holes in the screw head. When the screw is turned, the bar gets engaged into the nearest hole and its head end sits down hard on the ball (33) which prevents it from further axial movement. The bottom part of the ball touches the hexagonal hole for the socket screw wrench. When inserted into the hole the wrench lefts the balls while shifting the bar back. Now the screw is slackened for a quick move of the slide.

ATTENTION! - before removing the inserted wrench from the screw head hole pull the wrench slightly out of the reach of the balls and turn the wrench until the bar engages in the nearest hole and secures the screw against turning. (The guide marks on the screw end determine 3 possible positions for the bar engagement.)

The worm with scale for dimension setup (41) is pivoted in the body and its back under the lid (14) has a ratchet wheel (16) which causes its rotation during automatic feed. The socket screw wrench can turn the worm in both directions. One point on the scale represents a slide movement from the body by 0.005 mm. The play in the gearing should be taken into account which is demonstrated by lost motion of the worm. In order to determine the lost motion we recommend to establish the dimension only from one side of the scale rotation, i. e. to make one more revolution when returning and to return to the required value in the direction of the dimension setup.
The worm wheel (42) is pivoted in the head body with minimum axial play and is also screwed to the feed screw in the slide as nut. When the worm rotates together with the worm wheel the feed screw moves in the axial direction and carries away the slide.
In manual feed of the slide the worm is rotated manually. In automatic feed the worm is rotated by the ratchet wheel.
The automatic feed is derived from the rotation of the head. The mechanism is place in the upper part of the body--in the set of four rings (47, 9, 7 and 6) that are fitted on its upper cylindrical part.
What is their function?
The control ring (47) has pins (12) that are engaged in it. The pins move out of the the spring ring (11). The actuating ring (9) is put on the control ring and when selected in the inner diameter it forms a gate for pin position programming. The ring with numbers (7) is put on the driving pins of the control ring and serves as a carrier with the positions and sizes of feeds marked in red. By turning the control ring when the red mark on the circumference matches another mark on the ring with number the corresponding number of pins (12) moves to the center of the actuating ring to form a barrier that causes the ratchet wheel to rotate if the head is turning and the set of ring is resting.
This is kept resting with the brake ring (6). The brake ring is connected to the the ring with numbers through a projecting safety pin (5) that engages in brake ring ridge with all its cylindrical surface. The ridge has bevelled sides so that on exceeding a certain value of the torque the safety pin moves out of the slot from the ridge and both rings disconnect.
In order to ensure the protective function of the safety pin against dangerous increase of torque and against the resulting overload of its internal mechanism the brake ring contains a pin (54) which is pressed into one of the two teeth of the safety pin by the spring (53) and the adjusting screw (52) in dependence on in what position the safety pin is at a given moment. If the screw (52) is overtightened the safety pin has insufficient place for retreating and the safety pin may become non-functional and fail to disconnect. The brake ring is kept at rest with the bar (50) inserted into the hole on its circumference. When working with the head we recommend leaning the bar against a suitable headrest instead of holding it in hand.
The two adjustable stops (25 and 39) are installed in order to limit the slide way in automatic feed. In case the stop strikes on the stop pin (66) the internal load of the head increases and the safety pin disconnects. In this moment, it is necessary to turn the scale in contrary direction and to release the internal tension and to press the safety pin into one of the ridges. This prepares the head for further function.
There is a flange (4) screwed on the body over the rings to which a clamping taper is screwed with four screws. The tools and holders are clamped in the slide with screws (31 and 32).

6. Basic Operations Performed with Vhu

List of Operations

1 - Hole boring
2 - Facing
3 - Internal recessing
4 - Recessing
5 - Back facing
6 - Machining of external surface
7 - Boring of taper hole
8 - Machining of external taper
9 - Thread cutting

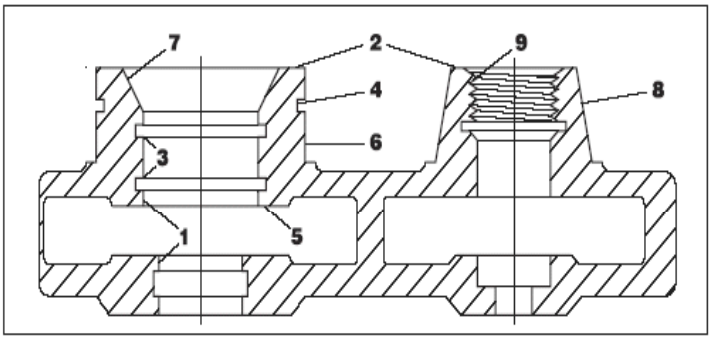
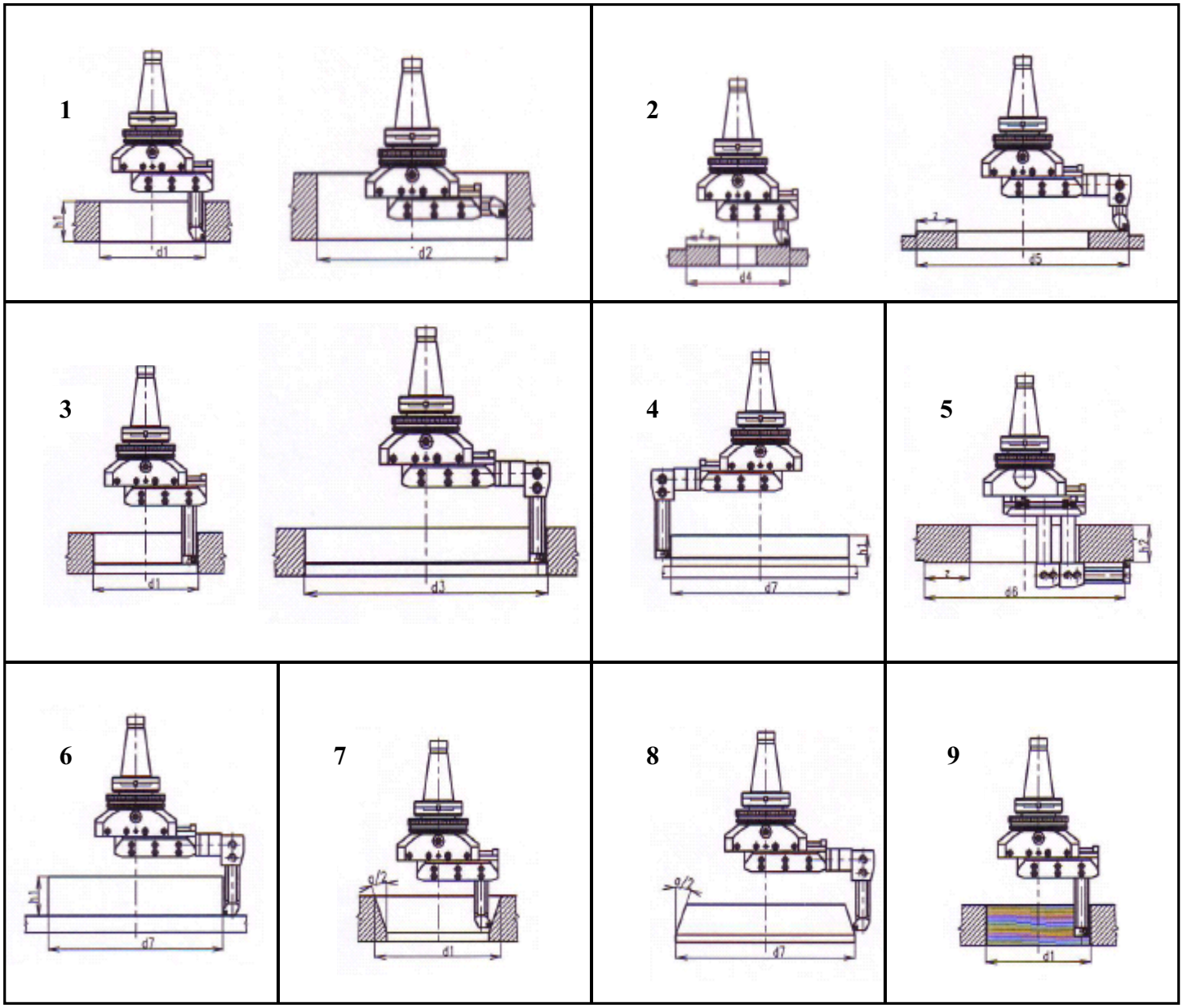


Table of limit dimensions for basic operations according to the drawing

	Z max [mm]	d max [mm]						
		d1	d2	d3	d4	d5	d6	d7
Vhu 36	36	92	160	225	88	230	200	200
Vhu 56	56	170	250	360	210	320	300	280
Vhu 80	80	210	300	410	180	380	380	320
Vhu 110	110	270	340	450	240	430	430	370
Vhu 125	125	280	390	650	245	610	600	530
Vhu 160	160	350	480	720	340	690	690	610

The “h” lengths in the drawing are always determined by the tool used or by its working length

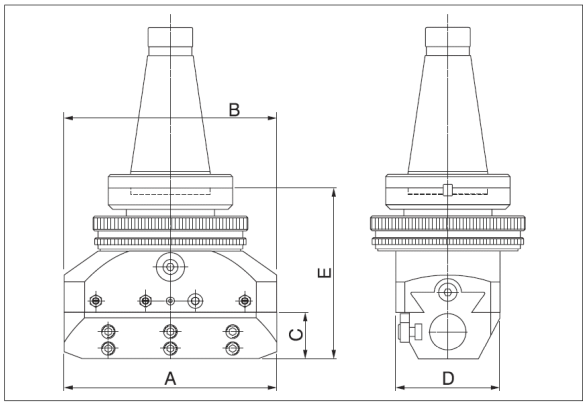


7. Basic Technical Parameters

	Vhu	36	56	80	110	125	160
Slide motion	max.[mm]	36	56	80	110	125	160
Facing diameter	max.[mm]	230	320	380	430	610	690
Boring diameter - minimum	[mm]	6	12	12	12	12	12
Boring diameter - maximum	[mm]	225	360	410	450	650	720
Automatic feed	mm.rev^{-1}	0,02 0,04 0,06	0,05 - 0,10 - 0,15 - 0,20				
Hend rapid feet	mm.rev^{-1}	3				4	
Accuracy of adjustment		1 DIV = 0,01 mm/Ø					
Diameter of clamping holes	[mm]	16 H8	25 H8			32 H8	
Weight of head without taper	[kg]	2,1	7,5	8,1	8,4	12,4	13,8
Size of taper shank		VK 360	VK 801				

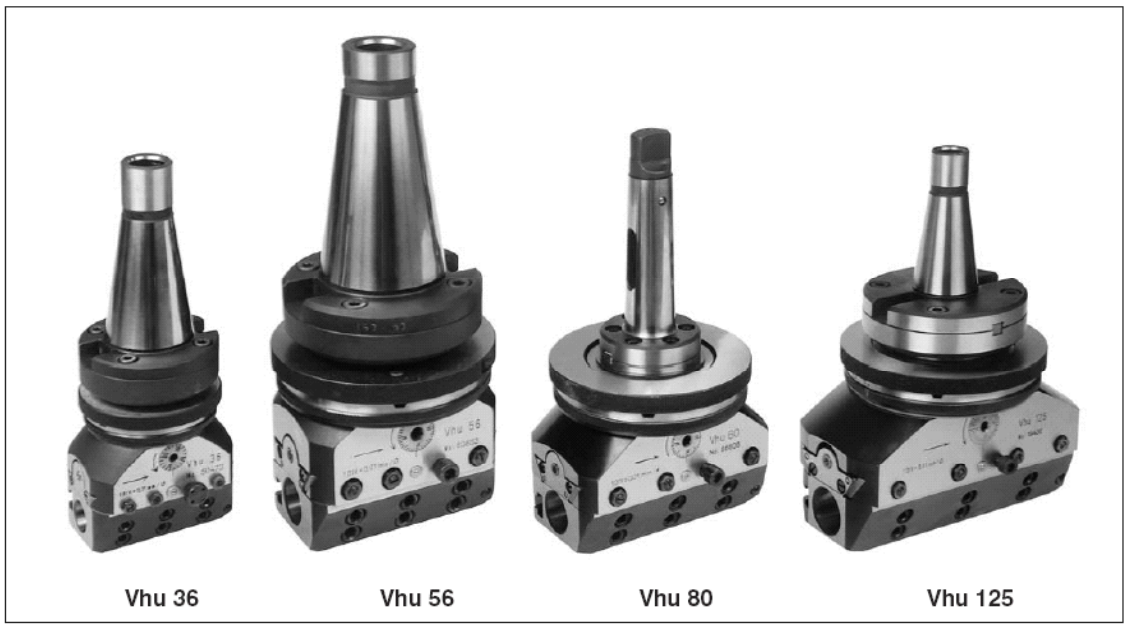
8. Basic Dimensions

	A	B	C	D	E
Vhu 36	78	78	28	53	100
Vhu 56	115	115	36	80	134
Vhu 80	140	140	36	80	134
Vhu 110	165	140	36	80	134
Vhu 125	190	190	42	92	151
Vhu 160	225	190	42	92	159



9. Clamping Taper Shank Assembly

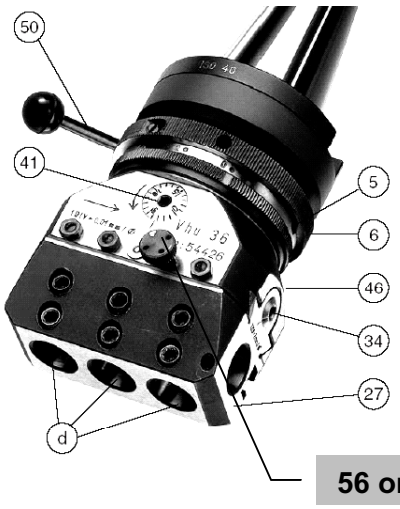
The taper shank is mounted to the centering hole of the flange (pos. 4) which is attached to the head body with six screws (pos. 60). Vhu36 and Vhu56 do not use springs (pos. 64) for the interception of the torque. Vhu36 has a flange diameter of 70 mm, other heads have 110 mm of diameter. The shank is attached to the flange with 4 screws (pos. 1). The screws need to be tightened across and evenly so that the heads remain aligned with the taper. The list of shanks is given in Attachment 14.7. on page 24.



10. Clamping of Head on Machine

The head is clamped in the machine spindle in that the taper shank is inserted into the spindle cavity and clamped in dependence on the taper shank type. During clamping make sure both clamping surfaces are clean (clamping taper and cavity). The taper shank MORSE with the tang need to be secured with a wedge against falling out of the machine spindle.

11. Application



Vhu 36

Vhu 80

39 – left dog

66 – pin

25 – right dog

LEGEND:

5	safety pin
6	braking ring
27	slide
41	worm with scale for fine adjustment of dimension
46	body
34	adjusting screw with scale for quick slide feed
50	stopping bar
56,19	slid locking screw (pos. 56 for Vhu36)

11.1. Boring Internal and External Diameters

When boring internal (diagram 1 on page 11) and external diameters (diagram 6 on page 11) the automatic feed of the head is not used and it is recommended to move the safety pin (pos. 5) out of mesh.

For quick adjustment of the slide, press the socket screw wrench for quick feed (34) 12 mm deep into the internal hexagon of the head. Now you can feed the slide by turning.

One point of the scale for quick slide feed means:

For Vhu 36, 56, 80 and 110 - slide feed by 1 mm = 2 mm per Ø
For Vhu 125 a 160 - slide feed by 2 mm = 4 mm per Ø

One screw revolution for quick feed of the slide corresponds:

For Vhu 36, 56, 80 a 110 - slide feed by 3 mm = 6 mm per Ø
For Vhu 125 a 160 - slide feed by 4 mm = 8 mm per Ø

After adjusting the slide, the screw for quick feed has to be secured against turning. Pull the socket wrench a little so that it remains only 4 mm deep in the hole and then turn the screw to align with the fixed guide mark on the slide (27). Check whether the screw is properly secured against turning by trying to turn the wrench in both directions.
In the fine adjustment of the slide (27) turn the scale for fine adjustment on the worm (41) with the socket wrench. Move the slide in the direction of the arrow by turning in the direction of the arrow. One mark on the scale for fine adjustment means a slide shift by 0.005 mm = 0.01 mm per Ø.
When performing fine adjustment consisting in a transition from a larger dimension to a smaller we recommend to turn the scale for fine adjustment by more than half of a revolution than the dimension and then to return to the required dimension. This will remove the influence of the free play of the gearing (lost motion).
After adjusting the dimension secure the adjusted dimension by the safety screw on the slide (19). You can reduce the value of the lost motion by slight tightening of this screw during fine adjustment.

11.2 Facing and Back Facing

(drawing 2 and 5 on page 10), Internal and External Recessing (drawing 3 and 4 on page 10)

During these operations when transverse slide feed is applied the screw for slide securing (19 or 56) has to be slackened. .
The Vhu heads can be engaged to the following automatic slide feeds:

Vhu 36 head	0.02 – 0.04 – 0.06 mm / revolution
Vhu 56, 80, 110, 125 and 160 heads	0.05 – 0.10 – 0.15 – 0.20 mm / revolution

The feed is engaged by turning the control ring (9) so that the guide mark filled with red colour on the ring points against the hole filled with red colour on the corresponding number denoting the cross feed size in hundredths of milimeters per revolution on the scale of the automatic transverse feed - ring (7). The feed engagement can be best performed by getting hold of the control ring (9) by the thumb and index of one hand on the knurling part while getting hold of the brake ring (6) with connected safety pin (5) by the thumb and index of the other hand and turning both rings against one another.
On completion of all these jobs that make use of automatic slide feed disengage the feed. For security reasons, engage the feed when the machine is at rest.

When the machine is at rest - after engagement of the corresponding transverse feed - turn the brake ring (6) at least by 1 revolution against the spindle turning direction!

Maximum spindle revolutions:	for Vhu 36	800 rpm
	for other boring heads	500 rpm

The automatic transverse feed of the slide is actuated by the braking of the ring set through the brake ring (6) to which the holding bar (50) is inserted. Hold the bar in hand only during adjustment, for safety reasons it is necessary to lean the bar against a fixed dog placed at the machine spindle. Take into account that the feed start is conditioned by connected clutch - inserted safety pin (5) place in the brake ring (6) which is pressed by finger or with a flat screw-driver into one of the two ridges in the ring with numbers (7).
When braking the control ring and when turning the head to the right the slide move in the direction marked by the arrow place on the slide side next to the fine adjustment scale, when turning the head to the left the slide moves against the arrow direction.
The transverse feed is automatically stopped when one of the dogs (25 or 39) to the dog pin (66) or when the torque abruptly increases as a result of tool blunting or tool break-out with subsequent increase of cutting resistance. The sensibility of the safety pin activation (5) can be regulated with the adjusting screw (52). This screw pressed or releases the spring (53) that works against the pin (54). When it is screwed deeper try to pull the safety pin (5) out with a flat screw-driver to make sure the safety pin is working. In case the safety pin is not working properly and the spring threads (53) stuck together slacken the adjusting screw a little and test the safety pin function again.

Dog Adjustment for Disconnection on Precise Diameter
The dog (25 or 39) has to be adjusted and secured so that the transverse feed might be stopped whenever the cutting edge of the tool achieves the desired diameter. Therefore you need to adjust the safety pin disconnection (5) in order that the necessary disconnecting pressure between the dog and the dog pin (66) is the smallest possible. That means the adjusting screw (52) has to be screwed down only to the minimum.
Despite that, the desired dimension is slightly overrun. The overrun is inside the tolerance for recess diameters for safety pins. For more precise boring you can adjust the dog according to the following instructions:

The dog (25 or 39) has to be adjusted and screwed tight so that it disconnects right before achieving the desired diameter. That means that e. g. move the slide approximately by 0.2 mm back by turning the scale for precise adjustment (41) and hitting the dog to the dog pin (66) and securing the screws firmly.

After a testing disconnection measure the difference between the desired diameter and the actual diameter. The dog can be adjusted as follows:

Do not release the dog but rather move the slide back so that an end gauge (e.g. 2 mm) might be pushed in between the dog and the dog pin.
Secure the slide against moving by the slide locking screw (19 or 56) so that its position does not change when the dog displaces.
Assemble the new end gauge as follows:
If the actual diameter measured after the test disconnection is larger than the desired diameter the new end gauge has to be by half of the measured difference smaller than 2 mm.
Now release the dog and hit it up to the new adjusted end gauge leant against the dog pin (66) and clamp firmly.
Remove the end gauge and slacken the slide locking screw. The disconnection of the automatic transverse feed is now adjusted for the desired diameter.

After running on the dog first release the tense mechanism by several revolution of the scale for precise adjustment in a direction opposite to the feed. Then you can move the slide back with the screw for quick slide feed (34).

11.3 Boring Cylindrical Holes and External Cylindrical Surfaces

When boring cones the transverse slide feed needs to be connected to the axial feed of the spindle. This expects a firm interconnection of the spindle revolutions with its axial feed.

Determination of slide feed and spindle feed in dependence on taper angle:
The diagram of taper boring (see Attachment 14.1 and 14.2) gives the required feeds of the slide and the spindle for corresponding taper angles. The diagram (14.2) shows that for a desired top taper angle of 70° you can select the slide feed of 0.05 mm per revolution and the spindle feed of 0.071 mm per revolution, or you can select the machine feed of 0.142 mm per revolution for the slide feed of 0.10 mm per revolution. The diagram also gives the spindle feeds in mm/min in dependence on spindle revolutions per minute. Try to select the smallest possible values of spindle feeds but when boring tapers with small top angles you will not be able to avoid relatively large feeds that deteriorate the surface quality. The surface of the bored taper may then be rough caused by interrupted transverse feed. Besides, a conventional machine might lack the required feeds for the for the desired taper and you cannot avoid deviations in the taper shape. Therefore, an additional calibration with another tool needs to be performed for precise tapers.

Tool clamping:
When the spindle turns to the right the slide feed can be oriented only in one direction. Despite that you can bore widening or contracting tapers. (Diagram in the Attachment on page 20).

If the tool is clamped in the direction of the transverse slide feed you can bore a widening taper. If the same tool is clamped against the direction of the transverse slide feed you can bore a contracting taper. When clamping the tool ensure that the tool tip is aligned to the plane formed by the head revolution axis and the slide feed direction. Otherwise, the bored tape might not be precise.

Basic Recommendation for Taper Boring

1. The diagram in Attachment 14.1 or 14.2 specifies cutting conditions for various given top taper angles. In case the value of spindle feed differs from the value in the diagram it is possible to perform a checking re-calculation of the actually bored angle with the following formula

$$\operatorname{tg} \alpha_{actt.}/2 = s_s / s_v ,$$

where: $\alpha_{act.}/2$ - half of the actually bored top angle of the taper [°]
s_s - selected automatic slide feed [mm per head revolution]
s_v - selected spindle feed [mm per spindle revolution]

2. Select a suitable tool from the tool accessories and clamp the tool to the head as described above.
3. Prepare the head for taper boring.

- First dog - the one that could prevent the slide feed should be placed on the border in order not to be in the way
- Second dog - install the second dog on a suitable place and use it for measuring the slide advancement into the chip with the help of inserted basic gauges between the dog and the dog pin (66).
- Neutralize the safety pin (5) by tightening the adjusting screw pos. 52
- Engage the selected automatic feed of the head
- Slacken the locking screw pos. 19 or 56

1. Prepare the machine for taper boring
   - Engage suitable revolution rate and the selected spindle feed (there has to be a firm relation between the revolutions and the spindle feed that is given by the machine construction or by a suitable programming function - G on NC and CNC machines).
   - Prepare a suitable support for the stopping bar pos. 50 that will be inserted to the corresponding holed of the brake ring. of the spindle, Ensure smooth sliding motion of the spindle during its axial motion.
2. Determine the basic position of the head over the worked piece from which the head will start and to which the head will return after completing the chip boring and in which the chip will be added. Recommended distance of the basic plane is 2 - 3 mm over the worked piece surface.
3. Prepare the boring program.
   - Start with the basic diameter of the cylindrical hole that is to be bored into a taper
   - Determine the chip depth with regard to the vibration and also determine the total number of chips necessary
   - Program of boring cycle that is to be repeated during the whole process of boring should include the following steps:
     - Stopping the spindle (with clamped head) in the basic position over the worked piece and manually - using the scales for precise adjustment - advancement of the slide to the chip depth.
     - Starting the spindle (and simultaneously starting the spindle feed) - taper boring and further stopping the spindle - immediately after the tool gets out of engagement
     - Return of the head and the slide to the basic position from which it started in the previous cycle. The return is done manually - turn the control screw for quick slide adjustment pos. 34 back and turn it another 1/3 revolution further and achieve the desired dimension with the scale for precise adjustment, simultaneously define the lost motion in the gears.

Chip depth is added with the help of the scale for precise adjustment. Either deduce the chip depth as well as the total value of slide advancement or use the basic gauge and the dog to monitor only the total slide advancement.

ATTENTION!
Do not forget that the head has disengaged safety pin. That means that during automatic feed you cannot move the slide up to the limit position or up to the installed dog. Therefore, proceed very carefully. Pay close attention to the axial motion of the spindle because the slide feed is derived from it.

This way of taper boring can be used on conventional machines where the spindle feed is connected with its revolution and also on NC and CNC machines that use the G function to ensure this functionality. External tapers can also be turned in a similar way.

11.4. Thread Cutting

The Vhu head can cut cylindrical threads and also taper threads in a limited degree. Both methods need a firm relation between the spindle feed and its revolutions. The same conditions apply also for taper thread cutting.
When cutting cylindrical threads prevent the interception of the brake ring (6) that could cause slide motion (27).

Steps:
Clamp the tool.
Engage appropriate spindle revolutions and the feed that corresponds to the thread pitch; the feed is to remain engaged during the whole job.
Use the screw (34) for quick slide feed to adjust the slide to the starting diameter, take the chip with the scale for fine slide adjustment and tighten the screw that secures the slide (19 or 56).
Start the rotation, cut the thread and stop the rotation.
Slacken the screw (19 or 56), remove the tool with the screw (34) for quick slide removal and its scale by 1 mark from the work surface.
Start rotation in opposite direction and advance the tool from the hole - the spindle feed is still engaged and also the head feed is in function.
Return the screw (34) to the original position and take another chip - repeat the process as needed until the thread cutting is complete.
For cutting taper threads, it is necessary to determine the size of the transverse slide feed according to the following formula:

$$\text{slide feed [mm per revolution]} = \text{thread pitch [mm]} \times \operatorname{tg} \alpha / 2$$

where: $\alpha / 2$ is half of the top angle
spindle feed [mm per revolution] = thread pitch

If the result corresponds to head feeds offered you can cut the threads without fear. Otherwise an angle deviation may occur and it is necessary to evaluate its feasibility.

The clamping of the tool and its adjustment to the given diameter as well as the steps of the process are described in Chapter: Taper Boring. **In this case the slide feed is continuously engaged and disconnects only after the completion of the job.**

12. Maintenance, Lubrication and Storage of the Head

Normal maintenance includes cleaning and lubricating the head. Internal parts of the boring head are lubricated by pressing the lubrication fat AK2 into lubricators (13) with the lubrication gun. The motion screw in the slide is lubricated with machine oil as needed at its advancement to both border dogs. Store the head in a clean and conserved state. Conserve the head with KONKOR 101 conservation agent and place it in the wooden box in a dry and non-aggressive environment.

13. Guarantee and Guarantee Conditions

1. Term of guarantee: The producer provides a 12 month guarantee for defect-free operation starting from the day of purchase by the first direct consumer (maximum 18 month guarantee from delivery from the producer to the distributor).
2. The guarantee does not cover the parts that have shorter service life as specified by corresponding technical standards or that are regularly replaced. The producer does not guarantee for damage caused by the shipping company, for defect caused by incompetent manipulation, inadequate storage conditions, overloading or severe treatment.
3. Transportation costs for shipping to the place of guarantee repair and back are paid by the producer on condition the producer approved the means of transportation.
4. When exercising a complaint it is unconditionally necessary to send or submit the invoice testifying the purchase of the instrument. Without this document, the repair will not be considered as guarantee repair and will be billed. The claim is considered as guarantee repair on condition that
    a) the product works in such conditions and in such manner as specified in the operation manual and the maintenance and operation instructions are observed.
    b) no design modification were performed on the product by the customer or another person without prior approval of the producer and the product suffered no incompetent assembly interventions.
5. Guarantee repairs are performed by the producer within 30 days from the complaint admission.
6. The producer also performs all repair of the products after the the guarantee period expires. .