

INSTRUCTION BOOK

HEADS
LINEA MODULAR
LINEA CONTROL

INDEX



SAFETY RECOMMENDATIONS	Pag 01
EXCLUSIVE USE	Pag 02
UNHAUTORIZED MODIFICATIONS	Pag 02
TRANSPORT AND STORAGE	Pag 02
HEADS WITH INTERNAL COOLANT	Pag 03
RUN-IN	Pag 04
POSITIONING OF THE STOP BLOCK	Pag 05
ORIENTATION OF ARBOR (CONTROL HEADS)	Pag 06
ADJUSTMENT OF CONICAL PIN	Pag 07
ADJUSTMENT OF THE PINS	Pag 07
INSTALLATION OF THE FLANGE	Pag 08
EXTENSION SPACERS (MODULAR HEADS)	Pag 09
ANGULAR POSITIONING OF MODEL T90 AND TCU HEADS (MODULAR AND CONTROL)	Pag 10
ANGULAR POSITIONING OF MODEL TCU HEAD	Pag 11
PRESETTING	Pag 12
ANGULAR POSITIONING OF MODEL TCU TOOL DRIVE	Pag 12
CLAMPING THE TOOL ON MODELS T90 - TCU	Pag 13
CLAMPING THE TOOL ON MODELS T90-5, T90-8, TDU-8, T90-10, TDU-10	Pag 14
CLAMPING THE TOOL ON SMART CHANGE HEADS	Pag 14
CLAMPING THE TOOL ON HSK QUICK CHANGE HEAD	Pag 15
MAINTENANCE	Pag 16
TAPPING	Pag 16
TECHNICAL DATA OF THE STANDARD HEADS	Pag 17
WARRANTY	Pag 17
DISCLAIM OF RESPONSIBILITY	Pag 18

SAFETY RECOMMENDATIONS

- *Do not touch or hold anything near the angle head when it is running or rotating in any way. When the angle head is mounted in machine spindle or in its tool magazine, be sure it is not overheated and the spindle rotation is locked handling it in any way.*
- *When the angle head is to be used, ensure its drive taper is correctly connected to the machine spindle, the arrester arm and block engage full and properly and that the cutting tool is clamped tightly before engaging machine spindle drive.*
- *Check the direction of cutter rotation is correct before cutting metal.*
- *Take care when setting up angle heads. They are made of cast iron and steel, are relatively heavy and can injure personnel, animals, or damage property if dropped whether caused by its inertia or incorrect handling tools used. This is not only true in case persons, animals or things are struck by an angle head but also in case of improper or insufficient protection of hands, arms, legs, feet and portion of the face including and especially eyes.*

ATTENTION !!! – The incorrect use of the head due to: exceeded torque during machining, non observance of the instructions for the coolant through tools, long term rest of the unit in cold and humid environment and the lack of general maintenance can cause serious damage not only to the unit but also to the machine and the operator.

AUTOMATIC TOOL CHANGE

- *Check carefully that the weight and dimensions of the head are within the limits specified by the machine builder.*
- *Check Automatic Tool Change (ATC) timings, loading cycle and unloading cycle thoroughly before running the machine in auto cycle.*
- *Every 40/50 hours check the release pin (inside the Anti-Rotation Pin) moves freely and performs its function without obstruction.*
- *Check carefully that the automatic tool change is in good conditions and underwent the needed inspection and maintenance. Do not load angle heads in the tool magazine if the max weight allowed for ATC is lighter than the one of the angle head. The manufacturer is not liable for any damage to the angle head or caused by the angle head to person, animals or things if the automatic tool changer is unsuitable, broken or inefficient.*



EXCLUSIVE USE

All Alberti tools are designed and manufactured to be used on machining centers and for the following operations only:

- *Drilling*
- *Milling*
- *Tapping*

Any other use is non-conform.

The manufacturer is therefore not liable for any damages caused by misuse.

The technical data and the performance limits of each tool is shown in the catalogue and on the relative technical drawings.

UNHAUTORIZED MODIFICATIONS

Do not modify, alter or tamper the tools without prior approval from Alberti.

The manufacturer is not liable for resulting damage of unauthorized modifications. The risk and responsibility are solely taken by the customer.

The original spare parts customer may need for self repairs can be purchased at Alberti who can also assist the customer from a technical point of view.

Repairing or dismantling angle heads as well as each customization had to be done at Alberti main shop or authorized dealers, unless otherwise agreed. Any tampering of the head even only for investigation or study purposes, is at the risk of the user and will determine the loss of warranty and interruption of the causality link between mighty damage caused by head and the action made by Alberti.

TRANSPORT AND STORAGE

The product is carefully inspected, packed and shipped with no faults or damage.

The manufacturer is not liable for damages occurred during transportation.

In case of damage or incorrect goods received, the customer should immediately contact the manufacturer and give written notice of the discrepancy within max 48 hours from delivery.

Store the head in a clean, dry environment and at a temperature higher than 15°. Carefully clean and lubricate all the surfaces with protective oil.

Please make sure to stock and store the items properly, according to general code of practice, in a clean environment with suitable temperature and humidity degree. The items should also rest on proper holding fixtures which cannot cause any damage to the angle head itself - following to condensation or sinking or outcropping of salt, rust or lubrication.

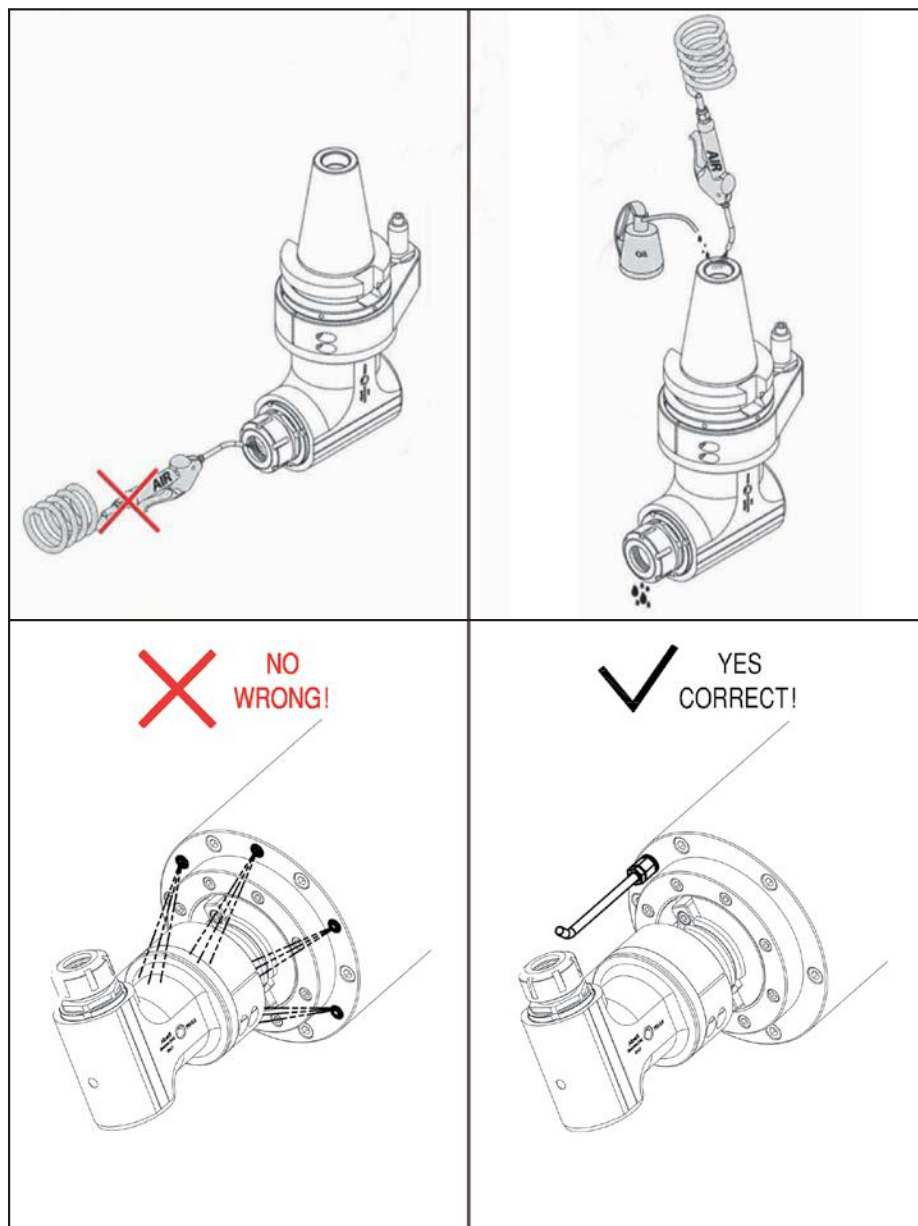
An incorrect storage of the goods may lead to the failure of the unit, cause damage to third parties so that to determine the loss of warranty and interruption of the causality link between mighty damage caused by head and the work action made by Alberti.

ANGLE HEADS WITH INTERNAL COOLANT

- *DRY RUNNING* on the angle heads with high pressure coolant through the spindle IS NOT POSSIBLE unless specifically written on the head casting and in the instructions.
- Enough quantity of coolant must always flow into the unit. *DRY RUNNING* is therefore forbidden and can cause serious damage to the unit, cutting tool and third.
- Only use coolant filtered at 15/20 μ m
- Do NOT lean your hands or other parts of the body close to the cutting tool edge when the high pressure coolant flow is on as it may cause serious damage.

WARNING!!

For angle head with internal coolant, DO NOT blow air through the output spindle. Should you leave the tool unused for a while, put few drops of oil into the input spindle to lubricate using compressed air.





RUN-IN

A short run-in of the head is accomplished during the final test to check all components for satisfactory operation. After the first installation the customer should complete the break in procedure of the head by alternating the rotation of the unit at the speed shown in the chart below to 10 minute rest.

The failure of complying with the indications suggested can cause damage to the head. It can also lead to an abnormal overheating and premature failure of the unit and will determine the loss of warranty.

HEAD	500 RPM	1000 RPM	2000 RPM	3000 RPM	4000 RPM	5000 RPM	6000 RPM
T90-0.4-0.5	3 min	3 min	5 min	5 min	5 min	5 min	4 min
T90-TCU-1.5	3 min	3 min	5 min	5 min	5 min	5 min	4 min
T90-TCU-2.5	3 min	3 min	5 min	5 min	5 min		
T90-TCU-3.5	3 min	3 min	5 min	5 min	5 min		
T90-4.5-5	5 min	10 min	10 min	5 min			
T90-TDU-8	5 min	10 min	10 min	5 min			
T90-TDU-10	5 min	10 min	10 min	5 min			
TR-1.5	3 min	10 min	7 min	5 min			
TR-2.5	3 min	7 min	5 min	5 min			
TR-3.5	3 min	7 min	5 min				

For the first 150 working hours after break in there will be a noticeable increase in the temperature, as all internal rotating parts need to self adjusted.

During this stage it is not possible to run the head at higher RPM as it has not warm up yet but it's very important to start running the head at lower RPM and step by step increase the speed similar to the chart above but without any rest pause.





POSITIONING OF THE STOP BLOCK

PHASE 1



- Position manually the stop block on top of the reference pin
- Press the block until the end of the release stroke
- Measure dimension "X" from the top surface of the block to bottom of the ring nut as shown

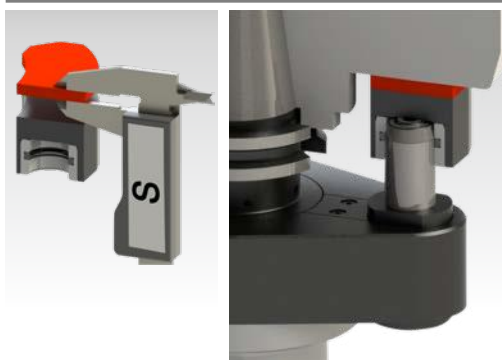
PHASE 2



- Load the angle head in the machine spindle manually without stop block
- Measure dimension "Y" from the machine spindle surface to the bottom of the ring nut as shown

PHASE 3

Case 1: If "X" is shorter than "Y"

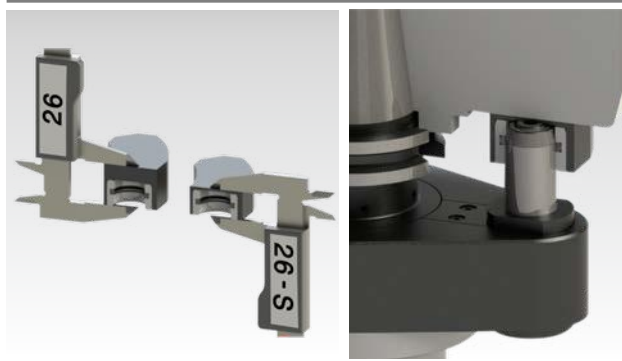


- Prepare a simple spacer whose thickness can be determined according to the following formula

$$S=Y-X-1$$

- Mount the spacer between the machine spindle surface and the stop block as shown

Case 2: If "Y" is shorter than "X"



- Shorten the stop block from the side without bore according to the following formula:

$$S=X-Y+1$$

- It is possible to remove max 8mm. In case the required thickness is even shorter, please turn to Alberti Umberto S.r.l.*
- Mount the stop block as shown

PHASE 4

- Bore the holes in the standard stop block (and the eventual spacer) in order to be mounted on the machine spindle surface. Use the existing holes on the machine spindle, if possible or contact the machine manufacturer. If the operator cannot understand or complete the above procedure, please refrain from installing the head and contact Alberti or the machine manufacturer.

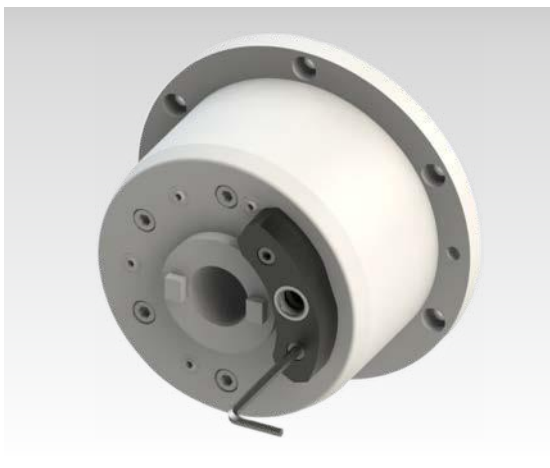




ORIENTATION OF ARBOR (CONTROL HEADS)

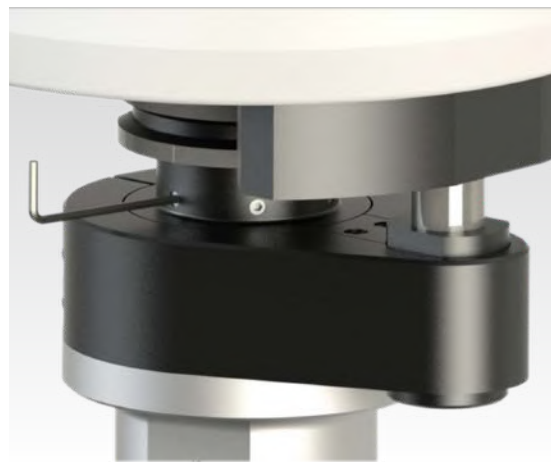
To locate the retaining block at the correct distance from the spindle center line and to assure the correct orientation of the arbor with reference to the retaining sleeve, use the following procedure:

PHASE 1



- a) Secure the retaining block by slightly tightening the fixing screws.
- b) Orientate the machine spindle using M19 function

PHASE 2



- c) Loosen set screws in the equipment through one turn and fit the head into the machine spindle (make sure that the retaining sleeve slips in easily). To orientate the spindle use M19 function.

PHASE 3



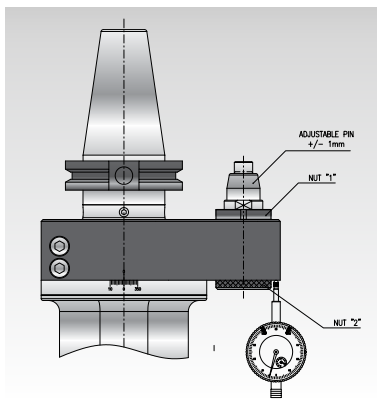
- d) Fully tighten the fixing screws of the retaining block. Remove and carefully clean set screws ; put a few drops of Loctite 242e or equivalent on the threads. Check whether the collet chuck is properly oriented for tool change.
- e) Drive in set screws of orientation ring
- f) Unload and load the head several times at first manually and then with the automatic tool changer to check for correct operation.
- g) Periodically check the position and tightening of the screws.

ATTENTION: During the first automatic tool change make sure that the head does not interfere with other components of the system!



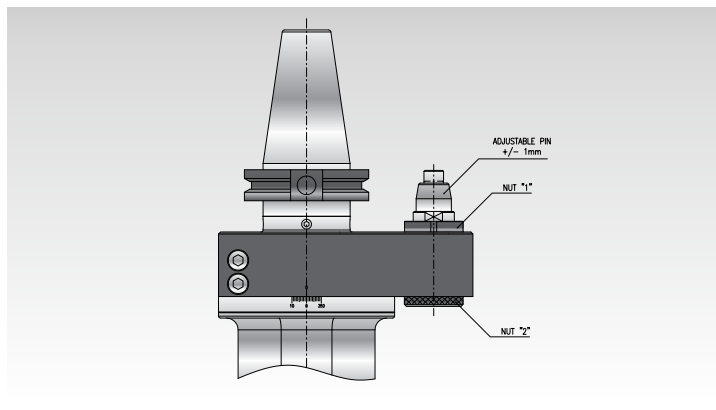
ADJUSTMENT OF CONICAL PIN

FASE 1



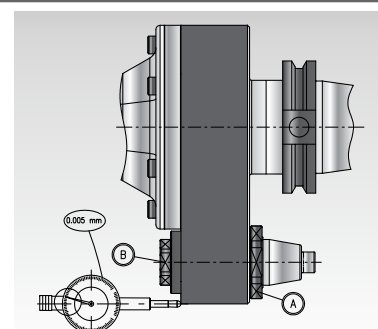
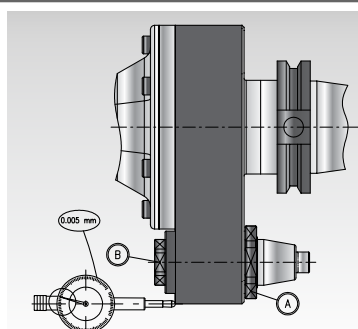
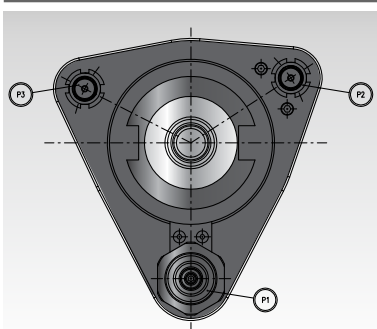
- Unscrew 2 turns the nut 1
- Screw 2 turns the nut 2 (the pin moves down)

FASE 2



- Mount the head into the machine spindle
- Put a dial indicator under the flange
- Unscrew 2 turns the nut 2
- Screw the nut 1 (the pin moves up) till you have a deformation under the flange of 0,005 mm
- Tighten and lock the nut 2
- Tighten and lock the nut 1
- Check that the deformation is 0,005 mm

ADJUSTMENT OF THE PINS - P1 P2 P3



In order to adjust the support pins that they can perfectly match with the references on the machine spindle. Please follow the instructions for each single pin:

- Mount the head manually in the machine spindle and match the pin P1 with the stop block installed on the machine.

PIN P1

- Tighten the nut (A) and eventually loosen the nut (B) until the pin touch the reference on the machine (matching with backlash)
- Position a dial indicator as shown in the picture
- Tighten nut (A) and eventually loosen nut (B) until you reach a shifting dimension of 0.005/0.010 mm on the dial indicator
- Tighten nut (B) by holding tight the nut (A) with the wrench.

PINS P2 E P3

- Tighten the pin (C) and eventually loosen the nut (D) until the pin touch the reference on the machine (matching with backlash)
- Position a dial indicator as shown in the picture
- Tighten pin (C) and eventually loosen nut (D) until you reach a shifting dimension of 0.005/0.010 mm on the dial indicator
- Tighten nut (D) by holding tight the pin (C) with the wrench
- Repeat the same operation for pins P2 and P3

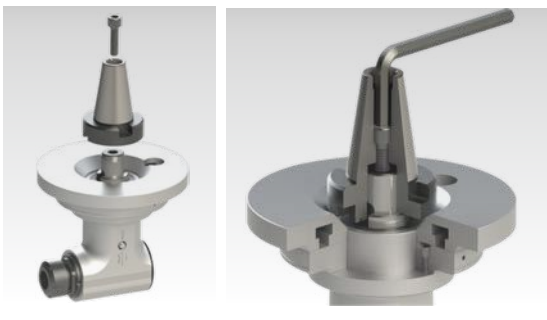




INSTALLATION OF THE FLANGE (MODULAR HEAD)

In order to mount the angle head on the machine, please follow the instructions below:

PHASE 1



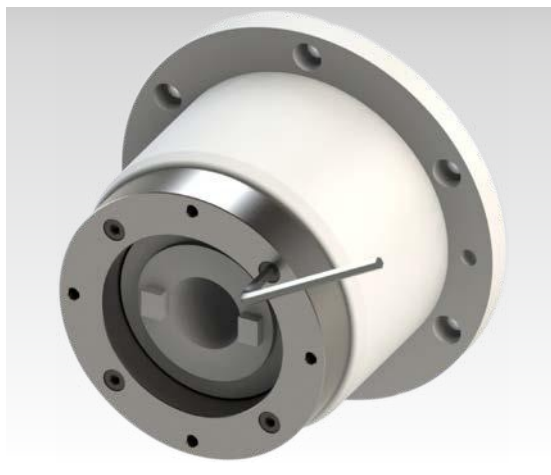
a) Secure the shank onto the head through the M10 screw inside of the shank

PHASE 2



b) Measure dimension "X"
 c) Remove the head from the machine spindle and build a spacer with dimension as follows: "x" + 0,5÷0,6mm. Make sure that the spacer can be mounted between the machine spindle and the head.
 d) **Togliere la vite M10 che blocca il cono alla testa.**

PHASE 3



e) Mount the spacer on the machine and
 f) Insert and clamp the shank into the machine spindle and remove M10 screw holding the shank to the head

PHASE 4



g) Mount the head in the machine and tighten at least 3 screws
 h) Check to be sure the drive nuts on the shank are not coming in contact with the head, damage to the bearings may occur.

If the operator cannot understand or complete the above procedure, please refrain from installing the head and contact Alberti or the machine manufacturer.





EXTENSION SPACERS (MODULAR HEADS)

For Alberti MODULAR series heads, extension spacers are available which allow the user to extend the length of the head as required. However, more than two extensions should not be used. To mount the extension, please use the following procedure.

PHASE 1



- a) Remove the upper link
- b) Slide the extension spacer onto the head. Make sure that the driving tangs enter their seats.

PHASE 2



- c) Secure the extension to the body by using the screws, washer and wrench given.

ATTENTION Make sure that the screws on the extension lock without touching the bottom of the tapped holes in the body.

PHASE 3



- d) Add the upper link and secure it with the screws.





ANGULAR POSITIONING OF MODEL T90 AND TCU HEADS (MODULAR AND CONTROL)

To set tool clamped in the head in horizontal, vertical or intermediate position use the the following procedure

PHASE 1



figura 1



figura 2

- a) Mount the head on the machine;
- b) Loosen the two screws shown in the pic. 1 for T90cn-1,5, T90cn-2,5, T90cn-3,5 heads and the six screws shown in pic 2 for T90cn-4,5 head and T90cn-5;
- c) Swivel body to the required position;

PHASE 2



- d) Check for precise position with a dial gauge (move the contact point on the ground face of the body sides).
- e) Fully tighten the six screws of T90cn-5 and T90cn-4,5 heads or moderately tighten the two screws of the other T90cn sizes (do not use an extension for the Allen wrench). Suggested screw torque 8/10 Nm.

Screw torque values are laser marked on each head.

Exceeding the torque allowed may cause damage to the bearings inside of the head.





ANGULAR POSITIONING OF MODEL TCU HEAD

To set the tool clamped in the head in horizontal, vertical or any intermediate position through 360° use the following procedure:

PHASE 1



- a) Mount the head on the machine and swivel the tool drive to the 90° position (read the graduated scale provided on the tool drive).
- b) Loosen the two screws and swivel body to the required position;
- c) Clamp a ground, sufficiently long gauge in the collet and use a dial indicator with flat point as shown to check for precise position.

PHASE 2



- d) Moderately tighten the two screws (do not use a wrench extension).
Suggested screw torque 8/10 Nm for TCU cn 2.5/3.5 and 6/8 Nm for TCU cn 1.5.





PRESETTING

When the head is correctly oriented and positioned graduated ring can be reset. Loosen screw and rotate the ring until the zero coincides with the reference notch in the indexing flange. Tighten screw again).

ANGULAR POSITIONING OF MODEL TCU TOOL DRIVE

Use the following procedure:



- a) Use the six screws and swivel the tool drive to the required position (use the graduated scale provided on the tool drive).
- b) Moderately tighten the six screws (do not use an Allen wrench extension).
Suggest screw torque 8 Nm for TCU cn 2.5/3.5 and 5 Nm for TCU cn 1.5.

ATTENTION – For more accurate positioning check with a dial gauge on a ground gauge clamped in the collet and rectify as necessary before tightening the six screws.

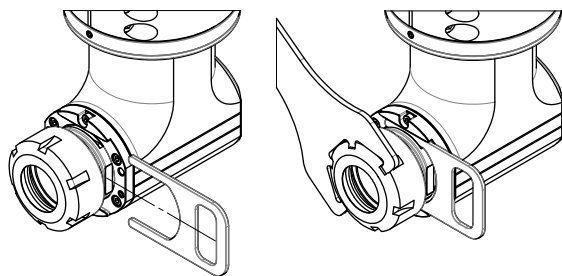




CLAMPING THE TOOL ON MODELS 790 - TCU

In order to clamp the cutting tool in the toolholder please follow the below instruction:

PHASE 1



- a) Press the indexing pin and rotate the input spindle of the head (half turn);
- b) Insert the correct ER collet;
- c) Close the nut few turns on the toolholder;
- d) Insert the cutting tool and tighten the nut by hand; **IMPORTANT!!! USE THE 2 WRENCHES** in the box to fully tighten the nut. One should be inserted onto the toolholder and the other one in the nut as a contrast;
WARNING: the non-observance of the instructions may cause damage to the bevel gear set.
- e) **IMPORTANT:** The max torque used should not exceed 25% of the torque suggested in the chart below. Too much torque applied correspond to an increased stress in the collet chuck area. To solve any issue please use a torque wrench;
- f) Use the same opposite procedure to unclamp the tool.

COLLET TYPE	ER-8	ER-11	ER-11	ER-16	ER-16	ER-16	ER-16	ER-20	ER-20	ER-20	ER-25	ER-25	ER-25	ER-25	ER-32	ER-32	ER-40
TOOL DIAMETER (mm)	0.5 5	1.0 2.9	3.0 7.0	1.0	1.5 3.5	4.0 4.5	5.0 10	1.0	1.5 6.5	7.0 13	1.0 3.5	4.0 4.5	5.0 7.5	8.0 17.0	2.0 2.5	3.0 22.0	3.0 26
RECOMENDED TORQUE (Nm)	6	8	24	8	20	40	56	16	32	80	24	56	80	104	24	136	176



CLAMPING THE TOOL ON MODELS T90-5, T90-8, TDU-8, T90-10, TDU-10

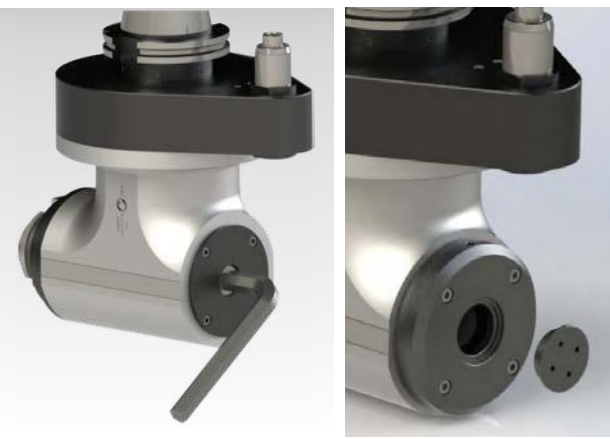
To clamp the tool in the ISO 40 or ISO 50 spindle it is necessary to hold the spindle or the tool in order to prevent that the clamping force damages the bevel gear pair in the head.

PHASE 1



a) Mount the ISO 40 or ISO 50 tool in the output spindle;

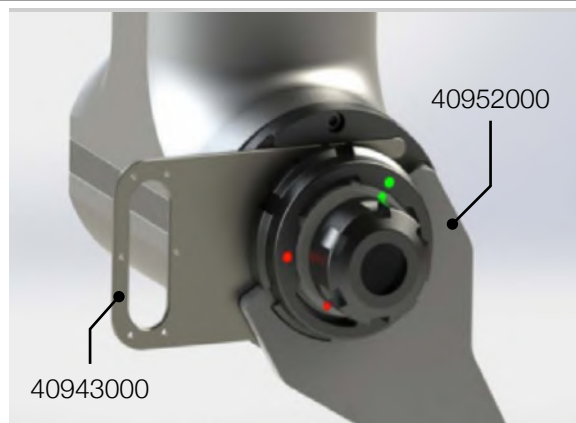
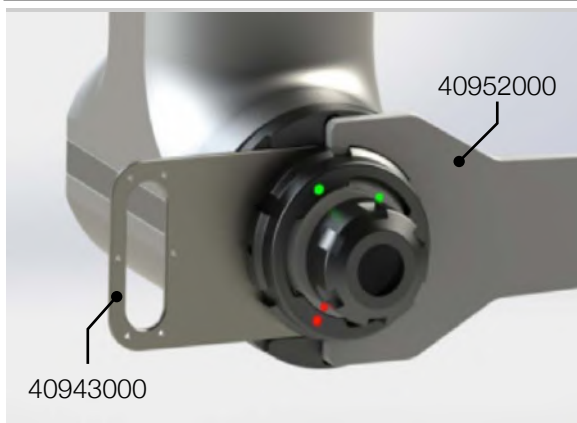
PHASE 2



b) Use the draw bolt screw given in the box from the back
c) Tighten with the wrench given.

ATTENTION! For the heads with internal coolant through the spindle, remove the the nut on the back before doing the same operation following a,b,c. above. Then tighten the nut again.

CLAMPING THE TOOL ON SMART CHANGE HEADS



- Carefully clean the adapter and the housing inside of the head by using a soft rag and alcohol. Use the first wrench 40943000 as contrast
- Rotate the ring nut counter clockwise
- Insert the adapter into the SMART CHANGE receiver or spindle by matching the RED dots
- Use the second wrench 40952000 and rotate the ring nut clockwise until the two green dots match. (Torque required 23-27 Nm)

ATTENTION: REMEBER TO REMOVE COMPLETELY THE WRENCHES 40952000 AND 40943000 BEFORE STARTING THE OPERATIONS.





CLAMPING THE TOOL ON HSK QUICK CHANGE HEAD

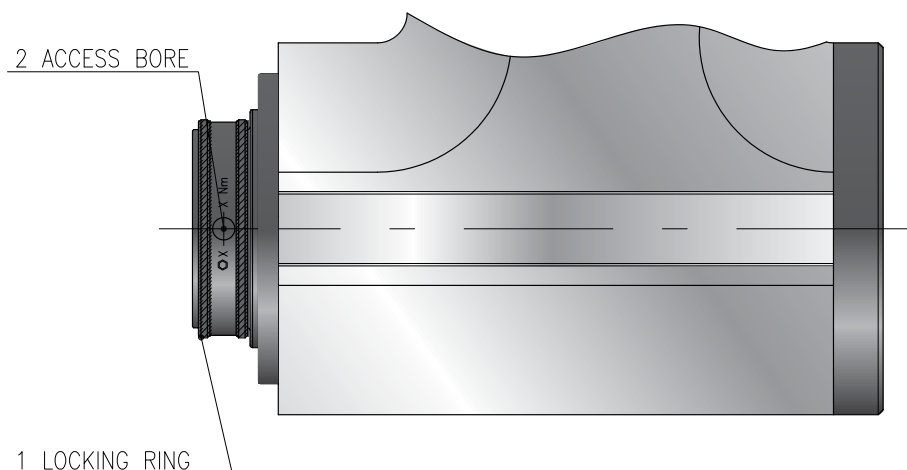


Tabella 1

HSK size	SWs	max. permissible torque Ma [Nm]	max. draw-in force [Kn]
25	2,5	1,5	4,5
32	2,5	3,0	7,0
40	3,0	6,0	12,0
50	4,0	14,0	20,0
63	5,0	27,0	28,0
80	6,0	54,0	40,0

1. Prior to connecting the HSK shank ensure the joining surfaces of the holder and the spindle are clean.
2. Turn the locking ring (1) until the access bore (2) to the clamping screw is open (Fig. 1).
3. Turn back the clamping screw over the threaded spindle with hexagon key SWS (table 1) until limit stop is felt.
4. Install HSK shank.
5. With hexagon key or the torque wrench tighten the clamping screw SWS clockwise to the torque MA (table 1) specified below.
6. Withdraw the clamping key, close the access bore (2) with locking ring (1) to protect against contamination.


MAINTENANCE

The heads are supplied already greased and ready for use.

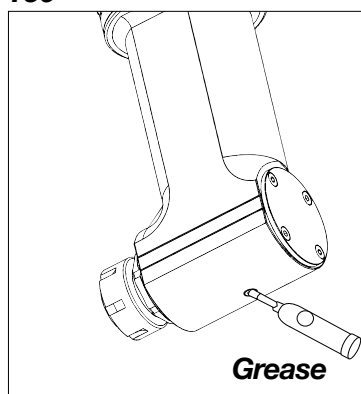
The following lubrication intervals and grease quality are suggested:

T90 every 1000 working hours; 30-50 g grease inject through the grease cup provided on the head.

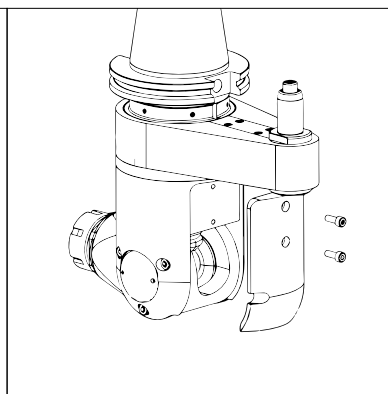
TCU every 500 working hours; 30-50 g grease through the opening accessible after removal of guard. If too much grease is used, do not direct the coolant flow on the head because the TCU model is not coolant proof. Also check for sufficient grease more frequently.

 **Keep to the suggested time intervals and grease quantities. Poor or excessive lubrication could be harmful.**

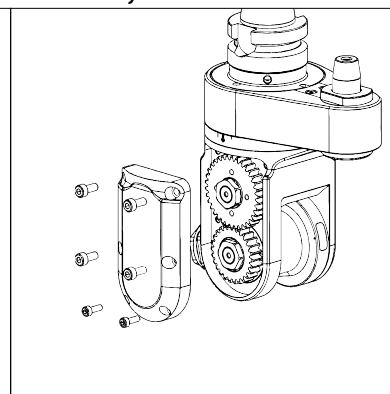
T90



TCU



TCUcn-0,5



Customer Service: ALBERTI UMBERTO S.r.l.
Via Gorizia n. 37 – 21047 Saronno (VA)
T. +39 02 96703586 - F. +39 02 96703620
info@albertiumberto.com

TAPPING

These collets are perfectly interchangeable with the normal collets, then the same head is suitable for drilling or tapping operations.

The specifications of these collets are in the next page.

HEAD	COLLET TYPE	CAPACITY	STROKE
T90-1.5	ET - 1-16	M1-M6	7 mm
T90-TCU-2.5	ET - 1-25	M1-M12	8 mm
T90-TCU-3.5	ET - 1-32	M4-M16	10 mm
T90-4.5	ET - 1-40	M6-M20	13 mm



TECHNICAL DATA OF THE STANDARD HEADS

	T90-0,4	T90-0,5	T90-1,5	T90-2,5	T90-3,5	T90-4,5	T90-5	T90-8	T90-10	TCU-1,5	TCU-2,5	TCU-3,5	TH90-1,5	TH90-2,5	TH90-3,5
Rt	1:1	1:1	1:1	1:1	1:1	1:1	1:1	1:1	1:1	1:1	1:1	1:1	1:1	1:1	1:1
RPM max Min 1	10000	10000	8000	6000	4000	4000	3000	3000	3000	4000	4000	4000	10000	9000	8000
MAX LOAD N	60	120	250	510	1250	1750	1800	2400	3300	450	480	715	250	510	1250
MAX TORQUE Nm	2	5	7	20	40	75	100	100	250	6	18	32	7	20	40
COLLET TYPE	ER-8	ER-11	ER-16	ER-25	ER-32	ER-40	ISO-40	ISO-40	ISO-50	ER-20	ER-25	ER-32	ER-16A	ER-25	ER-32
TOOL DIAMETER mm	5	7	10	16	20	30	-	-	-	13	16	20	10	16	20
WEIGHT kg (estimated)	4	4	4,5	5,5	11	17	22	33	77	4	7	13	4.5	5.5	12

WARRANTY

The ALBERTI heads are guaranteed for 12 months from the date of purchase. During this period parts proved to be faulty or unserviceable as a consequence of defective material or faults of design or manufacture will be repaired or replaced provided they are returned to the factory carriage free.

The warranty does not cover damaged seals and bearings and any damages or faults resulting from negligence or incorrect use, inexperience or inappropriate storage (not following the rules and advice shown in this manual) by the purchaser. The warranty also ceases if payments are not made on the dates agreed or the heads or parts thereof have been modified, tampered or repaired without ALBERTI's authorization



DISCLAIM OF RESPONSIBILITY

Alberti is not liable for any damage towards the purchaser or assignee to the end user (including personnel, animals, things, products, tools, semi-finished and finished products) caused by incorrect or inconsistent use of the head not complying with caution, care and competence required to the operator.

In particular Alberti is not liable for damages caused by using and storing the head NOT in compliance with this user's manual.

The angle head is NOT a stand-alone component and it can only be used on a suitable machine tool. Therefore it is forbidden to force the item to rotate without proper connection to the machine tool or through appropriate devices. Alberti is not liable for damages to the head and or to people, animal and things caused by the use of the head without being mounted on a machine tool.

The angle head is for professional use only and cannot be used for different purposes. Moreover it cannot be used for hobby, home improvement or by people, authority or companies who are not specialized in professional metalworking.

The angle head is NOT a toy and shouldn't be manipulated or used by people under 18 and/ or for different purposes than the mechanical production.

The head should not be used by unskilled workers and therefore the purchaser or assignee should train and instruct the personnel through appropriate training programs in order for the workers to be able to use the head properly and according to the instructions and safety rules.

The head is made up of different materials that can be hazardous to the health if they get in contact with mucosa or flabby parts of the human body or animals. Therefore the head should have never been used in a way to get in contacts with the mouth, eyes, nostrils or other physiological openings of the human body. Strictly avoid the contact of the head with wounds or other diseases that allow the flow and transmission of substances and bacteria into the human body and animals such as cuts, sores, papules or similar.

In any case or event of breaking down or abnormal functioning, the unit should be immediately removed and isolated from any mechanical or electrical source and should be placed in a suitable, strong and sealed packing.

In the same package the customer should also include eventual components or fragments of the head that might have detached. In no way the user should try to repair or restore the unit by himself as the head should be shipped as it is to Alberti for inspection and repair. Any repair done by customer should be excluded by unauthorised personnel from company Alberti unless the warranty has expired. In no way is Alberti responsible for damage to the head towards people, animals or things caused by incorrect handling of the head followed by a break down or malfunctioning.

In order to handle the broken or abnormal functioning unit properly, please consider the following options:

- *The head can be overheated and therefore can cause burns or abrasions to people, animals and things.*
- *The head can conduct electricity*
- *The head can accumulate different types of kinetik energy*

As a consequence removing and paking the head into contatiners should be carried out with the use of protection tools for both operators and cutting tools which allow a safe handling of the heads and a barrier against higher temperature or released electricity and / or kinetik energy.





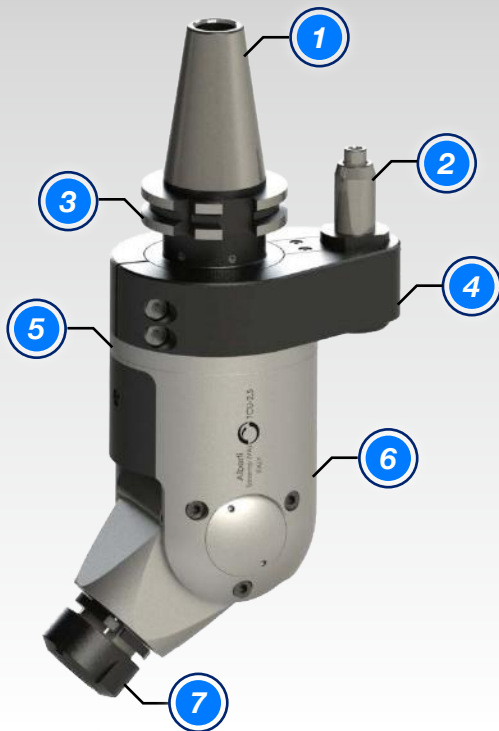


HEAD DETAILS



- 1 MAIN SPINDLE
- 2 ANTIROTATION PIN
- 3 ORIENTATION RING
- 4 INDEXING FLANGE
- 5 GRADUATED RING
- 6 BODY
- 7 CLAMPING NUT FOR ER
- 8 LAPPED SURFACE FOR ALIGNMENT

HEAD DETAILS

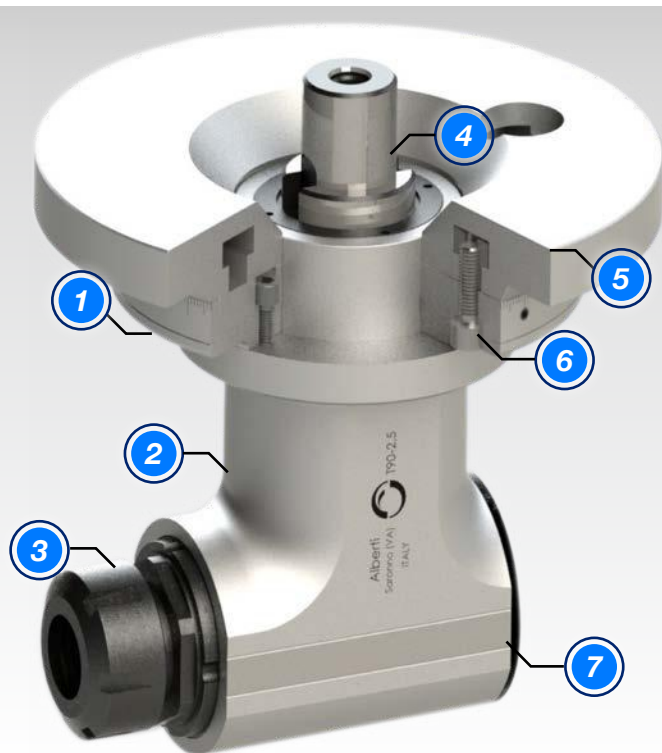


- 1 MAIN SPINDLE
- 2 ANTIROTATION PIN
- 3 ORIENTATION RING
- 4 INDEXING FLANGE
- 5 GRADUATED RING
- 6 BODY
- 7 ADJUSTABLE TOOL DRIVE





HEAD DETAILS



- ① GRADUATED RING
- ② BODY
- ③ CLAMPING NUT FOR ER
- ④ MAIN SHAFT
- ⑤ UNIVERSAL FLANGE
- ⑥ ADAPTING FLANGE
- ⑦ LAPPED SURFACE FOR ALIGNMENT

