



BARUFFALDI S.p.A.

TITLE

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TOE

series TURRETS

**TECHNICAL MANUAL
for use & maintenance**

Warning : All specifications included in this manual may be
changed without notice



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IDENTIFICATION LABEL

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TURRET

Turret

PART NUMBER

Part number

MOTOR 3 ~

N. of Poles

Motor pole number

V

KVA

Hz

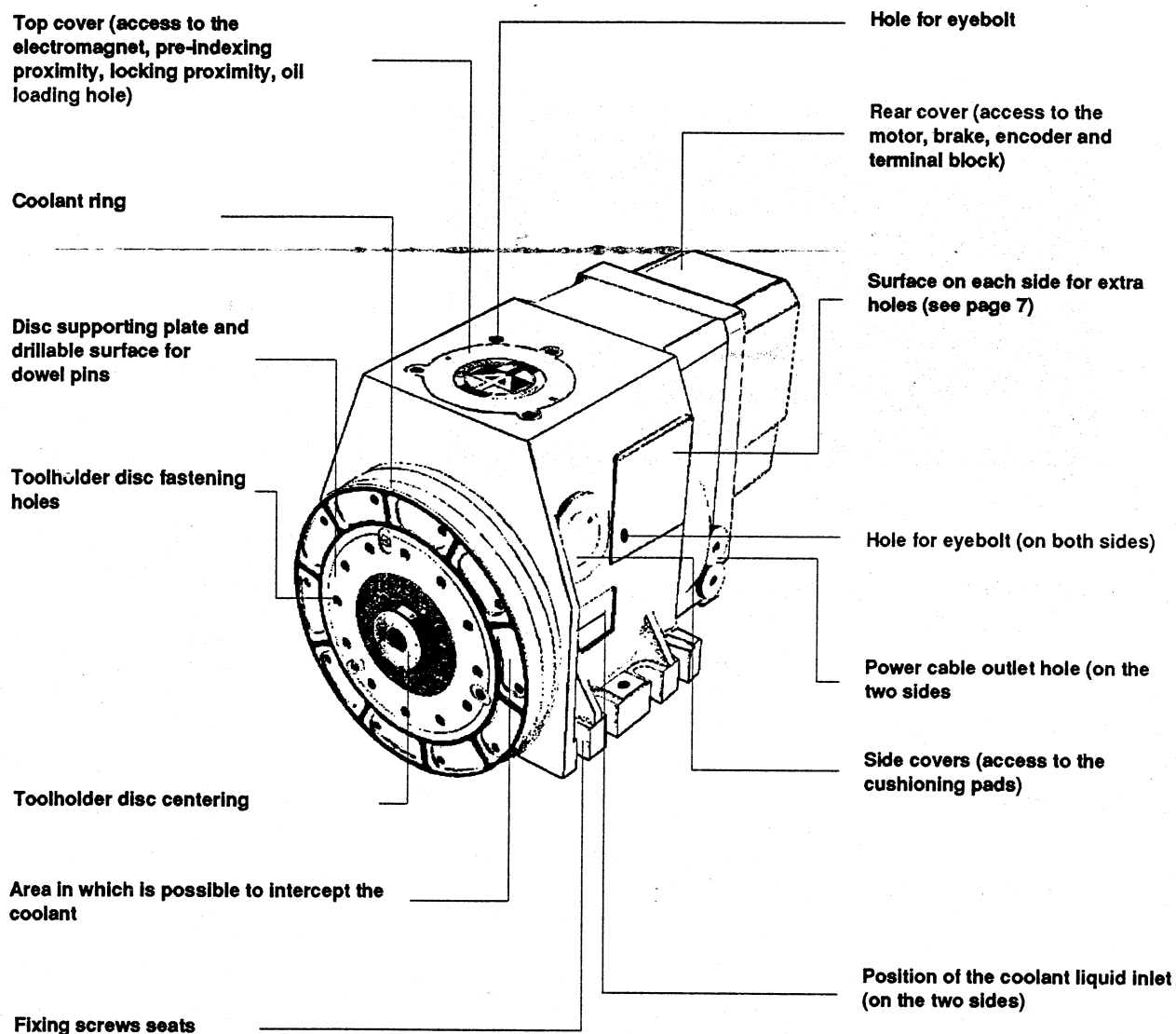
Motor Voltage

Motor power

Motor - frequency



The turrets consist of a fixed part (casing) containing all the elements for indexing, and a moving part where the toolholder disc is installed. The disc rotation axis is parallel to the casing mounting face.
Turrets series TOE, generally provided with 6, 8 or 12 positions, change from a position to the following one, rotating both in counterclockwise and clockwise direction.



Turret Size	Diameter hole for eyebolt	Diameter cable outlet holes
TOE 120	M 8	PG 13,5
TOE 160	M 8	PG 13,5
TOE 200	M 10	PG 16
TOE 250	M 12	PG 16
TOE 320	M 27	PG 16
TOE 400	M 30	PG 16



The mounting surface where the turret has to be installed must be clean and not damaged, its flatness error must be within 0.01/100 mm.

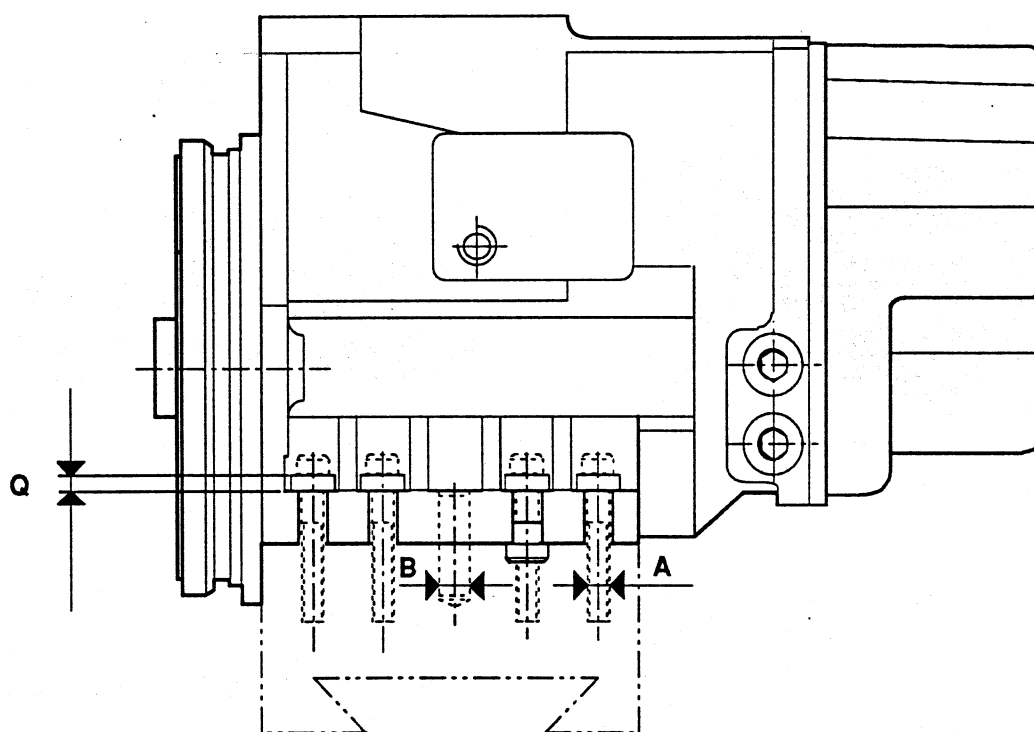
If necessary adapt the height by inserting a packing plate under the base of the turret.

By using fixing screws almost fully tightened, line up the turret, or rather the toolholder disc with the spindle axis, then tighten the screws.

It is even possible not to install the dowel in order to allow the turret to slip with respect to the slide (if there is an impact) Then the dowel can be lined up again.

IMPORTANT NOTE

Whenever checking the lining up and the centre height of the turret or of the toolholder on it, the turret must be in a locked condition. If this rule is not followed, problems in the setting up will arise.



Turret Size	Ø A (mm)	Ø B (mm)	Washers thickness Q (mm)
TOE 120	M 10	12	6
TOE 160	M 10	14	6
TOE 200	M 12	16	8
TOE 250	M 16	21	8
TOE 320	M 20	23	10
TOE 400	M 24	27	10

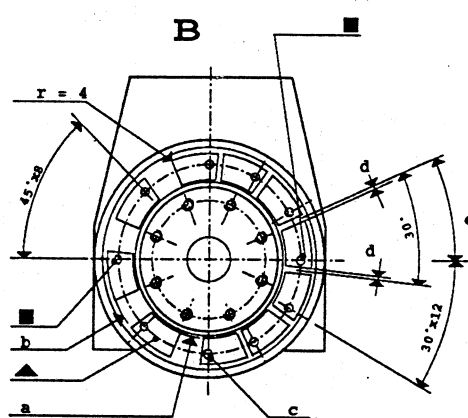
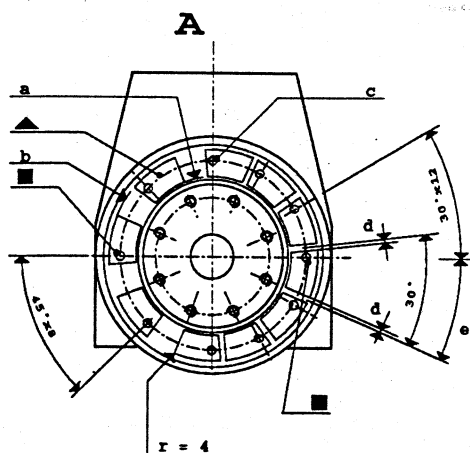


It is possible to make coolant liquid feed holes on both sides of the turret. The feed pipe has to be connected in either one of the two. The not utilized hole for the liquid coolant inlet must be plugged.

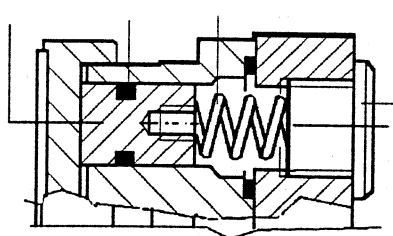
The drilled bush (033) must be mounted on the hole where it is foreseen the liquid coolant outlet on the toolholder disc; the other bush (033a not drilled) must be mounted on the other hole.

■ Coolant liquid inlet hole position

▲ Area in which it is possible to position the hole for interception of the coolant liquid in "model A" or in "model B", on the 8 or 12 position face plate.

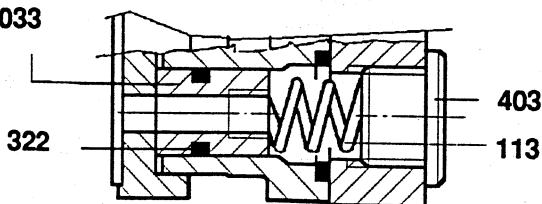


033 a 322 113 403



Turret Size	a	b	c	d	e(grad.)
TOE 120	124	166	6	1,5	24°
TOE 160	153	200	7	2	25°
TOE 200	186	237	8	2	25°
TOE 250	226	292	11	2	25°30'
TOE 320	308	373	14	2	25°30'
TOE 400	390	452	14	2	26°15'

033





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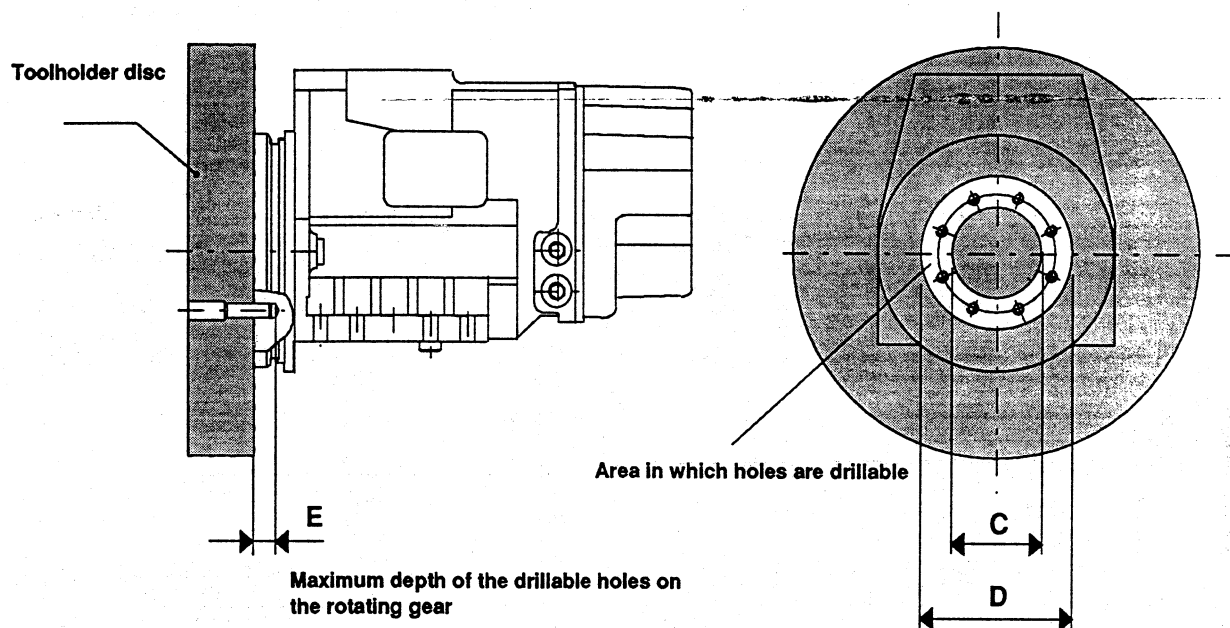
APPLICATION OF THE TOOLHOLDER DISC ON THE TURRET

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The toolholder disc is installed and fixed on the turret with screws, while its orientation is determined by suitable drilling and pinning.

The DIN 69880 seats must be aligned with respect to the nominal dimension X foreseen with a maximum error of $\pm 0,02$ mm. It is even possible not to install the dowels in order to allow the toolholder disc to slip with respect to the rotating ring gear (if there is an impact). Then the dowels can be lined up again.

The picture represents the maximum allowable depth of holes; on the rotating gear, and the areas where they can be made.



Turret size	C (mm)	D (mm)	E (mm)
TOE 120	82	98	15
TOE 160	88	128	15
TOE 200	110	156	20
TOE 250	130	194	20
TOE 320	170	240	30
TOE 400	240	320	30



Wiring inside the turret must be executed according to the scheme on page N° 8.

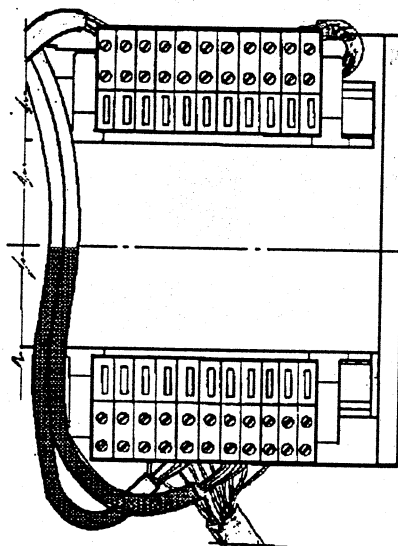
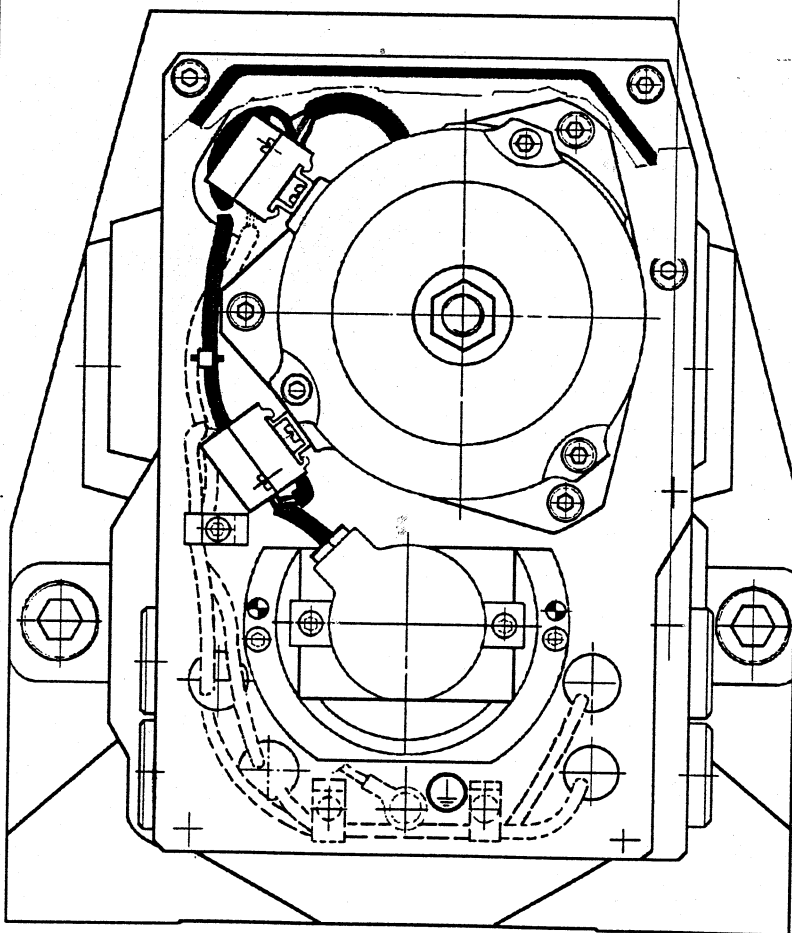
Wires must be arranged carefully so that they cannot be damaged or stripped in any way, particularly when finally closing the rear cover 011. Suitable anchoring bands are provided for this reason below the terminal blocks and we recommend their use, and their substitution with new ones in case of deterioration.

The wires must be kept close to the edge of the turret, any slackness being tucked away in safe spaces and fixed back with bands.

The sides of the turret each have two threaded holes for electric cables and reception of their protective conduits.

The unions and the conduits must be arranged and fixed in such a way as to ensure that the liquid coolant cannot possibly penetrate into the inside of the turret.

Any holes not used for the passage of cable must be hermetically sealed



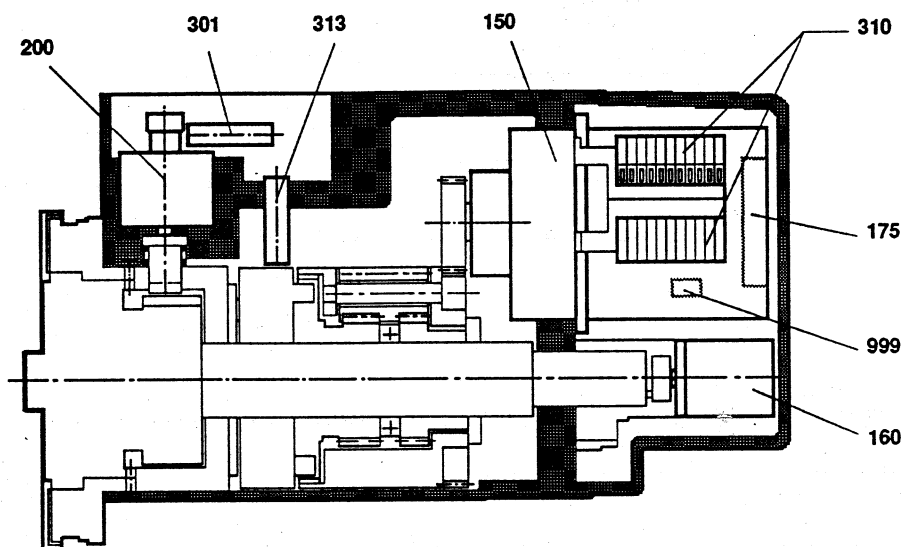
After having finished the wiring connections, carry out the test of correct phase connection of the AC motor.



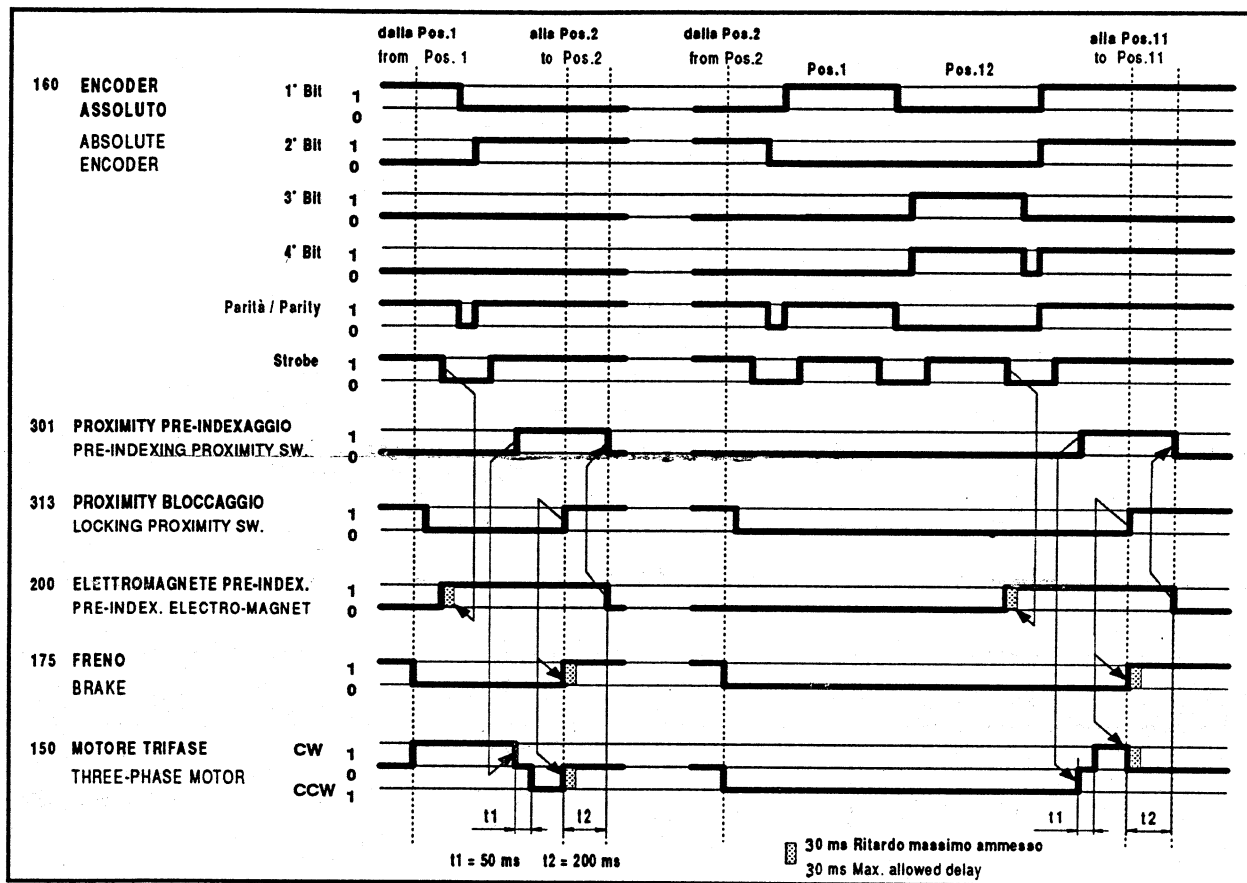
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CONNECTIONS & LAYOUT OF ELECTRICAL COMPONENTS

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Ref.	Component - Specification		Colour - Connections		Type - Notes
160	ABSOLUT ENCODER binary code	1° BIT 2° BIT 3° BIT 4° BIT PARITY STROBE + 24 Volt 0 Volt Screen	White Yellow Green Violet Red Black Brown Blue Yellow/ Green	1 2 3 4 5 6 7 8 9	Encoder typ e 10 for TOE 120 - 400
301	LOCKING PROXIMITY SWITCH	+ 24 Volt 0 Volt Output	Brown Blue Black	7 8 10	Diam. 12 mm L= 45 mm Ripple 10 % Output PNP-NO max. 300 mA Short circuiting protection
313	PRE-INDEX. PROXIMITY SWITCH	+ 24 Volt 0 Volt Output	Brown Blue Black	7 8 11	
200	P R E - I N D E X I N G ELECTROMAGNET	24 Volt DC	Orange Orange	12 13	24 Volt 60 Watt 50 % ED
999	TERMOSTATIC SWITCH		White White	14 15	Contatto normalmente chiuso. Apre a 120°C Normally closed type contact (120°C)
175	BRAKE	24 Volt DC	Black Black	16 17	
150	THREE PHASE MOTOR		Black X Y Z Red Red Red	18 U V W	110 Volt 50/60 Hz 220/380 Volt 50/60 Hz Ground
310	TERMINAL BLOCK				

**CYCLE DESCRIPTION**

The above operation diagram shows the sequence to be followed in order to move from position 1 to position 2, in clockwise rotation (with the turret tool-holder disk in front), and from position 2 to position 11 in anticlockwise rotation.

The brake is first de-energised and the motor feed for rotation in the direction selected. When the falling wavefront of the STROBE signal for the previous station is arrived at, the pre-indexing electromagnet is energised as quickly as possible (within the maximum permitted delay time).

With the electromagnet energised, the pre-indexing proximity switch signal is awaited, which confirms the rotation has been halted by means of the index key. Upon receipt of this signal the motor is immediately halted and the rotation sense is reversed after a 50 ms pause.

The locking proximity switch signal is then awaited, before halting the motor as rapidly as possible and energising the brake (within the maximum permitted delay time).

A safety check can be carried out at this point and consent for machining can be given, followed by electromagnet de-energising after a 200 ms pause.

NOTE: The maximum care should be taken regarding the permitted delays, particularly their repeatability. (Delays should be measured directly on the turret component devices).

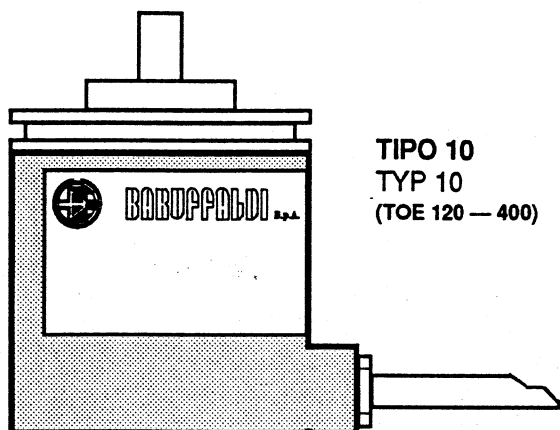


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ENCODER CODE TABLE

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TIPO 10
TYP 10
(TOE 120 — 400)

A (1° BIT)	WHITE
B (2° BIT)	YELLOW
C (3° BIT)	GREEN
D (4° BIT)	VIOLET
PARITA'	RED (parity)
STROBE	BLACK
+ 24 VOLT	BROWN
0 VOLT	BLUE

Screen YELLOW-GREEN

ENCODER CODE TABLE

POSIZIONE POSITION	A	B	C	D	PARITA' PARITY	STROBE
1	●				●	●
2		●			●	●
3	●	●				●
4			●		●	●
5	●		●			●
6		●	●			●
7	●	●	●		●	●
8				●	●	●
9	●			●		●
10		●		●		●
11	●	●		●	●	●
12			●	●		●

SPECIFICATIONS

- Power supply 24 Volt dc +/- 10 % Ripple 10 %
- PNP outputs (50 mA max) BINARY code
- PARITY Check and STROBE signal
- Reverse polarity protected
- Output short-circuit protected
- Connection to be made with 8-pole screened cable

**ORIGINAL SHUT - DOWN STATE OF THE TURRET**

- Brake connected
- Motor disconnected
- Electromagnet disconnected
- Rotating crown 003 linked to the fixed crown 002 through the short circuiting crown 004.

The dished springs press, by means of the three rollers on three cam ends of the short circuiting crown, keeping the Hirth teeth of the crown in contact.

SEQUENCE FOR A CHANGING OF POSITION:

Electricity is cut off from the brake and connected to the motor which, through reduction stages (the first coaxial and the second epicycloid), starts rotating the planetary roller ring 006 which stops, after a preset angle, against a positive stop. During this phase the central spring 034 pushes the short circuiting crown back, causing the cam ends of the roller to descend and thus disconnect the movable crown which is then made to rotate by the pinion 008.

Nearing the destination station, on the signal given by angular encoder 160, the electromagnet 200 is excited and pushes the catch 017 to make it enter the appropriate pre-positioning recess in the divider 005 thus stopping the rotation of the crown and the associated toolholder disk.

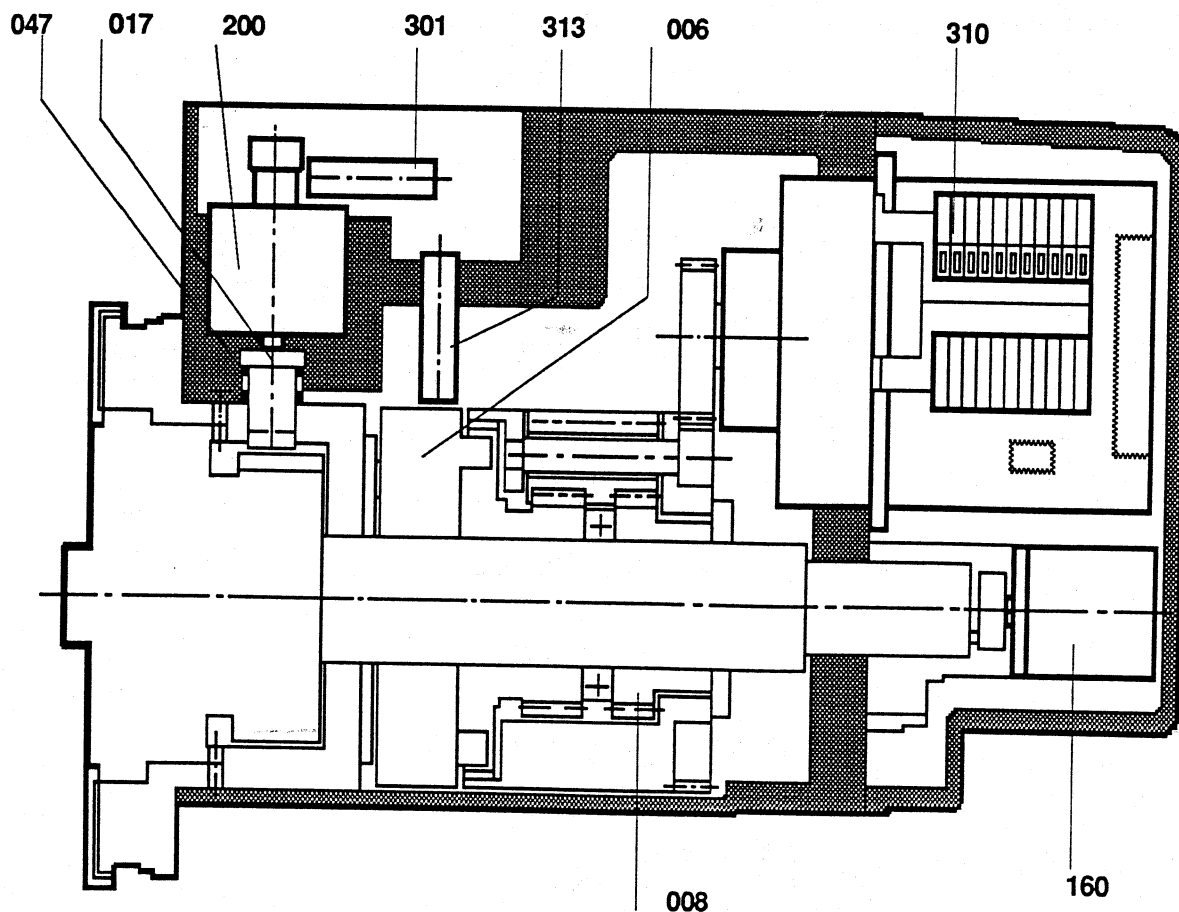
The resulting shock is absorbed by the buffer pads 032.

The completed insertion of the catch into the recess and consequent stopping of the rotation of the disk, is signalled by the pre-indexing proximity switch 301.

Arrival of this signal causes the reverse of the rotation of the motor, and thus also of the planetary roller ring 006; so that the rollers rise on their cam ends and push the short circuiting crown ahead, causing the Hirth teeth to engage.

Passage of the external profile (I) of the planetary roller ring 006, activates the locking proximity switch 313, indicating that the turret is closed, or, in other words, that the rollers are on the extreme end of the cams.

When this signal arrives current is cut off from the motor and the brake 175 goes into action to stop it. Immediately afterwards the electromagnet is deactivated, and consequently the catch is pushed out of the recess in the divider by the spring 047.





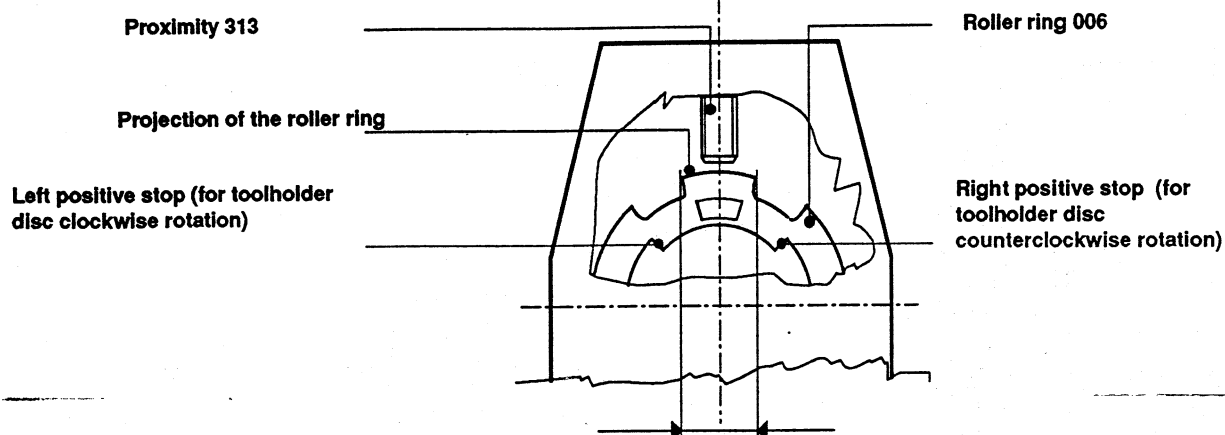
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ELECTROMECHANICAL FUNCTIONING OF THE TURRET

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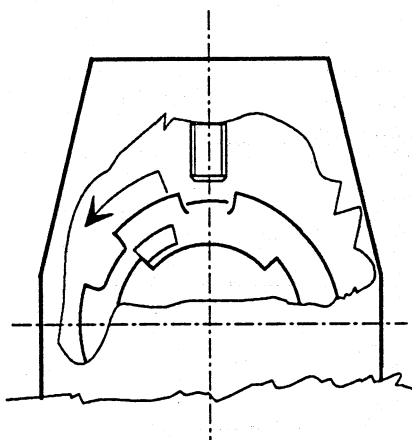
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Locked turret (rollers on the high central part of the cams)

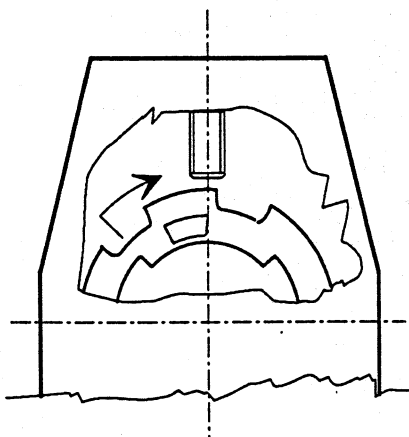


(1) 313 Proximity operating sector (corresponding to the highest part of the cam)

Turret unlocked (the rollers are on the bottom of the cams - Hirth teeth disengaged)



Locked turret (rollers at the beginning of the high level part of the cam . Proximity switch 313 triggers.



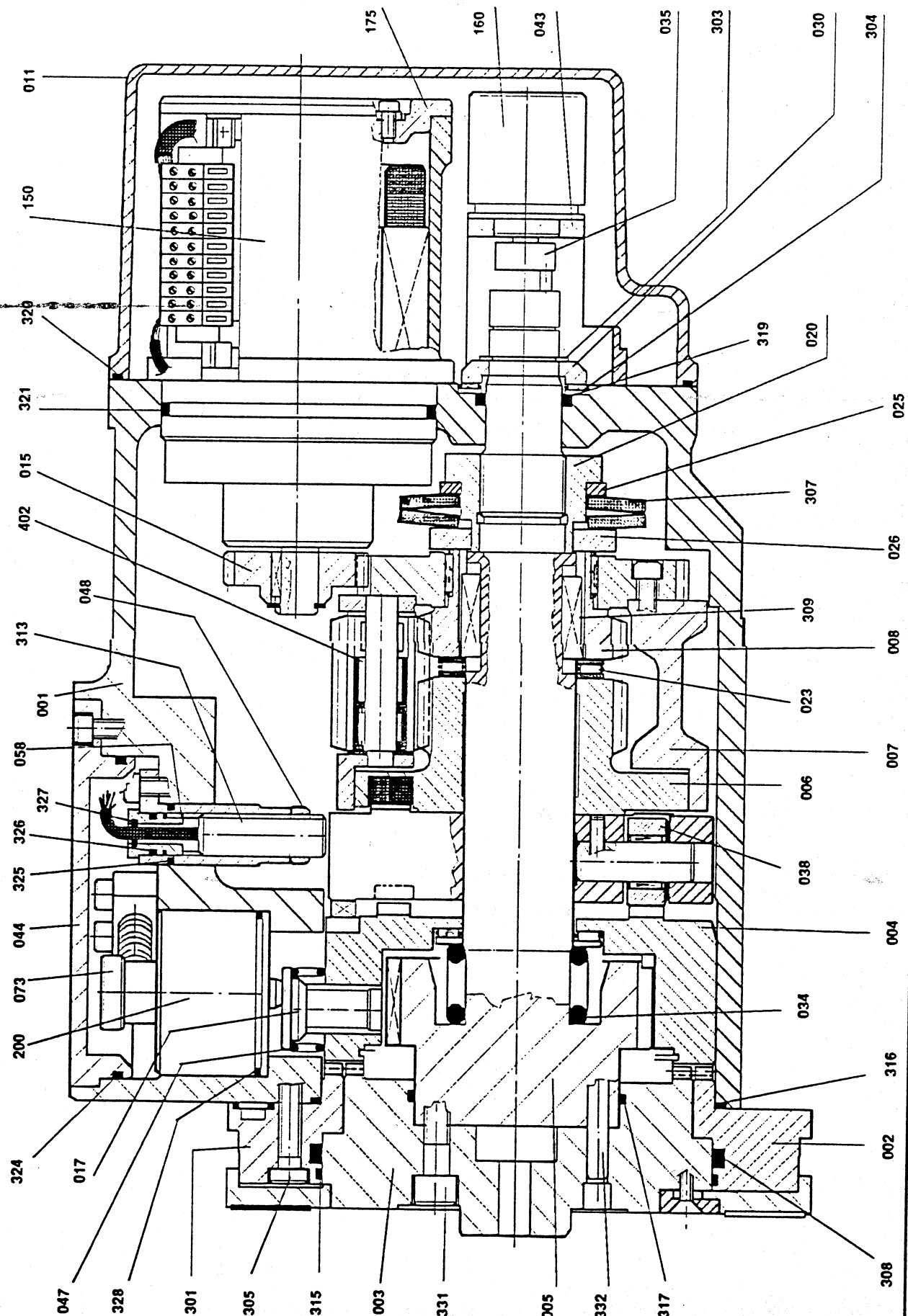
The above diagrams show the phases corresponding to a clockwise rotation of the toolholder disc. The movement (or phases) with counterclockwise rotation are the mirror image of the above.



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ASSEMBLY DRAWING
(section view)

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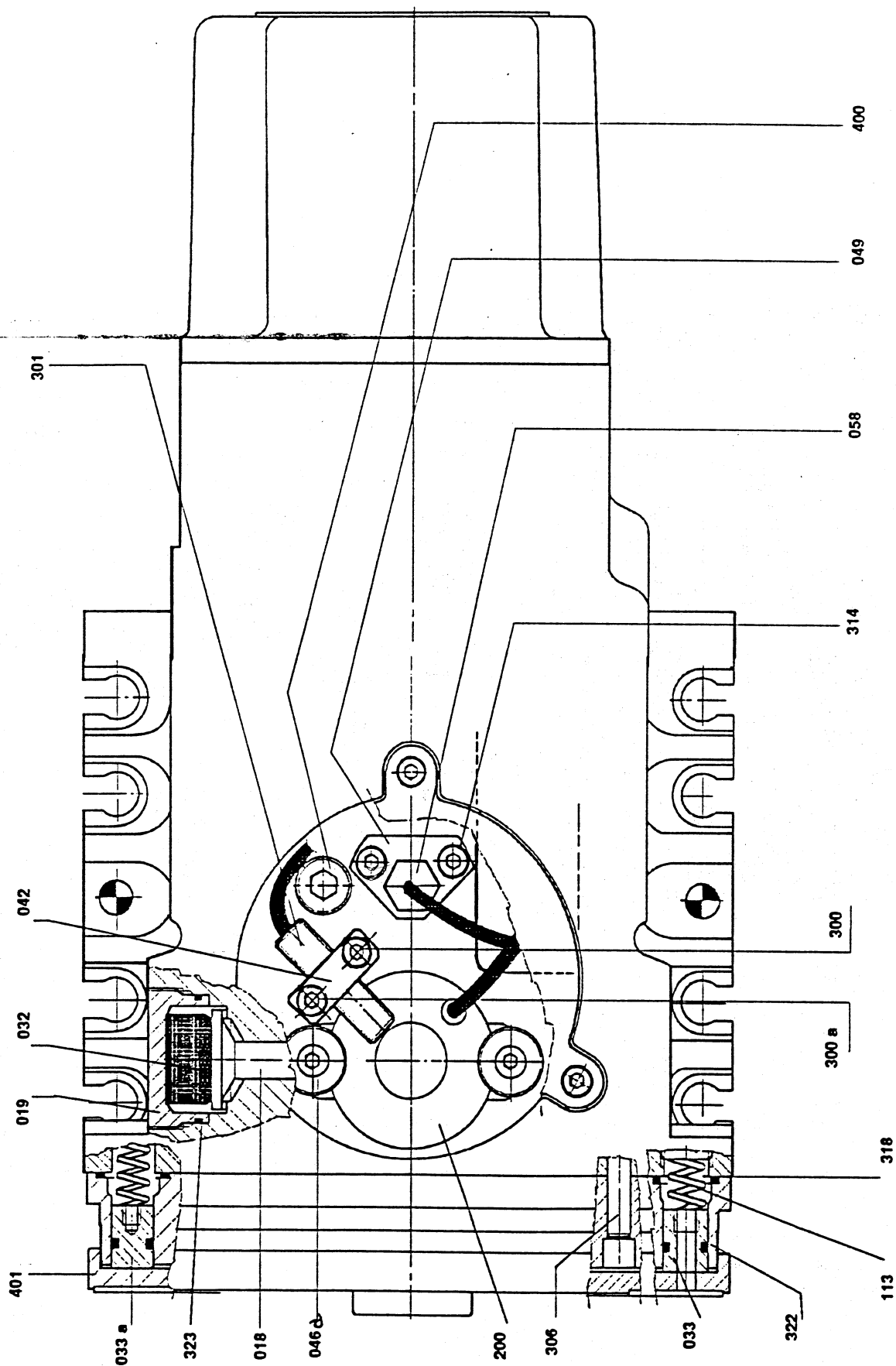




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ASSEMBLY DRAWING
(section view)

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ASSEMBLY DRAWING
(section view)

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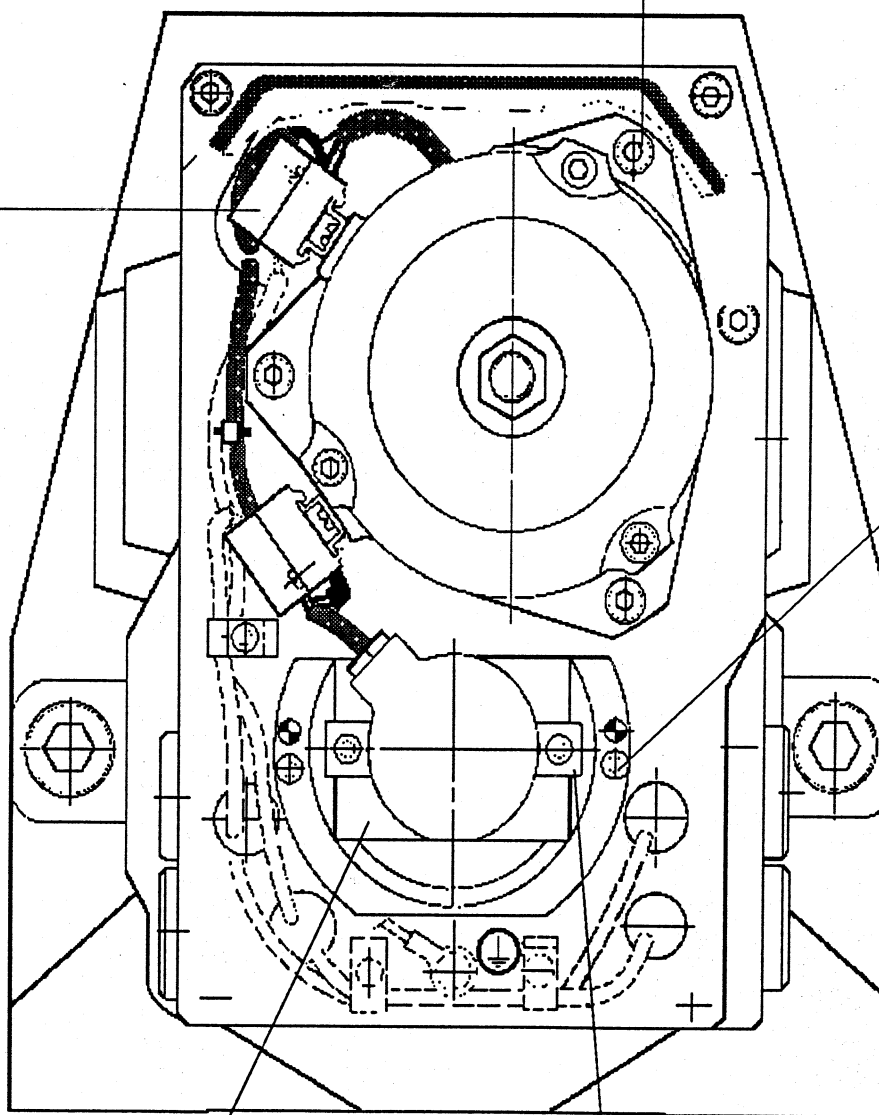
310

311

302

043

067



**FROM THE TOP SIDE**

Take off the 044 top cover. Remove the screws 300, extract the 042 proximity support with 301 proximity, take off the 049 support with 313 proximity, remove the 046a washers, extract the 200 electromagnet, extract the 017 lock with the related 047 spring. Remove the 019 covers from the two sides, extract the 018 shock absorbing pins complete of 032 pads.

FROM THE REAR SIDE

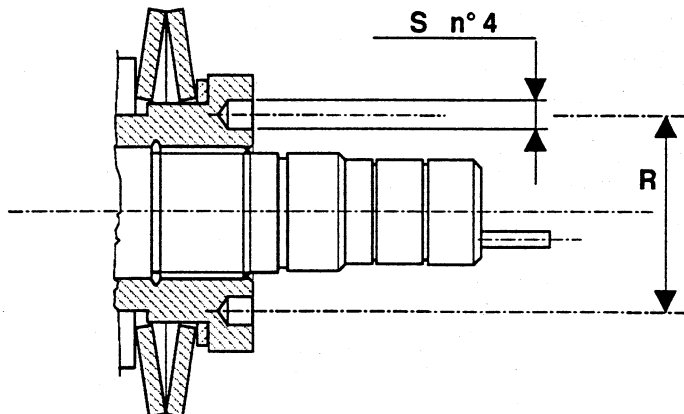
Take off the 011 cover, untighten the screws 302 and remove the 043 encoder support complete of 160 encoder, take off the 303 seeger, remove the 030 thrust block and the 304 bearing.

FROM THE FRONT SIDE

Take off the toolholder disc, remove the screws 305, take off the dowels 306. Extract the entire central body composed by 003 mobile ring gear, 002 fixed ring gear, 005 indexing head, 006 roller carrier set, 007 spider set, 020 ring nut, 307 belleville washers, 025 - 026 spacers.

If dismantling this set too were necessary, unscrew the ring nut, with a particular tool, and extract all the other components.

Turret size	Diameter R (mm)	Diameter S (mm)
TOE 120	44	8,25
TOE 160	44	8,25
TOE 200	56	8,25
TOE 250	56	8,25
TOE 320	100	10
TOE 400	100	10



Whenever the turret is disassembled check the state of the following elements which will have to be replaced in case of a negative result:

- principal gasket 308
- all the grommets type (O-ring)
- cushion pads 032

and the following elements (only when the central body has been completely disassembled):

- cam surface
- rollers
- Hirth couplings
- all gears
- supporting palte of the 003 ring gear with the 002 one



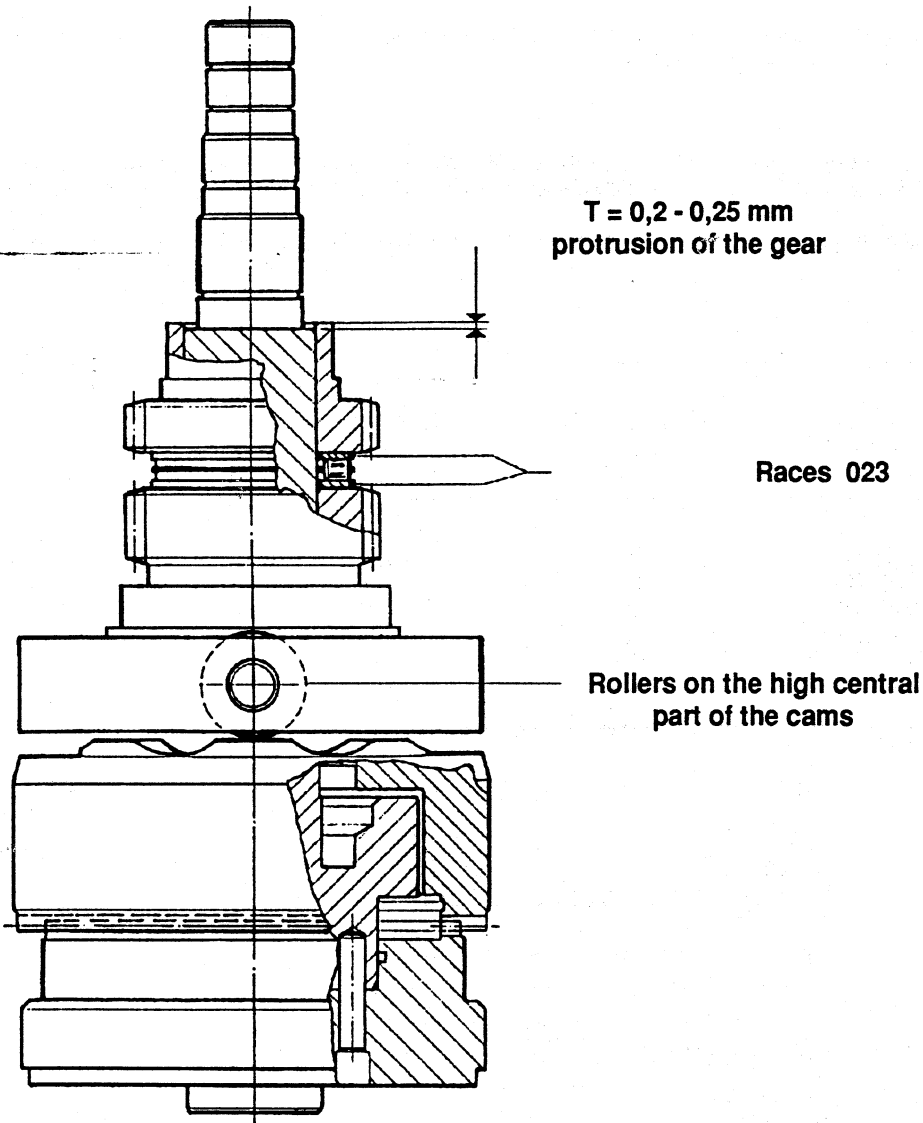
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TURRET DISASSEMBLY (Related to the indexing components)

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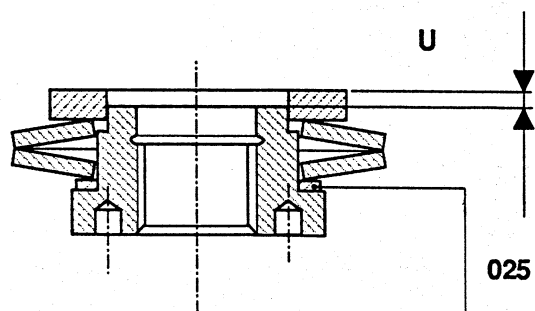
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If any of the parts composing the central sub-assembly (except the satellite carrier 007), has to be substituted it is necessary on reassemble to check and reset the distances T and U which determine the correct loading of the spring.
Reassemble the parts, as shown in the figure, with the HIRTH teeth in contact and the rollers sitting on the raised parts of the cams, check that value of T is inside of the range indicated (0,2 - 0,25 mm).
If it is not then grind new races 023 to bring the value of T within the prescribed tolerance.



Assemble the parts as shown, then check that the value of U is between the ranges in the table below.
If it is not then gring a new distance piece 025 to it so that U falls within the ranges specified in the table.

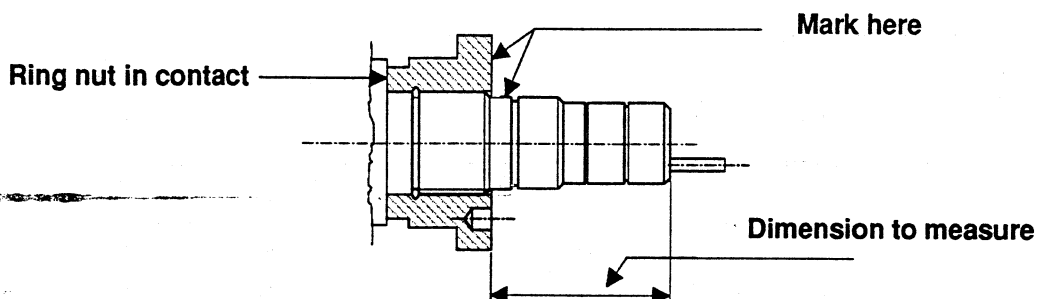
Turret size	Value U (mm)
TOE 120	1,8
TOE 160	2,1
TOE 200	1,7
TOE 250	2
TOE 320	3
TOE 400	4



**WHEN RE-ASSEMBLING EVERYTHING**

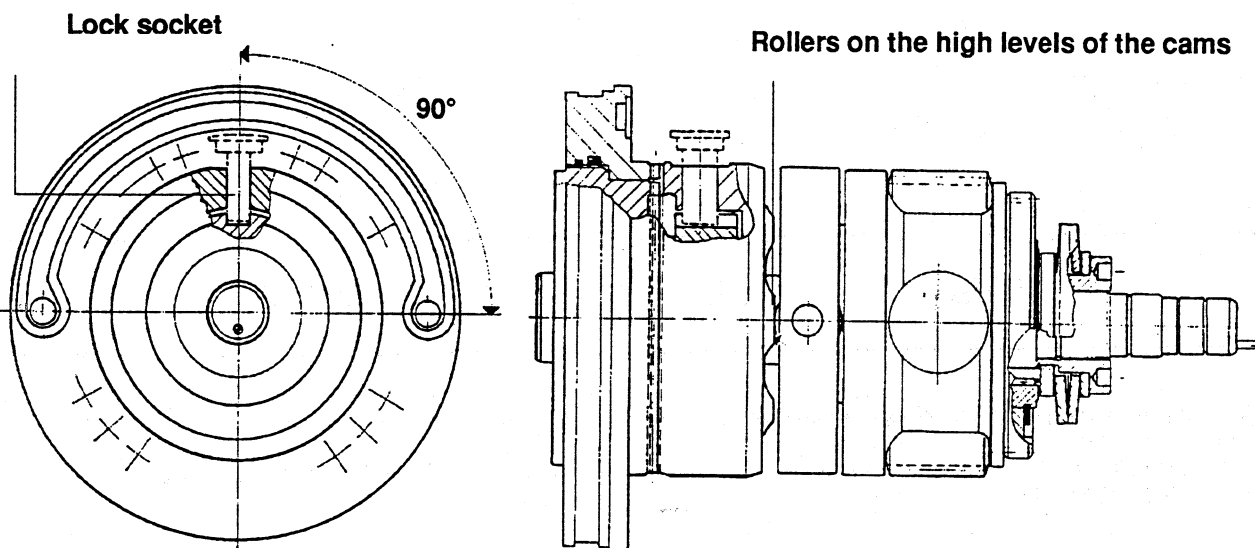
- Insert the keys 309 into their corresponding key-ways (identical marks), keeping the threaded holes towards the 020 ring nut and in contact with the bottom of the key-ways.
- Check that pinion 008 has a good sliding fit. If it does not, take it off and assemble it the other way with respect to the keys.
- Check that the ring nut is thoroughly tightened. To make sure of this follow these instructions::

Before final assembly, temporarily set aside parts 026-307-025, screw down the ring nut until it touches its seating, measure the distance between the end of the divider 005 and the top surface of the ring, mark the position of the ring nut in respect to the divider.

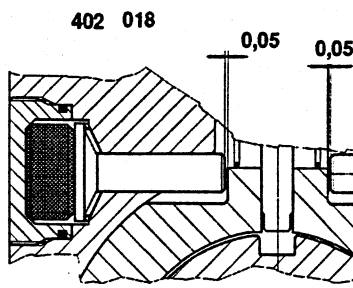


Then unscrew the ring nut, assemble the elements 026-307-025; screw on the ring nut, check that it reaches the same position as before. Make this check by measuring the distance and observing that marks coincide.

Before inserting the central sub-assembly into the carcase, rotate the satellite carrier 007 until the sealing of the latch is in perpendicular position towards the coolant interception holes of the crown 002; insert the latch 017 rotate the satellite carrier 007 by hand until the HIRTH teeth engage (rollers on the high level parts of the cams). Release the latch.



After assembling all the parts add right amount of the correct type of lubricant to the carcase through the oil hole (see page 19).



Lubricate O-ring 318 with heavy grease or vaseline.



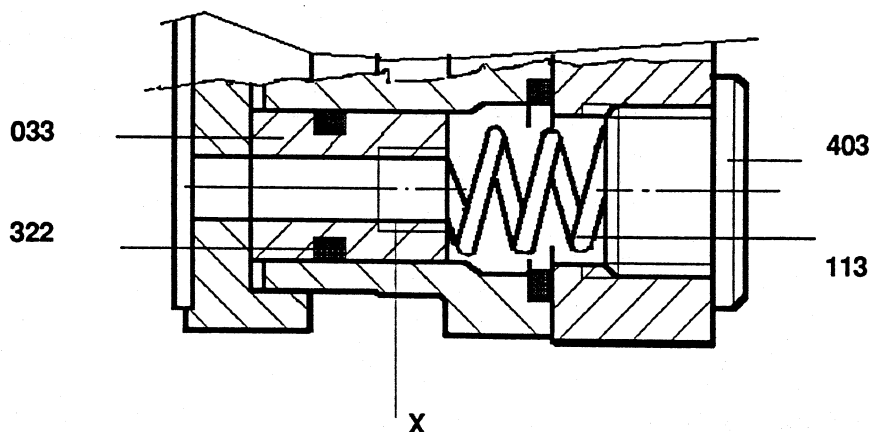
The mechanical moving parts of the turret are permanently lubricated.
The lubricant must be renewed only after eventual complete dismantling of the turret.
The lubricant, with viscosity 80 SW 90, must be compatible with rubber and teflon.
The following table indicates the quantities to be used.

Turret size	Quantity of oil Kg
TOE 120	0,5
TOE 160	0,7
TOE 200	1,5
TOE 250	2
TOE 320	4
TOE 400	4,5

SUBSTITUTION OF THE COOLANT BUSHING

Take off the airtight plug or the feeding pipe connector of the coolant, take off the spiral spring; then extract the bush 033 complete of O - ring by using a suitable thread X.
Clean the seating from any eventual incrustation, grease the outside part of the new bushes complete of O - ring, then insert them in their seating and check the sliding.

	TOE 120	TOE 160	TOE 200	TOE 250	TOE 320	TOE 400
X =	M8 x 5	M8 x 8	M10 x 8	M12 x 8	M16 x 8	M16 x 8





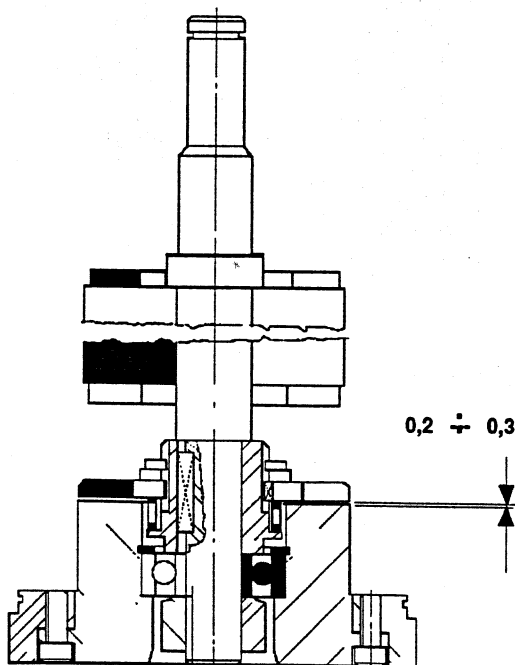
Remove the rear cover 011, disconnect the leads connecting terminal block to the motor, the brake and the thermal probes (heat sensor). Unscrew screws 311, extract the motor unit 150. Disassemble the gear 015 and remount it on the new motor unit. Mount the motor unit in the carcase and reconnect the electric wiring to the terminal block.
To check that the phases are properly connected, perform a tool change by calling up the nearest station... If the phases are properly connected, the change of station will take by the shortest route, if the disc goes the long way round then interchange two motor supply wires at the terminal block (phase rotation).
Replace the rear cover.

SUBSTITUTION OF THE PRE - INDEXING ELECTROMAGNET

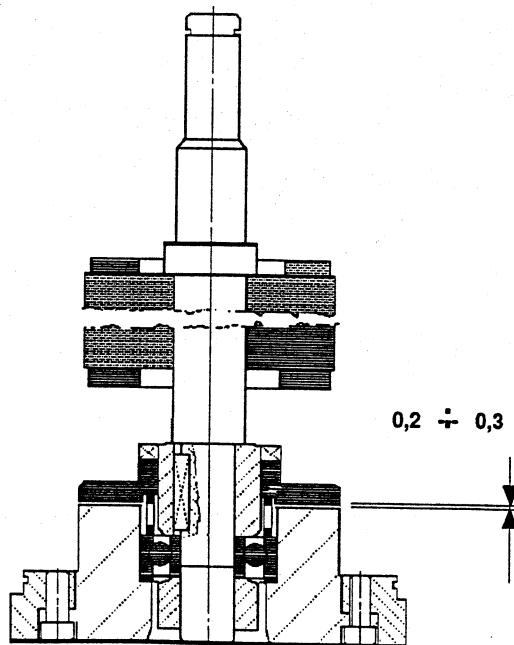
Remove the top cover 044, remove the support 042, remove the washers 046a, extract the electromagnet 200.
Remove the rear cover 011 and disconnect the electromagnet supply leads.
Mount the new electromagnet in the carcase and fix it down with the two washers.
Replace the support complete with its proximity switch 301 and reset it (see page 22).
Connect the electromagnet lead wires to the terminal block (see electrical connection schemes page 8).
Replace top and rear cover.

SUBSTITUTION OF THE BRAKE MAGNET AND ADJUSTMENT OF THE AIR GAP

Remove the rear cover 011, extract the motor unit 150 and the gear 015.
Disconnect the brake leads. Remove the defective brake magnet and substitute it with the new one.
Adjust the air gap (0,2 - 0,3 mm to be checked in a vertical position and acting on the distance pieces 090).
Reassemble the whole by following the above sequence in reverse.



TOE 120 - 160 - 200 - 250



TOE 320 - 400



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SUBSTITUTION AND ADJUSTMENT OF THE ANGULAR ENCODER

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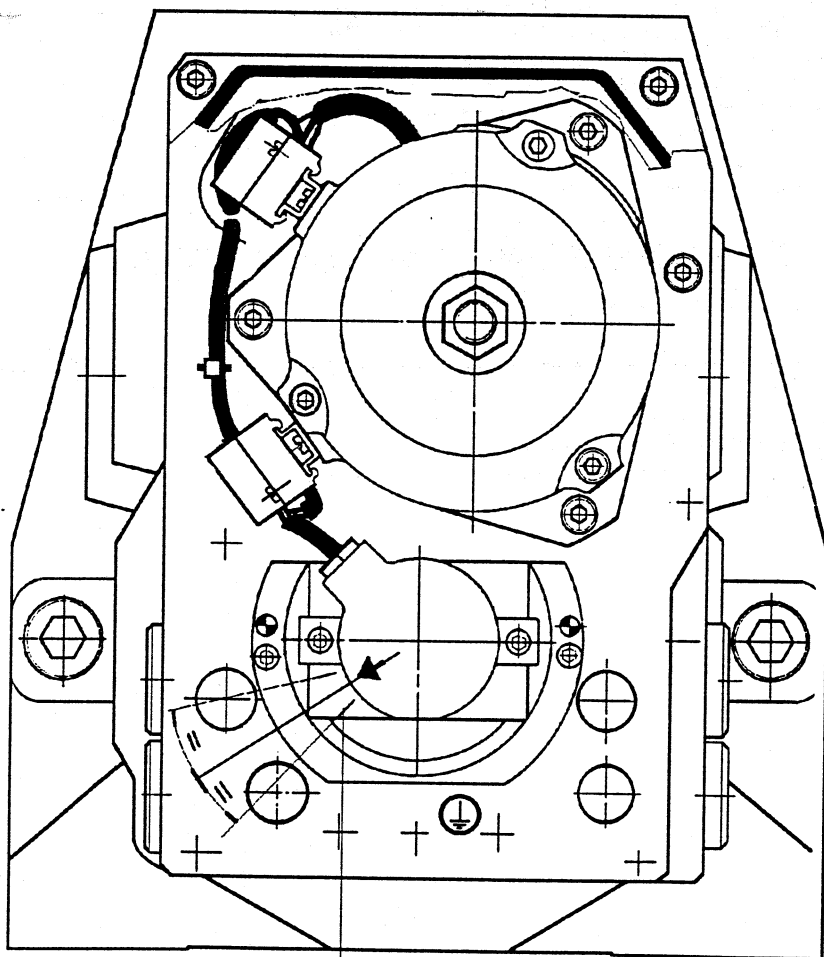
Remove the rear cover 011, disconnect the encoder leads from the terminal block 310, remove the stirrups 067 and extract the encoder. Remove the driving hub 035 and mount it on the new encoder.
Remount the encoder following the above instructions in reverse and connect it to the terminal blocks. Before finally fixing the encoder set it as follows:

Lock the turret in any position, rotate the encoder slowly until the STROBE signal disappears (this can be checked on the control system or with a voltmeter).

Mark the encoder and make a corresponding mark on its support. Slowly turn the encoder in opposite direction until the STROBE signal again disappears, and mark the new position on the support.

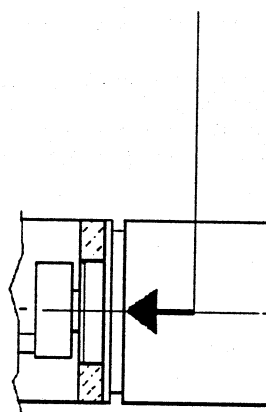
This defines the region in which there is a STROBE signal. Slowly turn the encoder until the mark on the shaft is a half way between the two marks on the support.

Tighten the stirrups 067 and replace the rear cover.



Marks on the encoder support

Mark on the encoder





Remove the top cover 044, remove the support 042 together with the proximity switch 301. Remove the rear cover 011, disconnect the proximity switch leads from the terminal block 310, and remove the proximity switch. Screw the new proximity switch into the support until it projects by the correct amount "X".

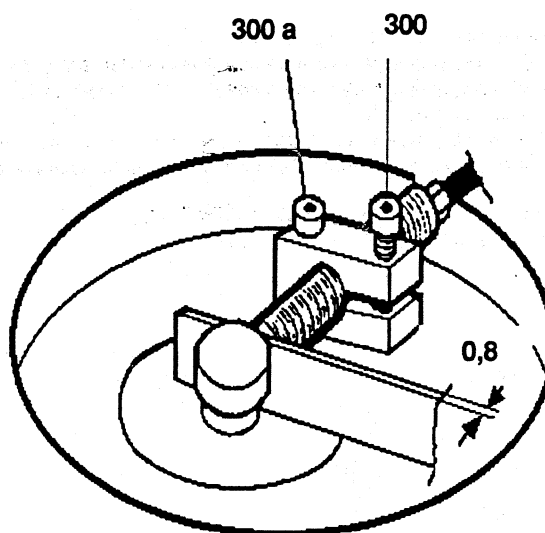
Assemble the support fixing it with the screw 300a in such a way that LED (luminous indicator) on the end of the proximity switch is visible. Insert a 0,8 mm thickness gauge (see figure) and bring the proximity switch into contact with the thickness gauge.

Tighten the screws 300 - 300a with a torque of 3 Nm and block them with LOCTITE.

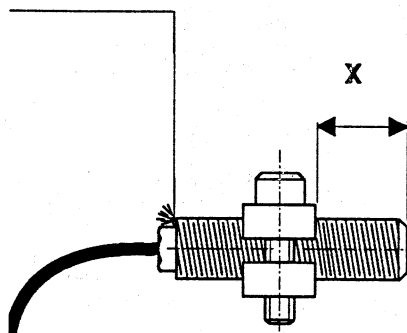
Connect the leads to the terminal block, and check that the proximity switch operates correctly when live, as follows:

- with a turret closed (locked) on lowering the end of the electromagnet by an amount between 1,8 and 2,5 mm the luminous "red" indicator on the back part of the proximity switch should light up.

Replace the rear cover and the top cover.



Luminous indicator



Turret size	X (mm)
TOE 120	18,3
TOE 160	18,3
TOE 200	18,3
TOE 250	18,3
TOE 320	18,3
TOE 400	18,3



Remove the top cover 044, unscrew screw 314, extract the support 049, take off the rear cover 011, disconnect the leads of proximity switch 313 from the terminal block. Unscrew the ring nut 048, unscrew and remove the wire clip 058, and remove the proximity switch.

Screw the new proximity switch into the support by amount needed to make dimension "Z" equal to figures in the table below. The dimension given for "Z" in the table are however only indicative, and correct setting of the operating distance "P" may require departure from those values.

The amount of the operating distance is obtained by difference:

$$(P) 0,8 \text{ mm} = V - Z$$

where "V" and "Z" are actual measured values

To measure "V" the closing sector (I) of the roller ring 006 must be against the proximity switch, that is to say with the turret in the locked condition.

If it is not in this state carry out the closing operation manually.

After adjusting the value of the operating distance "P" screw down the ring nut (tightening torque 3 Nm).

Peen over the edges of the ring nut, thread the wire clip 058 on the proximity switch leads.

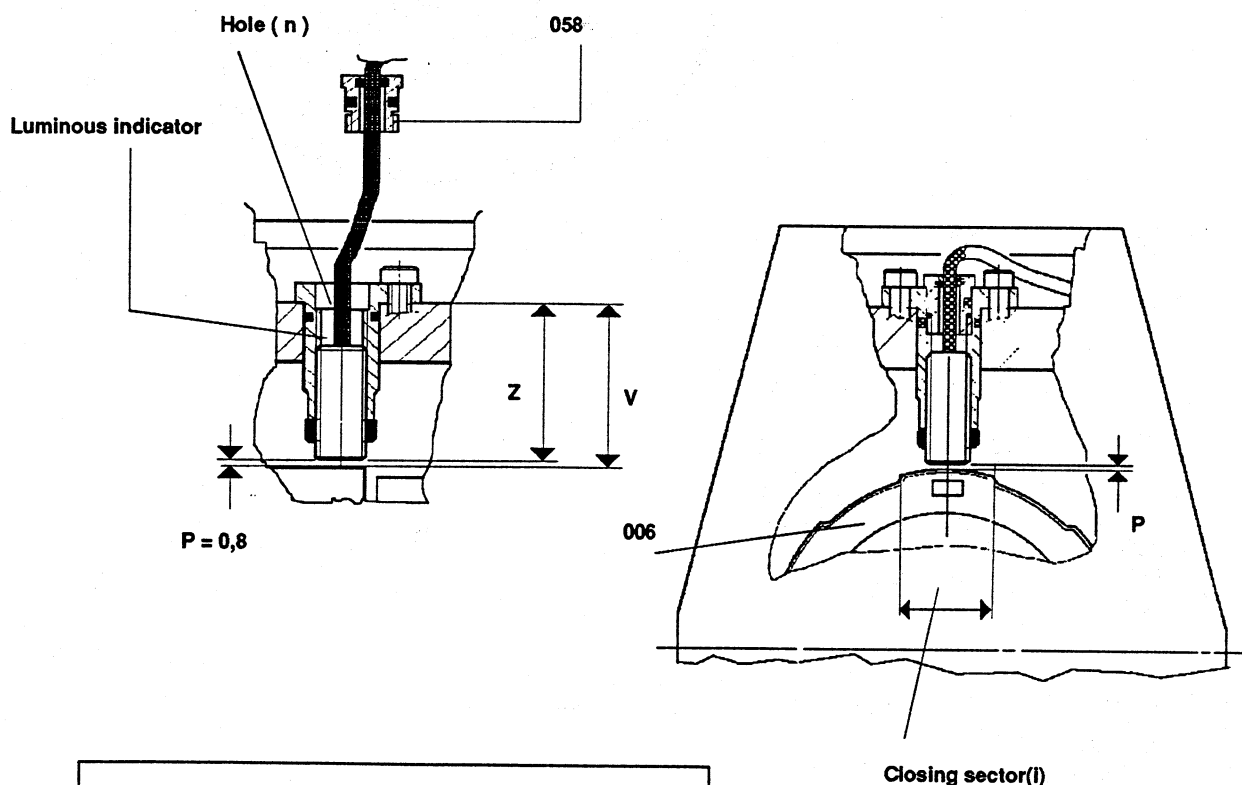
Replace and screw on the support 049.

Connect the proximity switch leads on the terminal block (see wiring scheme).

With the proximity switch live the red luminous indicator on the end of the proximity switch should be visible through the upper hole "n" in the support 049.

When this indicator is lit the turret is in the locked condition.

Replace the wire clip, the rear cover and the top cover.



Turret size	Indicative value of Z (mm)
TOE 120	60,7
TOE 160	59,7
TOE 200	60,7
TOE 250	75,7
TOE 320	66,7
TOE 400	99,2



Call up from the console a "tool change" (the nearest one) keeping to the same direction of rotation that the turret (the toolholder disk) had when it stopped. If this is not known and the "change" called for does not go through to completion (namely not locking or bringing about the operation of the heat sensor), proceed as follows:

- Noted the direction of the disk rotated during the attempted (unsuccessfully) "tool change"; call up from the console the nearest station which can be reached by rotating the disk from its present position in the opposite direction to that of the previous attempt.

If the control refuses to accept a "tool change" starting from the condition of "turret unlocked", then carry out the necessary operations manually as follows:

- Remove the rear cover 011 and the top cover 044, unscrew and partially extract the wire clip 058, disconnect the motor and the brake leads from the terminal block 310 (still keeping the proximity switches connected; please note the order of the motor wires, in order to avoid wrong connection at the end of operations).

Using a hexagonal spanner (see table) turn the motor shaft 012 by hand so that the toolholder disk rotates in the same direction as it did when it stopped and at the same time push the core 073 of the electromagnet 200 until the latch 017 enters recess in the divider 005.

Keeping the core pushed reverse the rotation of motor shaft until the red indicator of proximity switch 313 lights up and can be seen from above through the hole (n).

Make the shaft rotate for another turn but working so that the indicator still remain lit.

If the direction in which the disk was rotating when it stopped is not known and a mechanical block is encountered after the reversal and the turret will not lock, the shaft must be made to rotate in the same sense as that proceeding the reversal. Screw on the wire clip, reconnect the leads to the terminal block (care the phases of the motor leads), replace top and rear covers.

Turret size	Size of spanner CH (mm)
TOE 120	5
TOE 160	5
TOE 200	5
TOE 250	5
TOE 320	6
TOE 400	6

IMPORTANT: for an automatic positioning call,
see the electrical instructions



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PERIODICAL CHECK UP

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After around 400.000 manoeuvres:

- check the sliding of the 073 core of the 200 electromagnet by pushing the core end many times and by letting it recover through the 047 spring effect; then rotate it some turns. Remove any possible partbreak of contamination from the core and the nearby parts. Oil the core external surface which penetrates into the electromagnet.

- check the wear - rate of the 033 coolant bush and replace it if necessary.

- check the 315 - 308 gasket state; if they are deteriorated or clearly worn out.

Es ist sehr wichtig, diese zu ersetzen, wenn sie irgendwelche Anzeichen von Ausbrüchen zeigen.

- to check the gaskets: release the screws 331, extract the dowels 332 and the 003 mobile ring gear. If a large amount of oil leaks out, load it again.



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**RECOMMENDED
SPARE PARTS**

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32	Pads 2 off
576	Roller carrier pads
33	Fluid coolant valve
150	Motor unit
160	Encoder unit
175	Brake magnet
200	Electromagnet
301	Pre - indexing proximity switch
42	Locking proximity switch support
308	Wiping seal
313	Locking proximity switch
315	O ring 161
316	O ring 161
317	O ring 151
318	O ring
319	O ring 216
320	O ring 169
321	O ring 154
322	O ring 012
323	O ring 029
324	O ring 243
325	O ring 017
326	O ring 013
327	O ring 106
328	O ring 033
329	Seal
330	8 positions frontal coolant seal
330	12 positions frontal coolant ring


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TABLE OF DATA TURRETS

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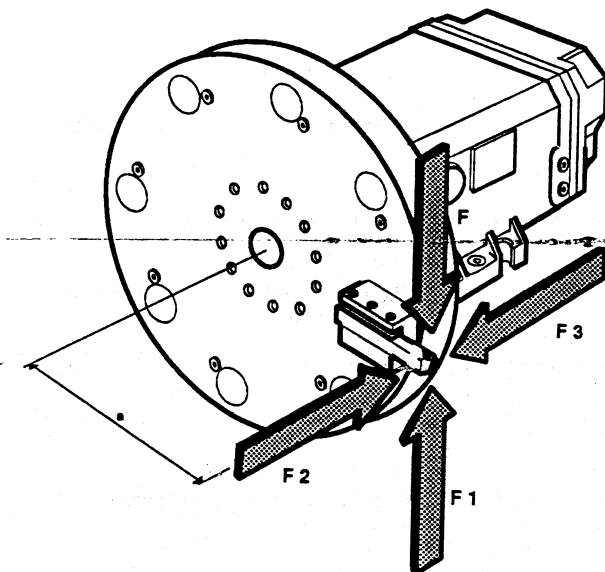
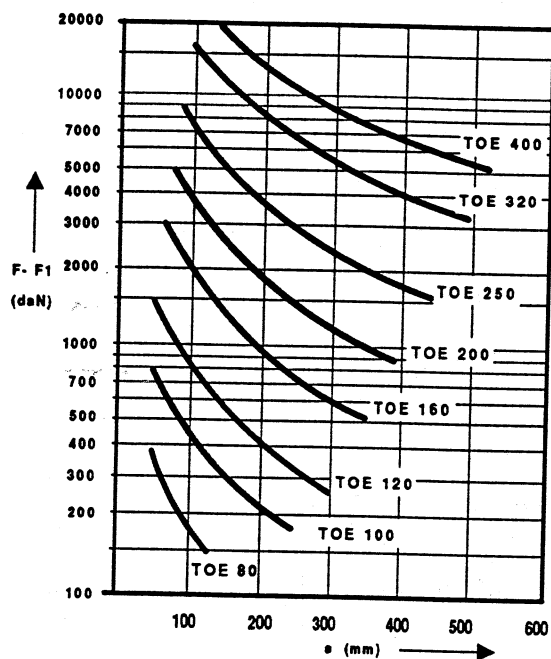
TURRET SIZE	TOE 120		TOE 160		
Code number of transmission ratio	TOE 120/..0	TOE 120/..1	TOE 160/..0	TOE 160/..1	TOE 160/..2
Moment of inertia of transportable masses (Kgm2)	0,65	0,50	1,3	0,8	0,5
Tangential couple applicable with turret locked (Nm)	800		1850		
Unbalanced couple with horizontal axis (Nm)	10		15		
Repetition accuracy (grad)°	± 2"		± 2"		
Weight of standard turret (Kg)	48		58		
N° of movement / hour (n/h)	750		750		

TURRET SIZE	TOE 200		TOE 250	
Code number of transmission ratio	TOE 200/..0	TOE 200/..1	TOE 250/..0	TOE 250/..1
Moment of inertia of transportable masses Kgm2)	4,5	3,0	7,5	4,5
Tangential couple applicable with turret locked (Nm)	3500		6900	
Unbalanced couple with horizontal axis (Nm)	40		60	
Repetition accuracy	± 2"		± 2"	
Weight of standard turret (Kg)	100		135	
N° of movement / hour (n/h)	750		750	

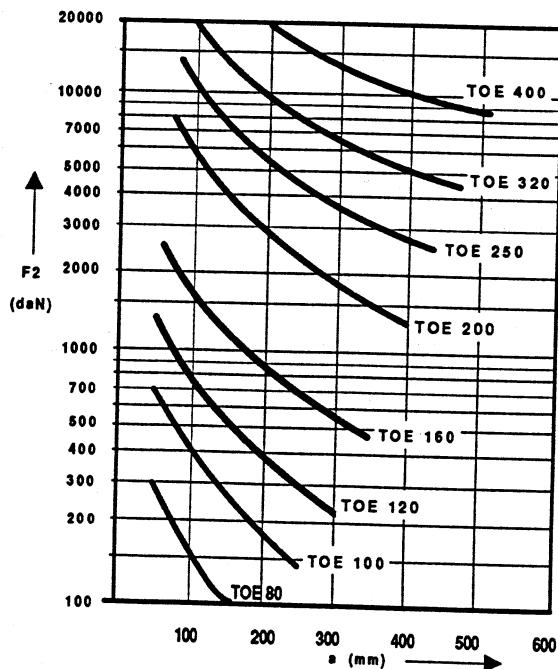
TURRET SIZE	TOE 320			TOE 400		
Code number of transmission ratio	TOE 320/..0	TOE 320/..1	TOE 320/..2	TOE 400/..0	TOE 400/..1	TOE 400/..2
Moment of inertia of transportable masses (Kgm)	32	22	15	70	32	22
Tangential couple applicable with turret locked (Nm)	16000			26000		
Unbalanced couple with horizontal axis (Nm)	160			470		
Repetition accuracy	± 2"			± 2"		
Weight of standard turret	380			480		
N° of movement / hour (n/h)	600			600		



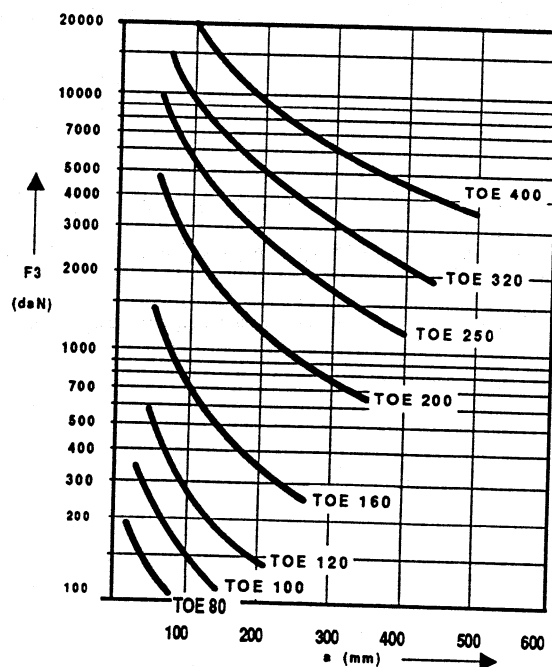
As a function of the
tangential thrust F & F1



As a function of the
pressing axial force F2



As a function of the
lifting axial force F3



After having selected the size of turret according to the above criteria, check that the moment of inertia to be applied is below the maximum values given in the table of Technical Data.



PROBLEM	CAUSE	REMEDY
Turret does not start	No power at motor Motor defective Heat sensor in operation	Get power to the motor Substitute the motor unit (see page 26) See next point
Turret does not complete its indexing cycle either because the heat sensor operates or an incomplete cycle is indicated	Number of movement / hour above the maximum permissible With the turret free in the position required and with current supplied to the motor there is no signal from the pre-indexing proximity switch 301 Pre-indexing proximity switch is defective Pre-indexing proximity switch not correctly set With the turret in the required position and with current supplied to the motor there is no signal from the locking proximity switch 313 Locking proximity switch is defective Locking proximity switch out of adjustment Restart after an emergency or accidental stop, but in opposite direction to the most convenient Blockage of the electromagnet's core	Reduce the number of movements (see technical data)) Substitute the pre-indexing proximity (s. page 22) Adjust the pre-indexing proximity sw. (s. Seite 22) Substitute the locking proximity sw. (s. page 23) Adjust the locking proximity switch (s. page 23) see page 24 see page 25
The turret overrun the pre-indexing station required	Electromagnet exited late	Overhaul the control apparatus



PROBLEMS	CAUSE	REMEDY
Turret does not stay locked	Delay in switching off the motor and in the braking Brake defective Brake wear excessive	Overhaul the control apparatus Substitute the brake magnet (s. page 20) Readjust the air gap in the brake (s. page 20)
The turret continues to rotate without stopping at the required position	Angular encoder defective Electromagnet defective Break in the electrical leads	Substitute the angular encoder (s. page 21) Substitute the electromagnet (s. Seite 20) Eliminate interruption
The turret approaches the required station by the longer path	Inverted phases in the power supply of the motor	Correct the connection of the phases
Excessive shock in pre-indexing	Excessive travel of the buffer pads Moment of inertia of the masses in use above the permissible maximum Moment of unbalance of the masses in use above the permissible maximum	Substitute the buffer pads Bring the moment of inertia of the masses in use down to a permissible figure (see Technical Data) Bring the moment of unbalance of the masses in use down to a permissible figure (see Technical Data)
Disk rotates in jerks	Moment of unbalance above the permitted	Bring the moment of unbalance of the masses in use down to a permitted value (see Technical Data)