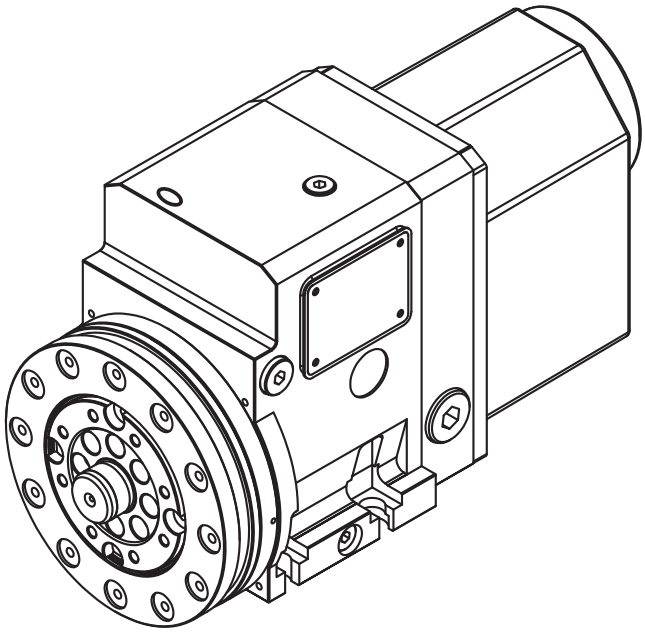
PRAGATI

BI-DIRECTIONAL

TOOL TURRET



B T P - 50

INSTRUCTION MANUAL

IMB50052014

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1. Turret Identification

1.1. Turret Name Plate Details

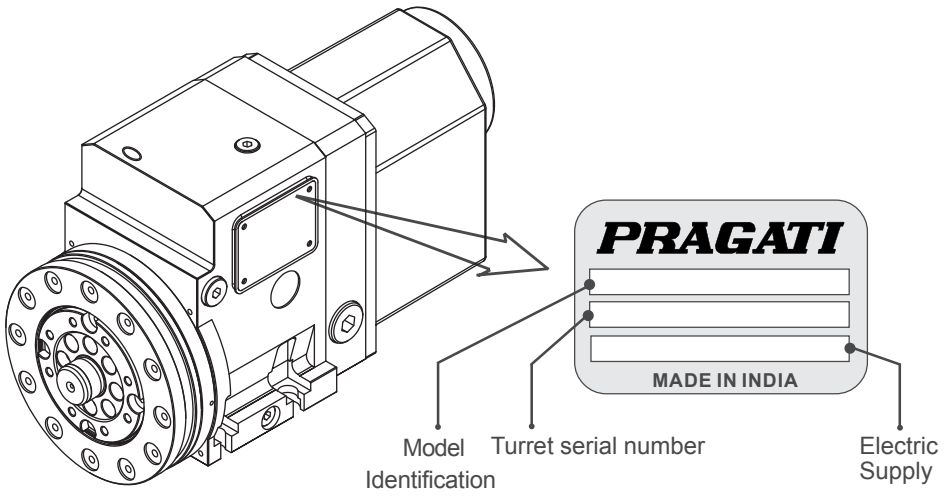


Fig 1.0

1.2 Model Identification

Ordering sample : BTP-50 Turret , 8 Station, Rear mounting, 415V , 3 Ph motor

BTP - 50- 8 - R - 415

BTP – ☐ – ☐ – ☐ – ☐

Model	Size	NO. of stations		Mounting	Motor voltage, 3 Phase	
					Range VAC	Specification
	50	**8 stations**	**8**	F - Front	380 - 440	**415**
		12 stations	12	**R - Rear**	210 - 230	220
					100 - 120	110

Default Values :
No. Of stations - **8**
Mounting position - R
Motor Voltage - **415**
Frequency- **50/60 Hz**

Fig 1.1

1.3 Mounting position:

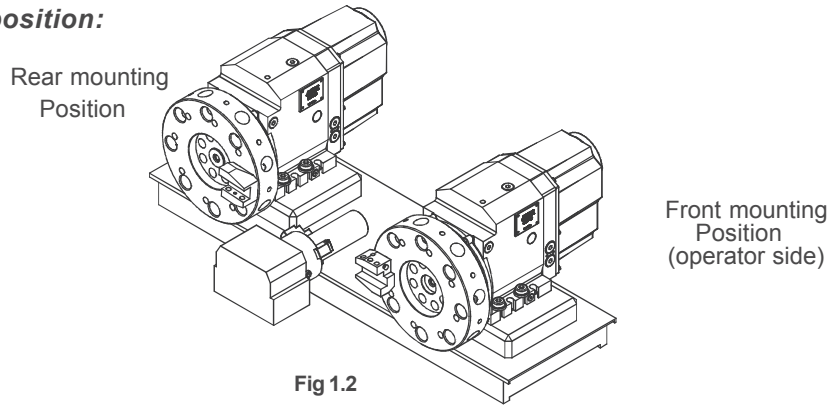


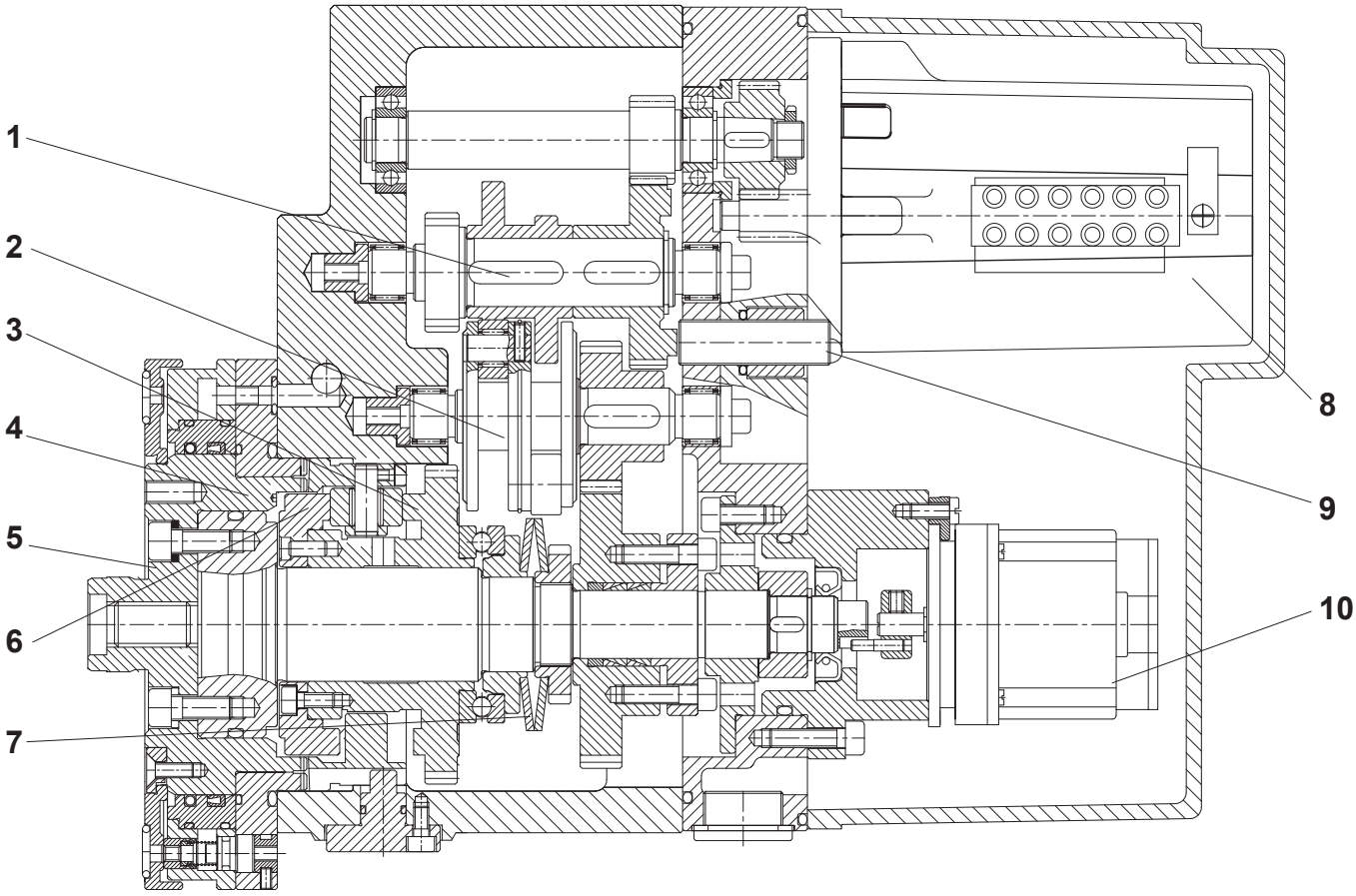
Fig 1.2

Coolant valve position of turret depends on the mounting position; Front or Rear. If not specified Rear mounting is standard.

2. TECHINICAL INFORMATION :

2.1. Principle of Working :

Fixed coupling (4), Indexing coupling (5) and sliding coupling(6) form a set of 3 piece coupling. Axial movement of 3 piece coupling is controlled by drum cam (3), Movement of indexing coupling (5), is controlled by parallel index mechanism(1) and (2). Torque motor(8) drives the cam shaft (1) through a system of gears. Cam shaft indexes the follower shaft (2) through a "Parallel index" drive mechanism. Cam is also geared to the "Drum cam" (3) which controls clamping and release of the 3-piece coupling. One revolution of cam shaft completes one indexing cycle of "de-clamping-indexing-clamping" Absolute Position encoder gives feedback of the turret position.Proximity switch checks the clamped position of the turret.



1. *Cam Shaft* ***2.*** *Follower Shaft* ***3.*** *Drum Cam* ***4.*** *Fixed Coupling*
5. *Indexing Coupling* ***6.*** *Sliding Coupling* ***7.*** *Disc Spring* ***8.*** *Torque Motor*
9. *Proximity Switch* ***10.*** *Encoder*

Fig 2.0

2.2. Special features :

* Three-Piece, face gear coupling allows the tool disc to be indexed without lifting. It also ensures high repeat positioning accuracy and rigidity
* Parallel index Cam mechanism allows fast and smooth indexing of heavy tool discs. Computer generated cam profiles ensure shock free indexing action.
* Totally enclosed ,Robust mechanism with oil bath lubrication.
* Electrical elements conveniently located in a separate area, Free from oil and coolant
* Bidirectional working can index in either direction to allow shortest indexing time.

2.3. Techinical and Dimensional details :

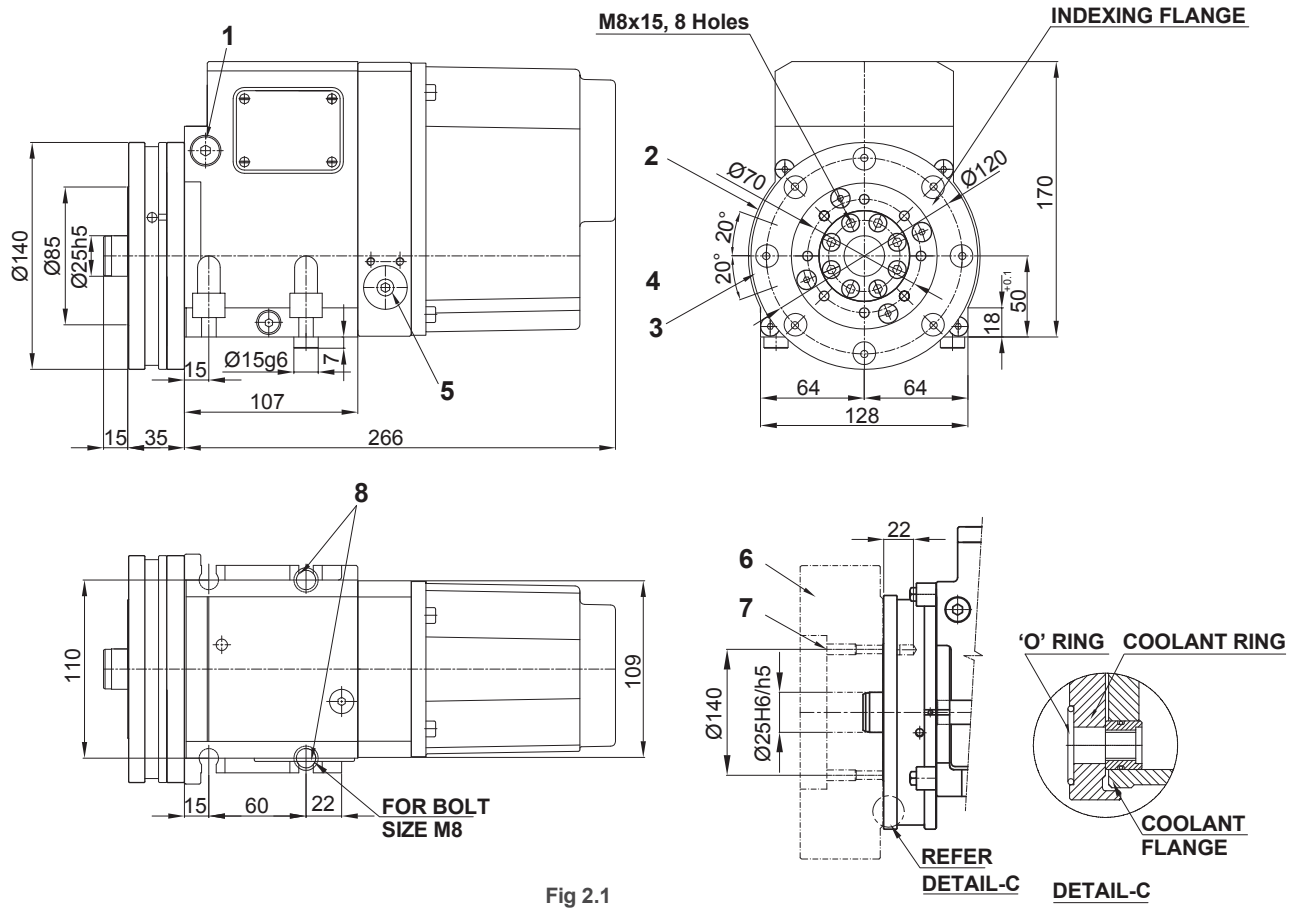


Fig 2.1

1. 1/4" BSP coolant inlet from either side. **2.** Coolant Ring can be clamped to indexing coupling at a suitable angular position.**3.** Alternative positions of coolant valve,**4.**Adjustment range for coolant outlet valve.**5.**1/2" BSP electrical connection from either side.**6.**Tool disc.**7.** Reference pin for tool disc if required. **8**.To be removed after alignment and clamping of tool disc.

Technical Specfications		
Model		**BTP-50**
Centre Height	mm	$50^{+0.1}$
No. of index position		8
Total indexing time for adjacent station (30° or 45°)	sec	0.35
Interia of Transportable Masses	$kg.m^2$	0.25
Indexing frequency (max.)	1/min	12
Repeat positioning Accuracy	sec	±2
Indexing Accuracy	sec	±6
Total weight (Without Tool disc)	kg	18

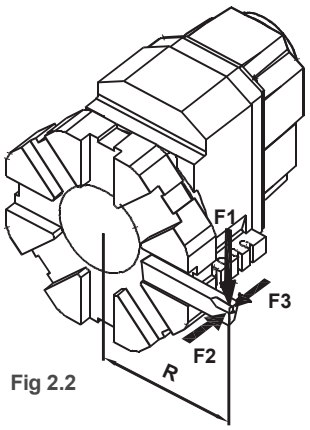


Fig 2.2

Loading Capacity Nm	
F1xR	400
F2xR	350
F3xR	160

3. INSTALLATION

3.1 Fitment on the machine

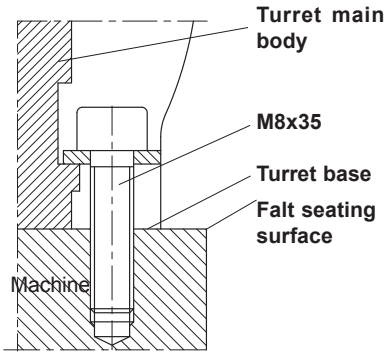


Fig 3.0

Turret should be aligned by dialing surface of the indexing flange. Clamping bolts should be tightened after aligning the seating surface, square to the lathe axis.

Clamping bolts should use machine washers of extra thickness (min.5 mm) to ensure proper clamping.

Dowel Pins are not recommended for ensuring the alignment of turret. It is preferable to allow the turret to slip in the event of an accidental shock or overload. This slipping absorbs some of the energy of the shock and reduces the possible damage. Turret can again be brought back to alignment by dialing a reference surface on the tool disc.

There is one more reason for avoiding the dowel pin. Accidental collisions are not uncommon in the field of CNC lathes. In the event of a collision, dowel pins can get sheared or damaged. It is a difficult task to remove such dowel pins, and to fit new ones. New dowels may involve enlarging the damaged hole by drilling and reaming. This is difficult to do at the customer's place. This is a difficult operation to be done on site, and is most likely to be less than perfect. On the other hand, it is perfectly possible to use the turret and tool disc without the use of dowels. The friction joint can easily take up normal cutting loads, including occasional over loads.

Pragati turrets, therefore, do not have a provision of dowelling the body to the base.

3.2 Coolant system

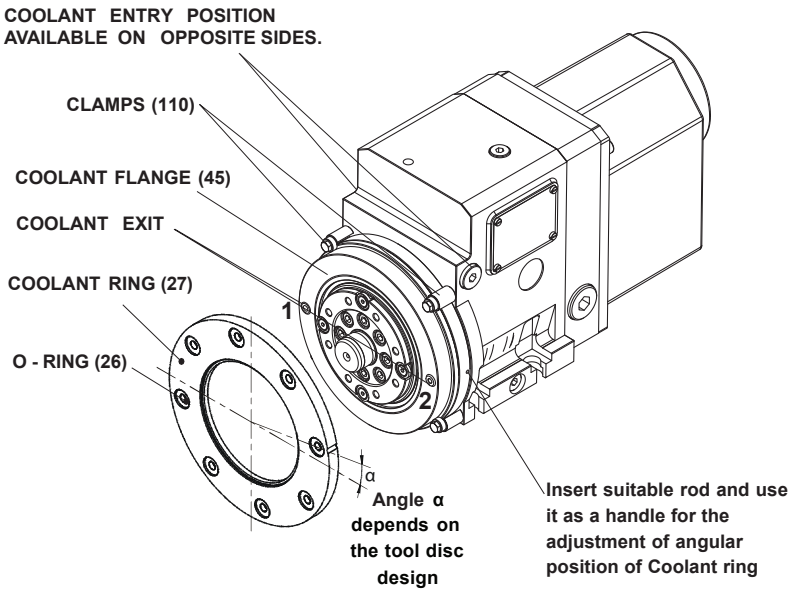


Fig 3.1
VIEW WITH FRONT COOLANT FLANGE REMOVED.

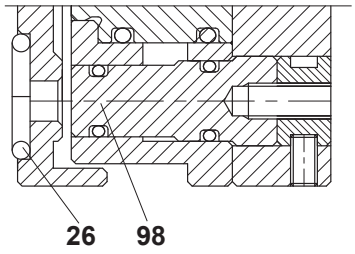


Fig 3.1a
CUT SECTION AT 1

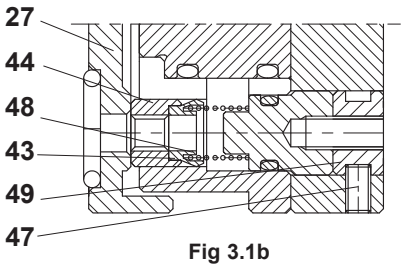


Fig 3.1b
CUT SECTION AT 2

Turret has the two alternative positions for the coolant entry. Coolant outlet is at two valves position, '1 and 2 ' located on the coolant ring as in the figure. Spring loaded poppet valve (fig 3.1.2) is fitted on the working position; and other entry position is blocked by the plug (98).

3.2a Procedure for adjustment :

Both the coolant ring and coolant flange have provision for angular adjustment. Coolant flange should be adjusted to align the 'O' Ring (26) with coolant passages on tool disc. Coolant ring angle should then be adjusted by the same angle to align the coolant valve with a hole in coolant flange. This can be done by aligning the marker lines on these components.

3.3 Fitment of Tool Disc on Turret :

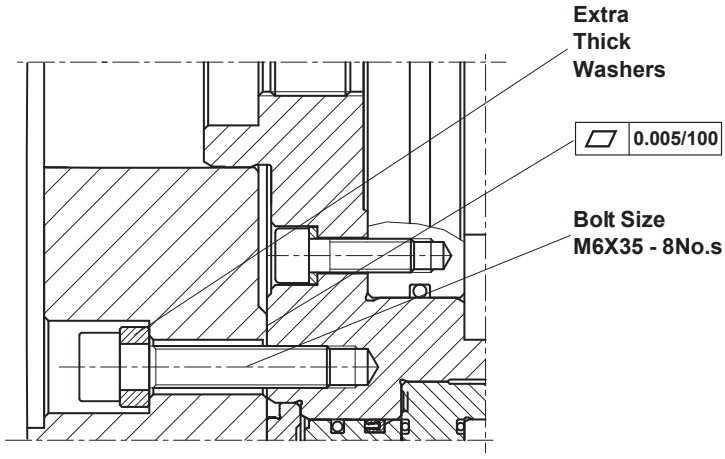


Fig 3.2

Mounting surface of the tool disc must be **0.005/100** flat
Any flatness error should be concave. If Tested with blue, Colour should be all over, Or on outside part of contact area.Tool disc is to be fitted on the indexing flange with the help of clamping bolts, and machine washers. Disc should be angularly adjusted within the clearance of the bolt holes, to get the correct centre height of the tool. It should then be firmly clamped by tightening the bolts.

3.3a Tool Disc Mounting Details

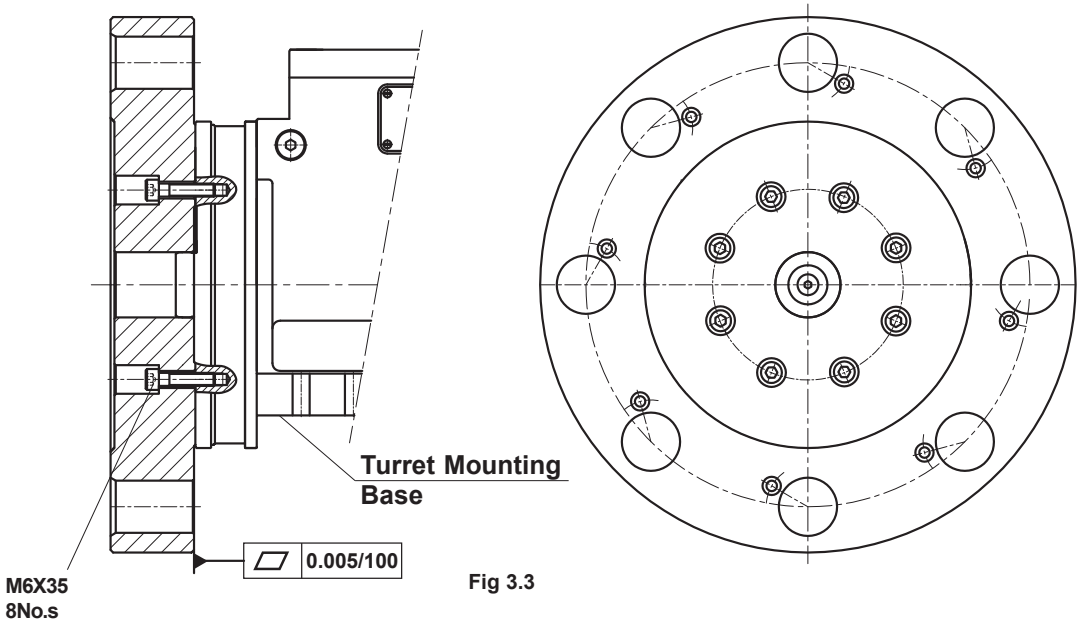


Fig 3.3

3.4 Details of Electrical Connections

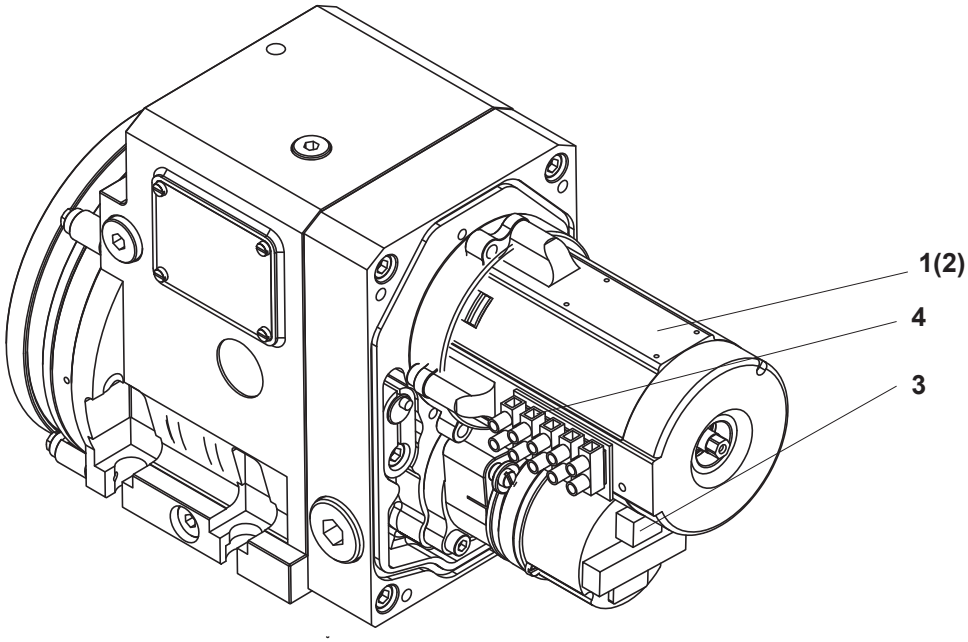
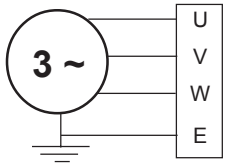
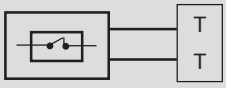
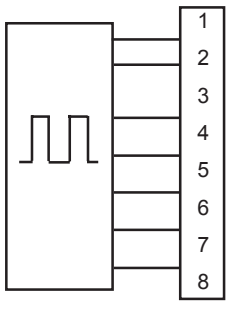
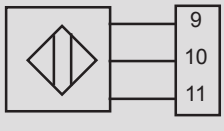


Fig 3.4

1. Torque Motor 2.Thermal switch 3. Absolute Encoder 4. Proximity Switch

Wiring Details For Bi-Directional Tool Turret					
Sl.No	**Component**	**Characteristics**	**Number**	**Details**	**Wire size**
1	**Torque motor**	Alternative voltage 415,380 AND 220V AC 3 Phase Alternative frequency 50 Hz AND 60 Hz Motor short circuit power 0.9 kVA		R-phase Y-phase B-phase Earthing	0.75 mm²
2	**Thermal switch**	110° 415V AC 2A Normally closed contact			0.2 mm²
3	**Absolute encoder**	15-30V DC Ripple 10% 350 mA (Supply) 50 mA/Channel (Load) Output-PNP		Bit 1 Bit 2 Bit 3 Bit 4 Strobe Parity 0 V 24V DC	0.2 mm²
4	**Proximity switch (Turret clamp Signal)**	10-30V DC Ripple 10% 200 mA (Load) Output-PNP-No		Out Put 0 V 24V DC	0.2 mm²

3.4.1 Electrical motor wiring details

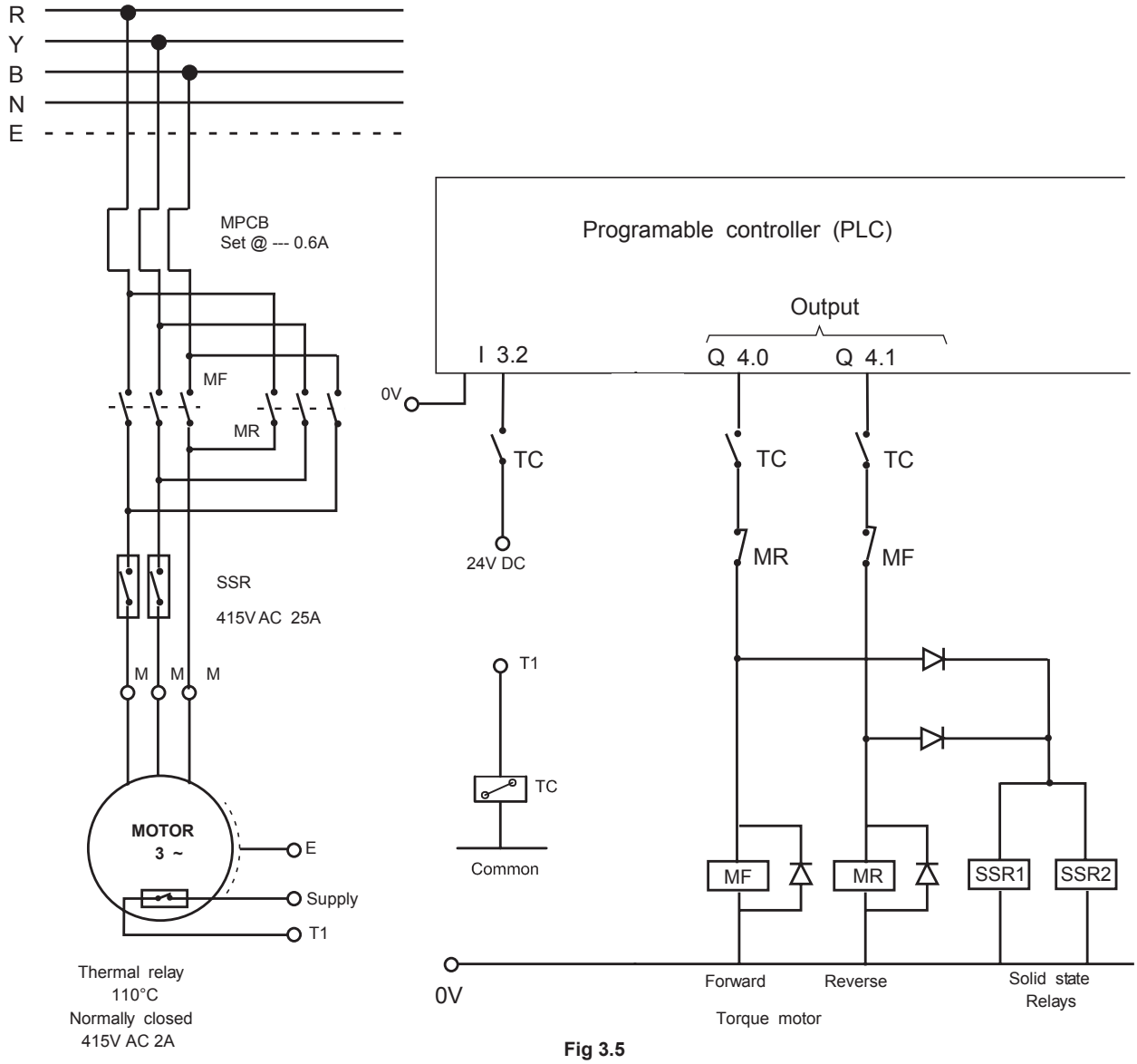


Fig 3.5

Motor current (Amps)			
Voltage	415/ 380	220	110
Current(A)	1.2	2.6	3.3

Use fuse rating about three times motor Current. (minimum 6a fuse to be used)

The figure shows recommended wiring diagram Turret.

Please note that only 3 phase motor with thermal relay is part of Turret supply.

1. Solid state relays are required to switch off the motor in shortest possible time
2. Thermal relay should directly switch off the motor.

4. TURRET CONTROL

4.1 Electrical signals

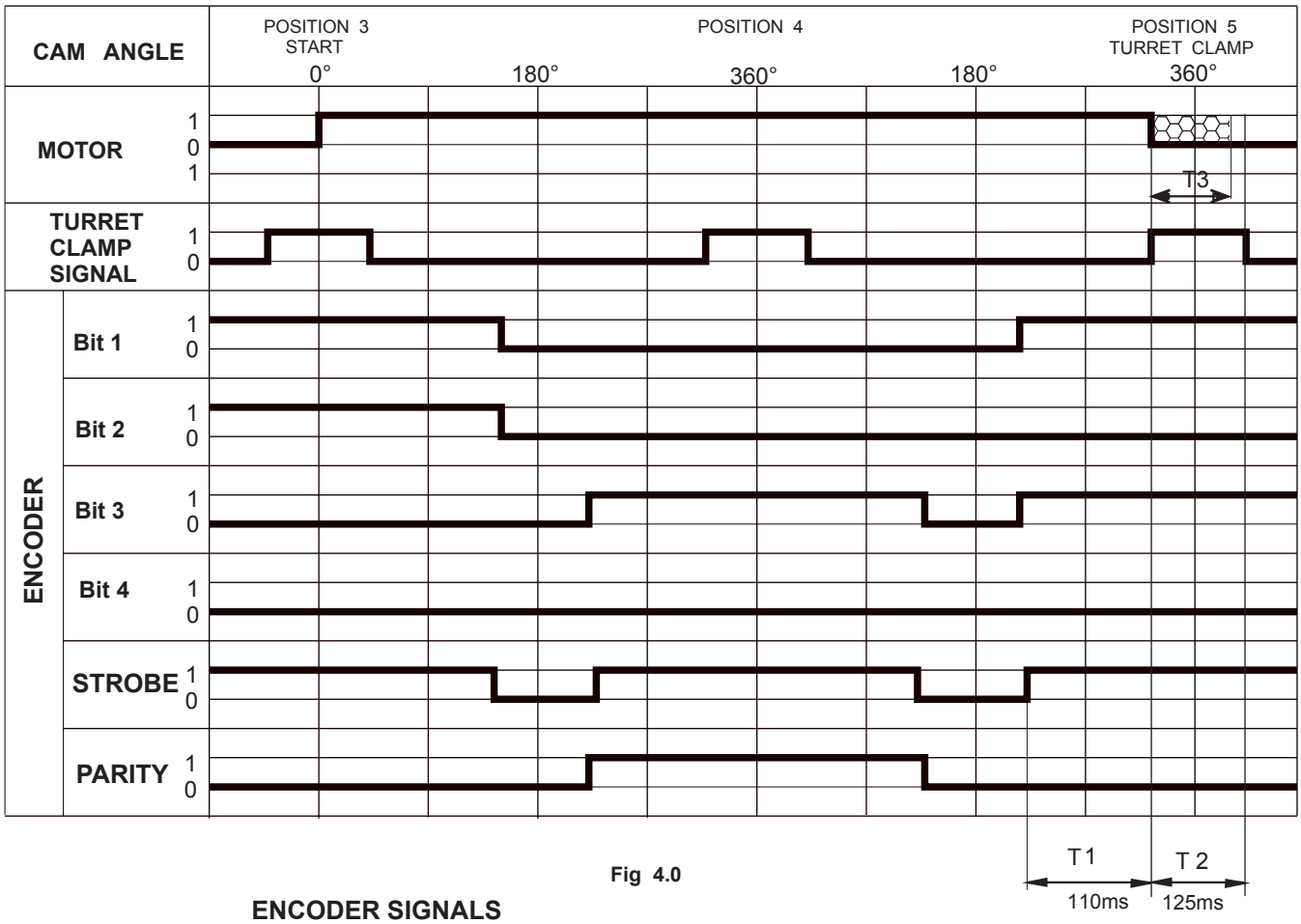


Fig 4.0

ENCODER SIGNALS

	POSITION NUMBER											
	1	2	3	4	5	6	7	8	9	10	11	12
Bit 1	1	0	1	0	1	0	1	0	1	0	1	0
Bit 2	0	1	1	0	0	1	1	0	0	1	1	0
Bit 3	0	0	0	1	1	1	1	0	0	0	0	1
Bit 4	0	0	0	0	0	0	0	1	1	1	1	1
STROBE	1	1	1	1	1	1	1	1	1	1	1	1
PARITY	1	1	0	1	0	0	1	1	0	0	1	0

CW → ← **CCW**

Following points should be noted while selecting control system for turret :

1. Direction of rotation of motor for shortest indexing time is to be decided by control system.
2. Indexing times of these turrets are short. It is necessary to select particularly fast PLC (programmable logic controller) for the control of turret operations.
3. Referring to the signal diagram, value of T3 is particularly critical. Motor must come to a physical halt within this time. Otherwise, the turret will get de-clamped and the Turret clamp signal will be lost.

Following measures are suggested for stopping the motor in minimum possible time:

a. Control should be capable of detecting the Turret clamp signal within 3 to 6 ms.
b. Solid state relays should be incorporated in the motor circuit to ensure fastest possible disconnection. Regular contactors can be used for motor direction selection, followed by solid state relays, at least in two phases.

4.2 Flow chart for turret control

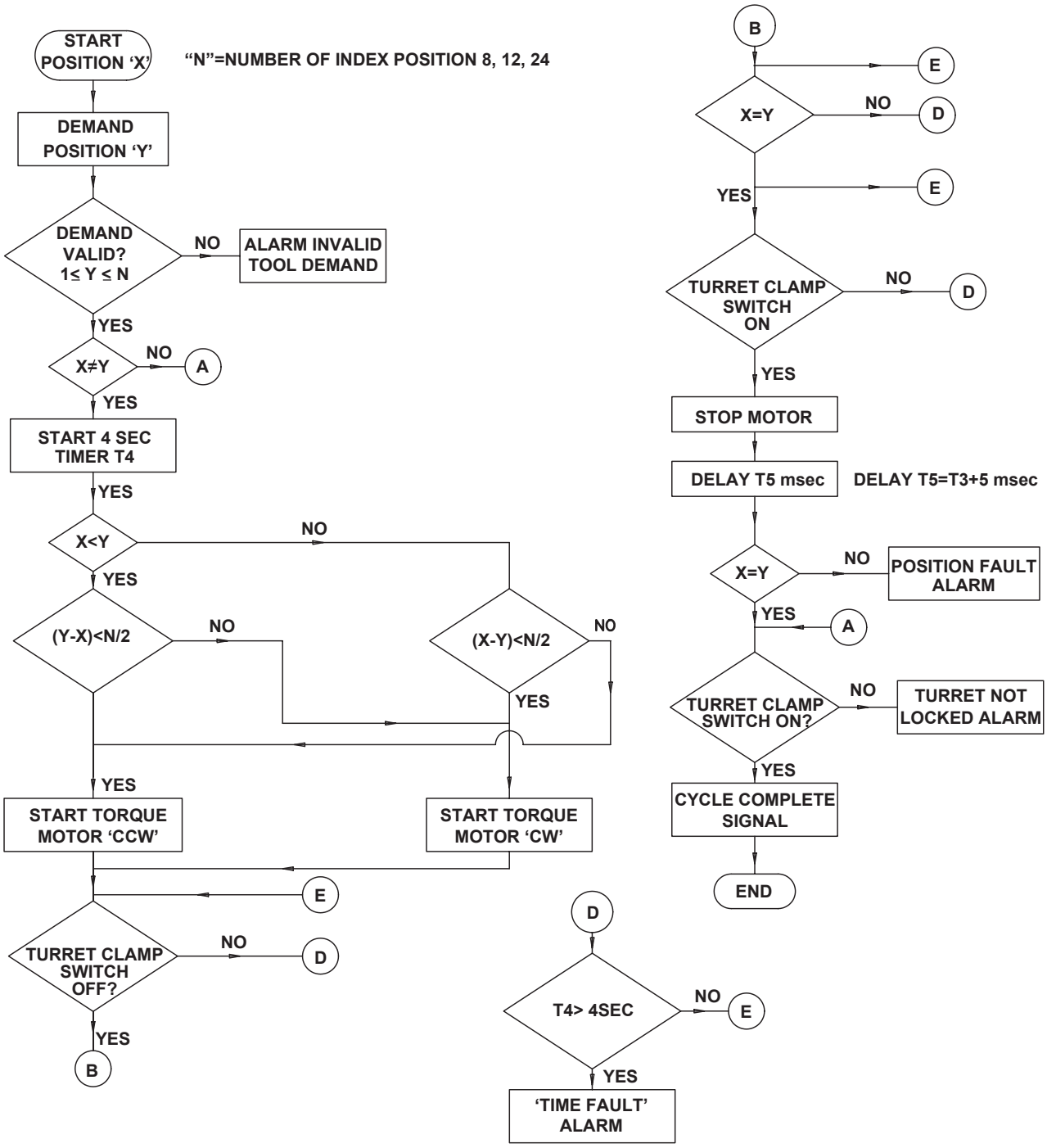


Fig 4.1

Note : Monitor turret clamp switch signal on continuous basis generate feed -hold. If clamp signal missing

4.3. Requirements of turret control :

4.3.1 Sequence of operation :

Flow chart on the page 13 gives the details of operation sequence. Following general points should be noted while selecting the control system and its program.

4.3.2 control system :

* Select a particularly fast PLC (programmable logic controller) for the control of turret operation.
* Control should be capable of detecting the turret clamp switch signal within a period 5 ms.
* Motor should be switched off by solid state relays. Contactors take much longer time (30 to 40 ms). Suggested electrical circuit is on page 12.

4.3.3 Safety interlocks :

A. **'Motor Overheat' signal**

Thermal Switch has been provided in the motor winding to give indication of motor overheating. In the event of overheating relay should trip the motor contactor, and also give 'Motor overheating' signal to the control circuit. Motor contactor should be tripped without depending on PLC software.Typical circuit diagram is given in page 12.

B. 'Time Fault"signal

Time required for indexing through 180° is between 1.3 seconds to 3.1 seconds depending on the Turret model. This is the maximum time required for completing the indexing operation. If the 'cycle complete' signal is not received even after this time, this will be an indication of some fault in the indexing cycle. Control circuit should be programmed to give a 'Time Fault' signal, if the 'Cycle complete' signal is not received within a specified time (say 1 second more than the maximum expected time) after the 'Cycle Start' signal.

C. 'Turret Not Locked' signal

Turret clamp signal should be continuously monitored. If the clamp signal is missing, a Feed Hold signal should be generated to stop the machine movements. Simultaneously, 'Turret not Clamped' alarm signal should also be generated.

D. 'Position Fault' signal

At the end of indexing cycle, a check should be made to ensure that the turret has indexed to the demanded position. If the actual position and demanded position do not match, then 'Position fault' alarm should be generated.

E. 'Invalid Demand' signal

An eight position turret cannot react to a tool demand other than 1 to 8. If any other tool position (say 12) is demanded, the control should give ' INVALID DEMAND ' Message.

All these signals should stop the operation of the machine, and an indication should be available on the control panel regarding the nature of the fault.

F. Manual mode of turret control

Control panel should have a facility to change over the turret control to manual mode. Following facilities should be available in this mode :

G. 'Inching' the motor in either direction :

During servicing, it is sometimes necessary to rotate the motor for checking the functioning of the turret mechanism. Push button switches should be provided to allow 'inching' of the motor in either direction.

H. Tool indexing cycle on manual demand :

Control system should provide a facility to index the turret into desired position by manual data entry of 'tool demand'. This can be either by a 'thumb wheel' switch, or by push button data entry through CNC panel.

Indexing cycle through manual tool demand will be identical to the normal indexing cycle, except for the fact the cycle will start even if initial signal conditions are not satisfied.

Turret can stop in an un-clamped position, if the power fails during the indexing cycle. It is then possible that valid encoder feedback is not available because the turret has stopped in an intermediate position. In such a case, in MDI mode, the control should choose a fixed direction of motor rotation (i.e. default direction) and then index the turret to demanded position.

5. MAINTENANCE

5.1 Lubrication

Turret is lubricated by medium viscosity gear box oil. Normally, oil does not require regular attention. Oil should be changed in case the turret is opened for some reason. Use only acid- free gear box oil HLP ISO VG 46. Place the turret on the horizontal base, And fill the oil to the level seen in oil level indicator (109). The oil filling capacity is 0.5 liters.

Grade EP-140
Viscosity @40deg:370 CST

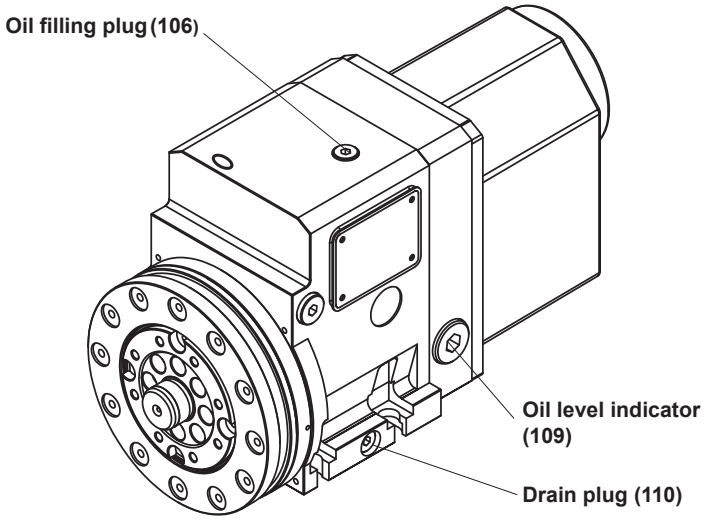


Fig 5.1

5.2 Hand cranking :

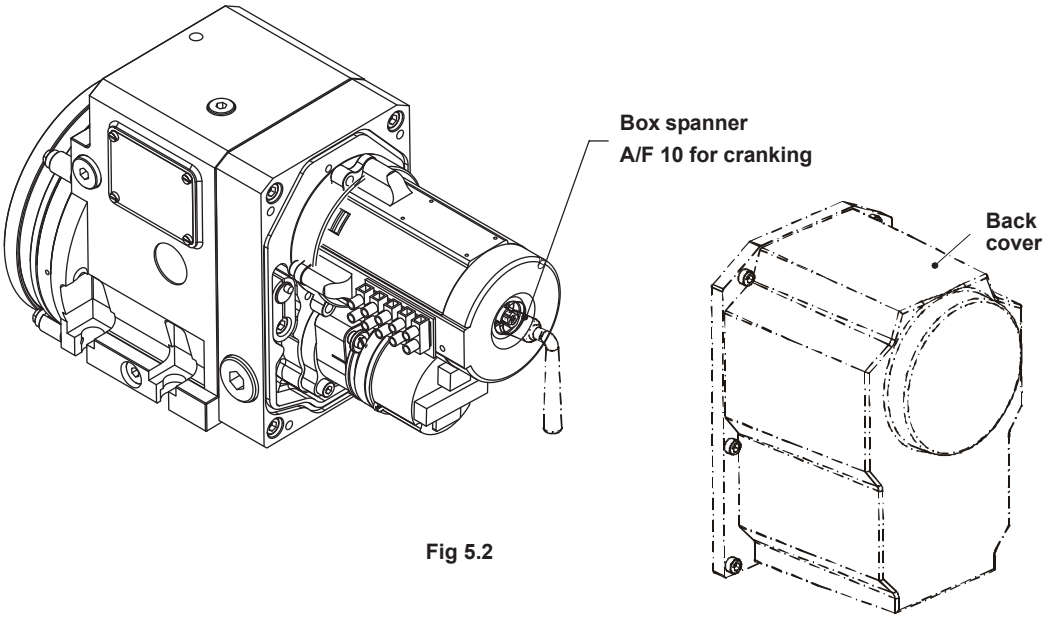


Fig 5.2

Turret can be indexed by cranking the rotor of electric motor by hand. Hand cranking is required for inspecting the setting of encoder, proximity switch and clamping function of disc springs. If turret is hand cranked through one indexing cycle; the extra pressure can be felt during the clamping phase.

Procedure for hand cranking is as follows :

1. Switch off power supply to the motor.
2. Remove Back cover. Hexagon head(A/F 10) of motor shaft is now approachable.
3. Use a suitable spanner to crank the motor.

5.3 Adjustment of Ringfeder Clamps

Accident can happen while the turret is indexing Spurious signals in control circuit can unintentionally start the indexing cycle, causing the turret to index in the middle of a machining operation.

In such accidents, the friction joint of Ringfeder slips and protects the internal mechanism from damage. Such a condition is usually associated with the change in angular position of tool disc in the clamped position or excessive noise in one direction during indexing. So, it is necessary to put back the indexing mechanism into proper orientation by adjustment of ringfeder clamps

5.3.1 Procedure for adjustment of Ringfeder clamps.

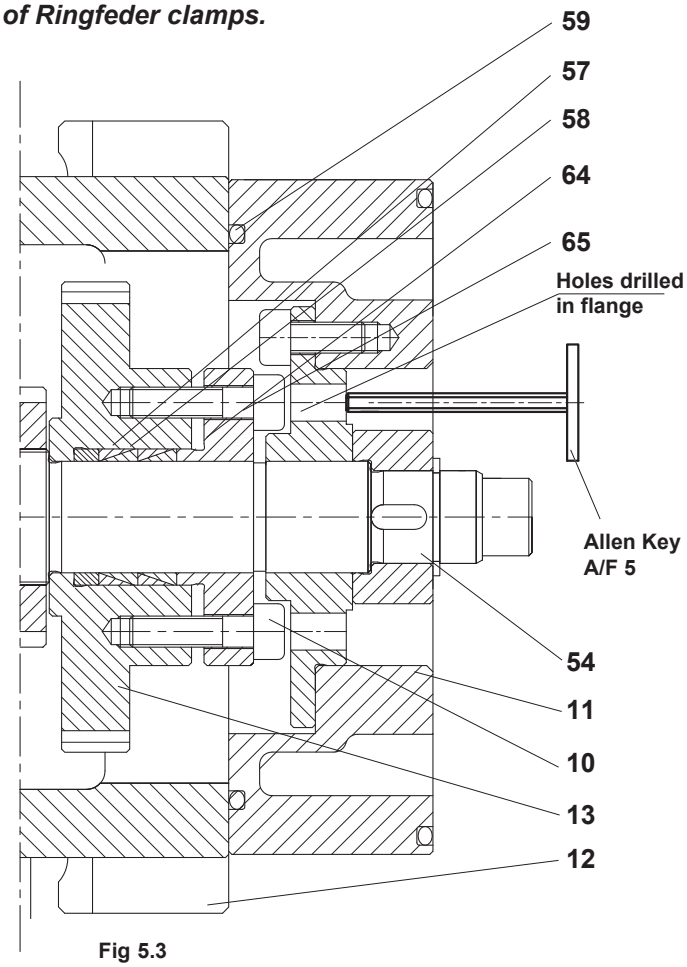


Fig 5.3

* Drain lube oil
* Remove Encoder (02) and mounting flange (05)
* Bring the turret to the clamped position by hand cranking, bolts (65) in line with the holes drilled in flange (10). In case of a 8 station turret, you may have to crank through one or two stations to get the alignment.
* Use suitable Allen key and loosen all bolts. Slightly tap the bolt heads to release Grip.
* Crank the turret by hand and bring the turret in declamped position.
* Fit the Tool disc on the flange and force the angular movement to loosen the grip of Ringfeder clamps.
* Bring the Tool disc in proper angular position. Crank the motor and bring the turret in clamped position.
* Tighten Bolt (65) to clamp Indexing gear (13) on the spindle. Bolts should be tightened in 3 or 4 stages. Tighten opposite bolts in sequence 1,5,2,6,3,7,4,8.
* crank the motor by hand in both directions and check for correct indexing movement.
* Fit flange (05) and encoder (02) back in position follow encoder mounting instructions(sec 6.1).

6. REPLACING COMPONENTS

6.1 Replacement of Rotary Encoder

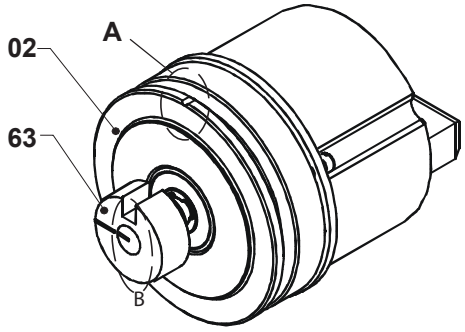


Fig 6.1a
Encoder and Drive dog Assembly

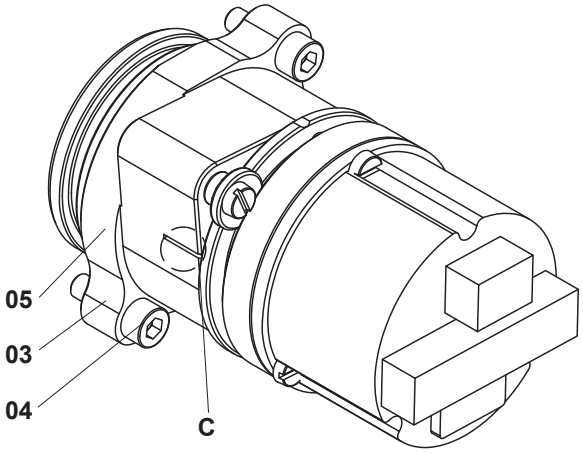
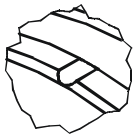
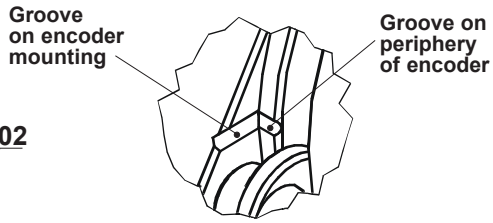


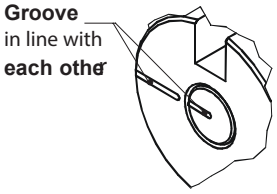
Fig 6.1b
Sectional view



Detail - A
Groove on periphery of encoder



Detail - C
Alignment of encoder
with flange



Detail - B
Alignment of Groove on face of
encoder shaft with Drive dog

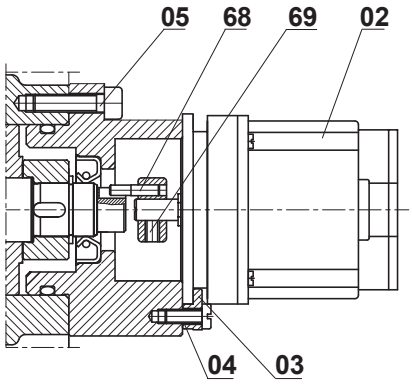


Fig 6.1C

1. Mount the drive dog (69) on the encoder shaft by aligning the mark on the face with that on the dog (6.1a)

2. Ensure that turret is in work position, if not hand crank the motor and bring the turret in working postion.

3. Align the slot of the drive dog with Drive pin (59) on Main spindle and Position the Encoder on the Encoder mounting flange (05) (Fig 6.1c).

4. Match the Encoder marks on its periphery with the marks of flange(02) on its face (detail C).

5. Clamp the Encoder in this position using Clamps and screws (03,04).

6.2 Replacement of the proximity switch

* Bring the turret to clamped position by hand cranking.
* Take out Proximity switch assembly.
* Measure distance 'a' and note it down for reference.
* Replace switch, and maintain distance 'a'.
* It is important to maintain the gap of 0.8 mm to 1 mm as shown in the figure; Detail X. If necessary adjust 'a' to get the desired gap.
* replace the 'O' Ring(114) back in position.
* Place the switch assembly back in position . Hand crank the Turret(ref page 15) and check the function of the switch. Switch LED should light up during clamped position of turret.

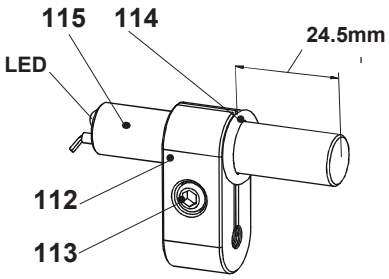
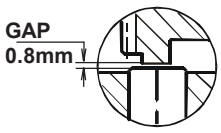
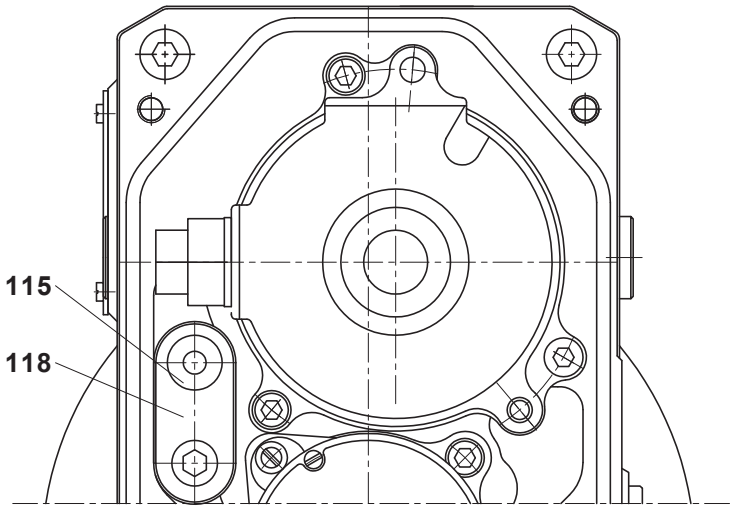


Fig 6.2b
Proximity switch assembly



Detail X



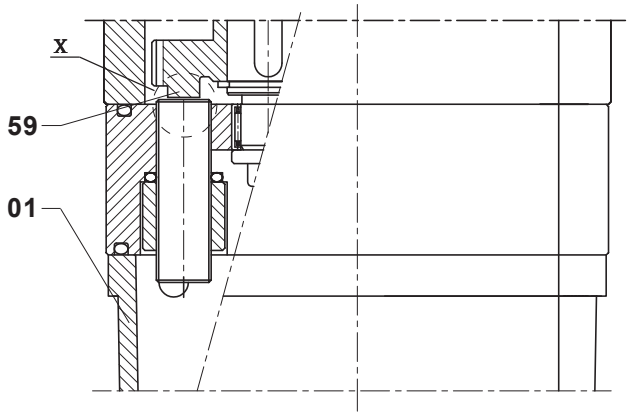


Fig 6.2a

6.3 Replacement of Coolant valve Button (poppet).

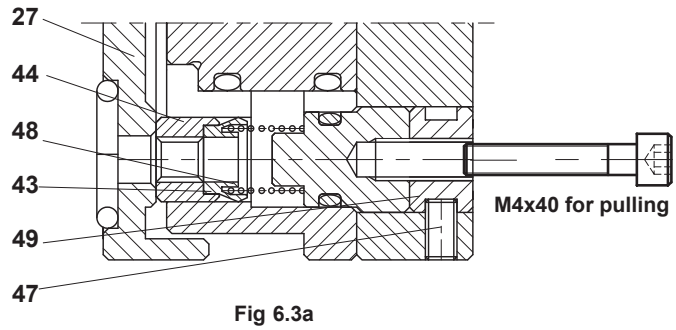


Fig 6.3a

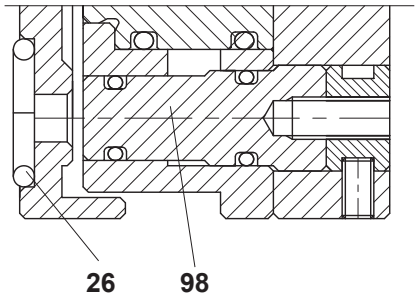


Fig 6.3b

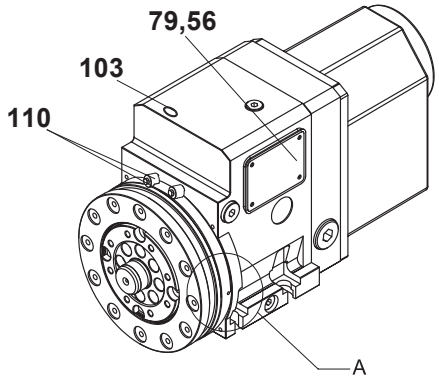


Fig 6.3c

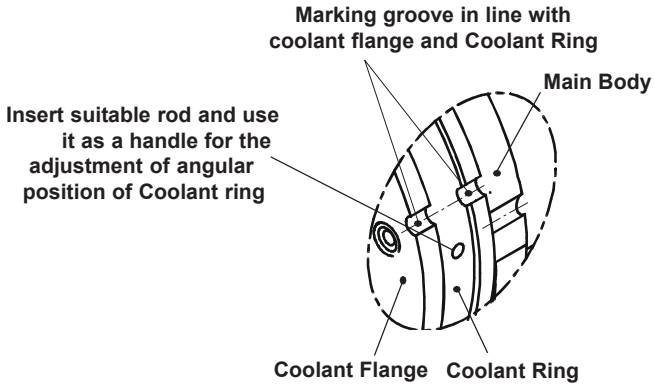


Fig 6.3d

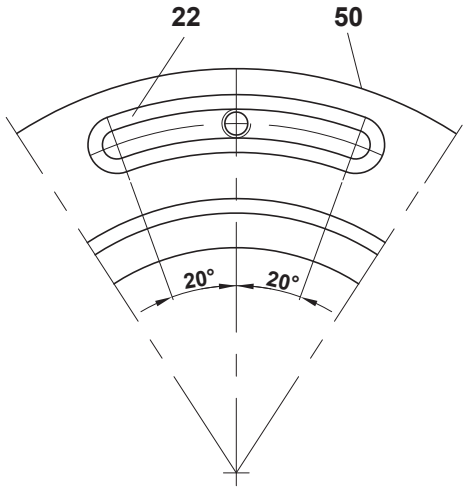


Fig 6.3e

Coolant Poppet (44) rubs against coolant ring during indexing; and is liable to wear. Provision has been to made replace the button, without removing the Tool disc from the turret.

For replacement , Loosen clamps (110), and move coolant ring to align the reference marks in line with the corresponding mark on the body as shown in fig (fig 6.3f). Remove the Grub (47). Use M4x6 screw for removing the poppet Assembly. Change the poppet and reassemble it.

7.0 ASSEMBLY DRAWINGS

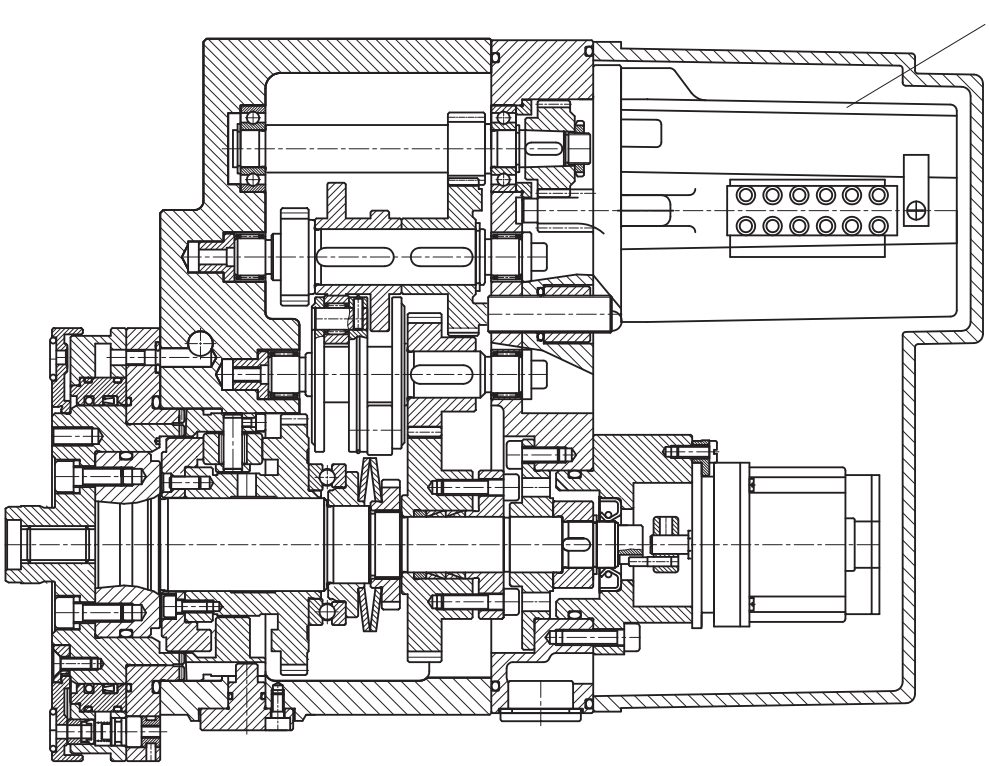


Fig 7.1
OVER ALL ASSEMBLY

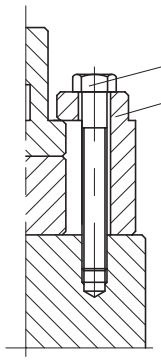


Fig 7.1a

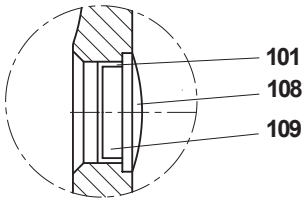


Fig 7.1b

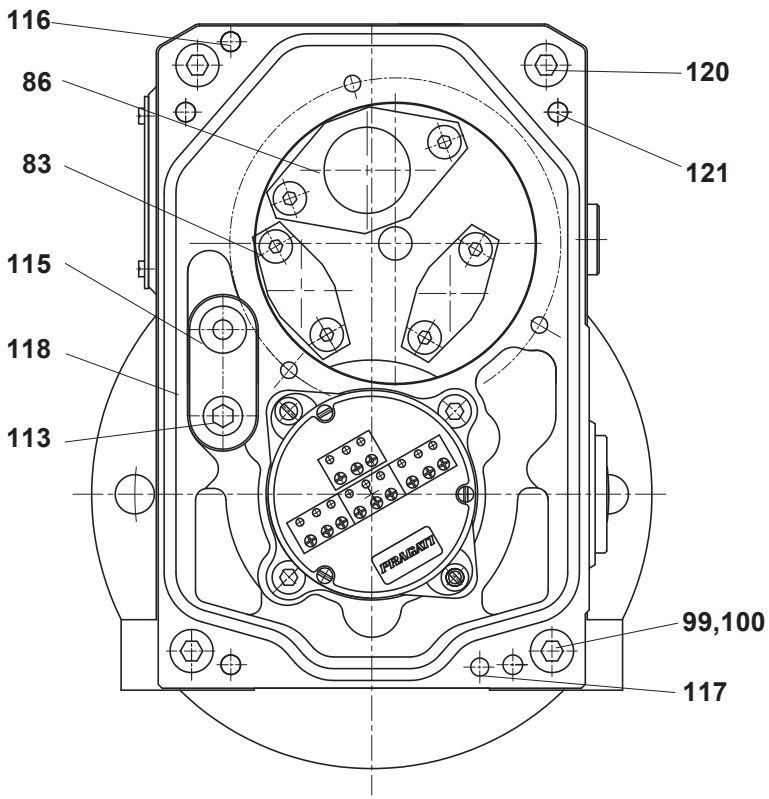


Fig 7.2
With back cover and motor removed.
Actual orientation of axes is visible in this view.

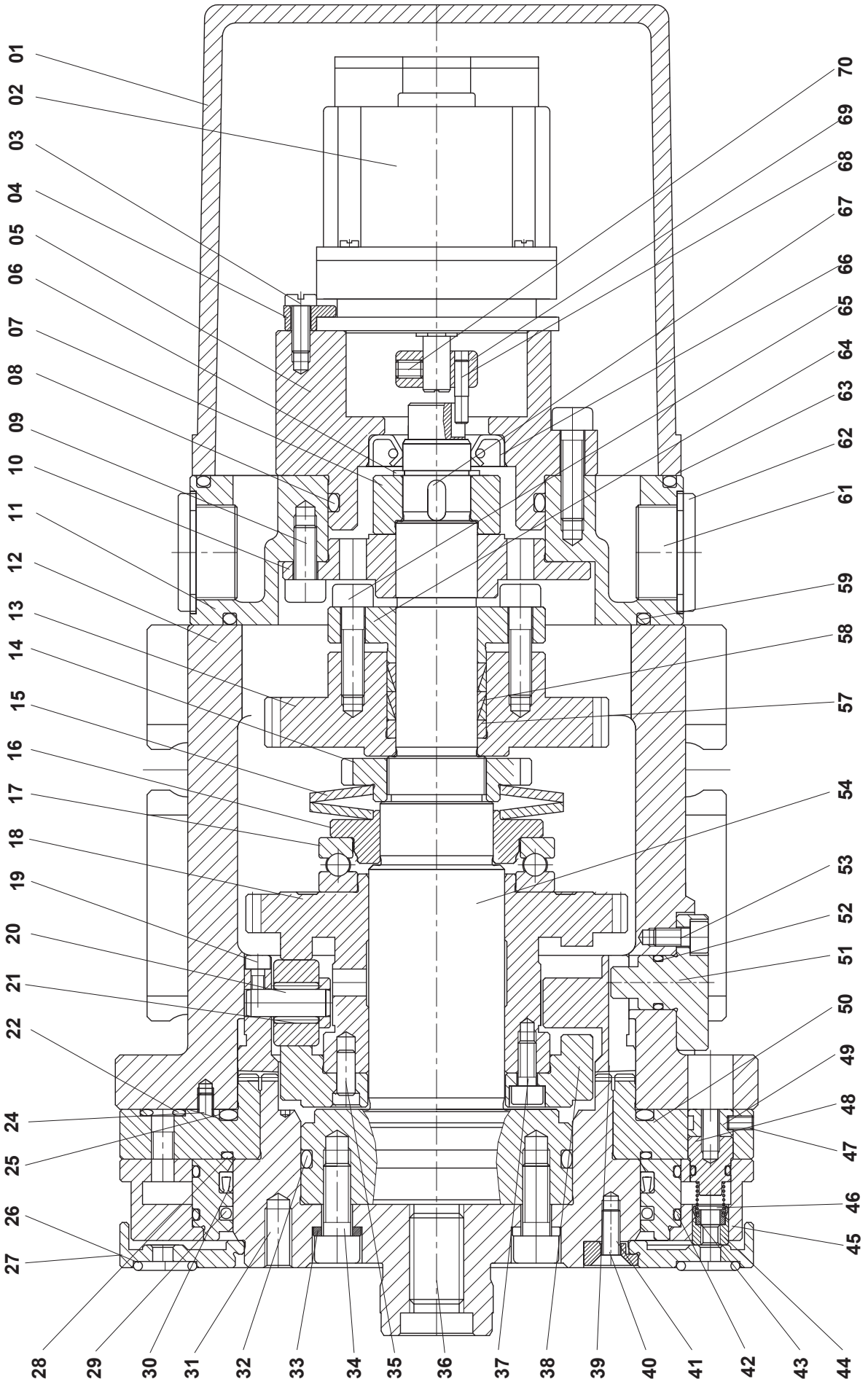


Fig 7.3
MAIN SPINDLE ASSEMBLY

7.4 INDEXING DRIVE

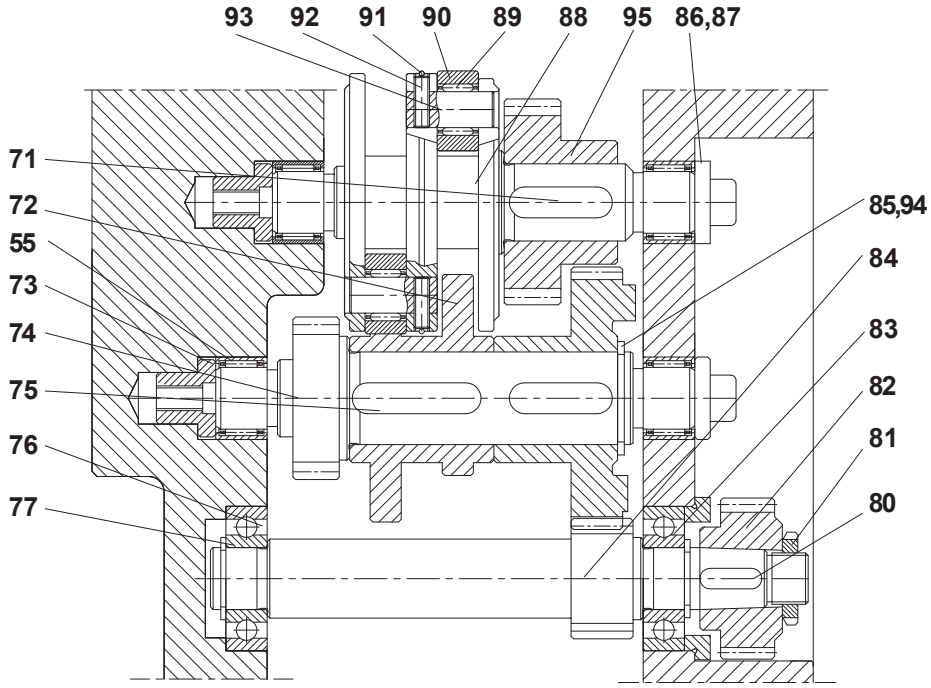


Fig 7.4

7.5 COOLANT VALVE ASSEMBLY

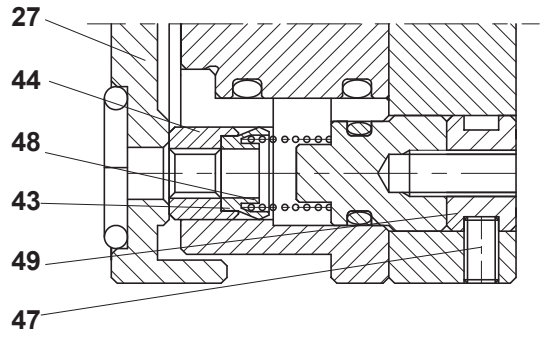


Fig 7.5.a

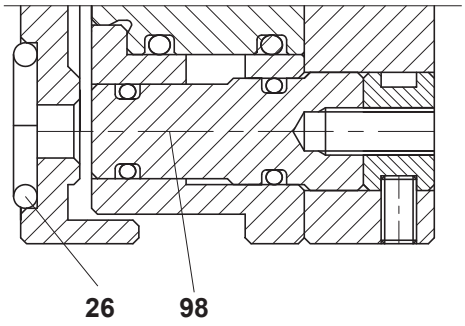


Fig 7.5.b

7.6 DRIVE SHAFT ASSEMBLY

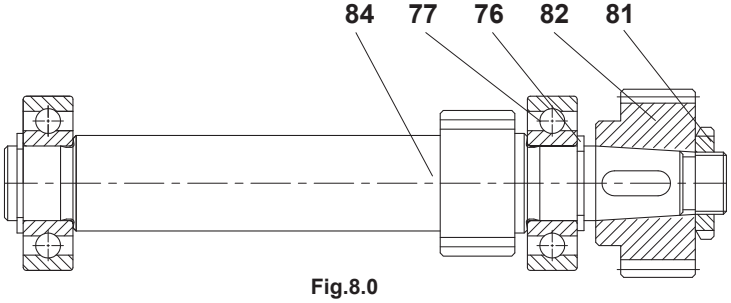


Fig.8.0

8. INSTRUCTIONS FOR ASSEMBLY

1. Prepare the following assemblies

1. Drum cam Assembly

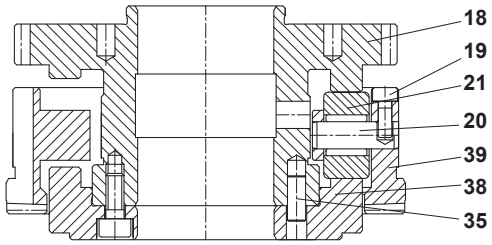


Fig 9.0

2. Indexing Gear Assembly

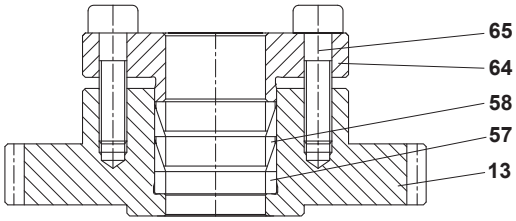


Fig 9.1

3. Cam shaft Assembly

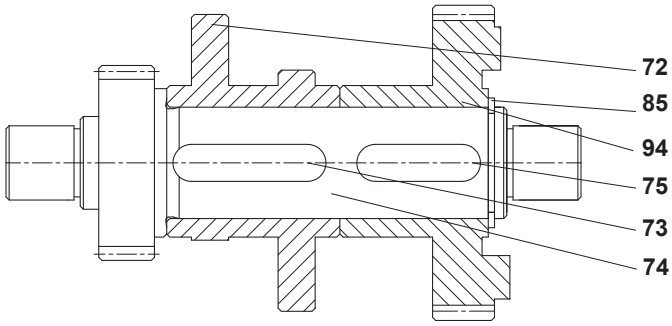


Fig 9.2

4. Follower shaft Assembly

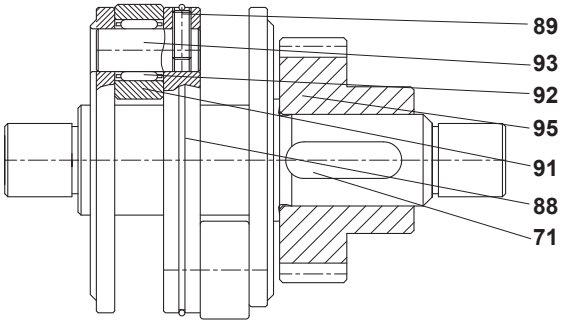


Fig 9.3

2. Partial Assembly of spindle

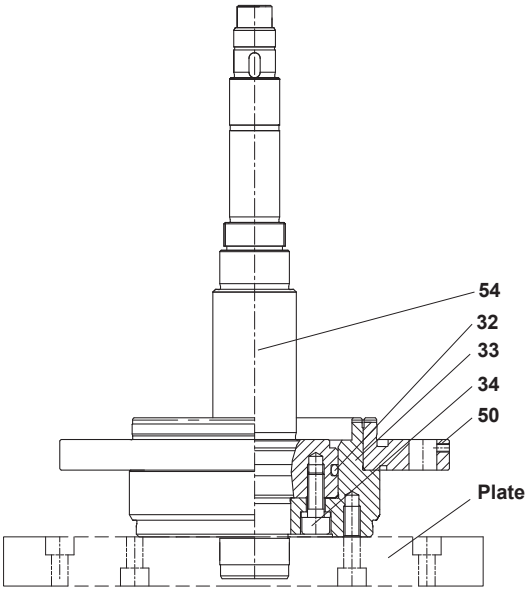


Fig 9.4a

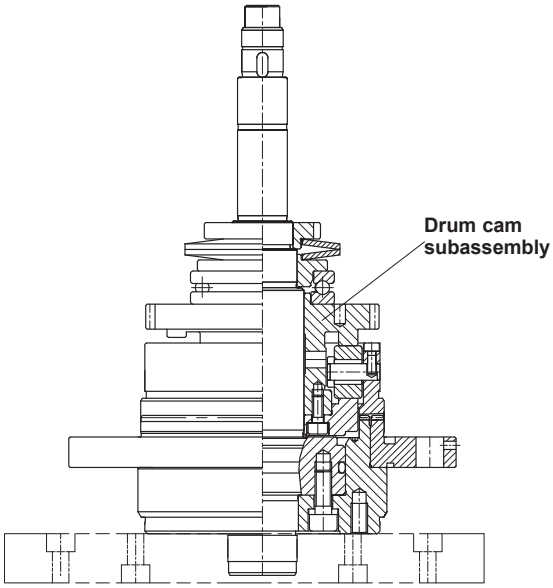


Fig 9.4b

2.1. Coolant Flange Assembly

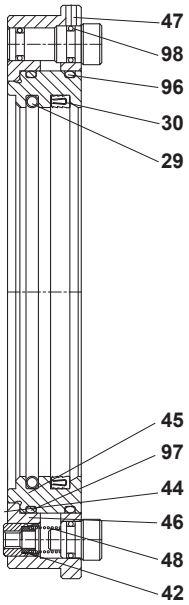


Fig 9.4c

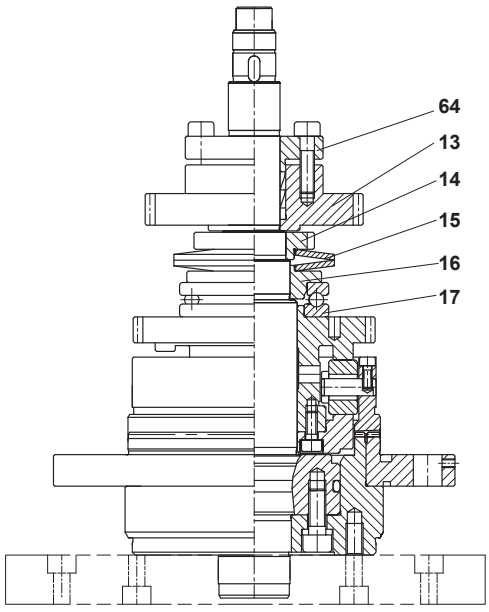


Fig 9.4d

1. Assemble Main Spindle (54) Main / Indexing flange (31) and Fixed coupling (50) with respect to the reference marks
2. Place Drum cam sub assembly (fig 10.0) on the spindle, Take care to align the orientation marks on Fixed coupling (50) and Sliding coupling (39).
3. Also align Orientation marks on Cam gear (18) and sliding coupling (39)
4. Place components 17, 16, 15 in position
5. Use indexing gear with pinion tighten nut 14 till it buts against the shaft shoulder.
6. Spindle sub assembly.

9. COMPONENT LIST

No.	PART NAME	QTY
1	Back Cover	1
2	Encoder Assembly	1
3	Slotted Screw (M3)	2
4	Encoder Clamp	2
5	Encoder Mounting Block	1
6	External Circlip (Ø35)	1
7	End Spacer	1
8	'O'Ring (Enc Mtg Blk)	1
9	Soc.HD.Screw (M6)	3
10	End Bush	1
11	End Plate	1
12	Main Body	1
13	Indexing Gear	1
14	Spring Lock Nut	1
15	Disc Spring	1Set
16	Bearing Seat	1
17	Thrust Ball Bearing	1
18	Cam Gear	1
19	Grub Screw (M6)	3
20	Pin (Sliding Coupling)	3
21	Roller Assembly	3
22	'O'Ring (Coolant Flange)	1
23		
24	Soc.HD.Screw (M6)	12
25	'O'Ring (Fixed Coupling)	1
26	'O'Ring (Coolant Ring)	8
27	Coolant Ring	1
28	'O'Ring (Fixed Coupling)	1
29	Spaghetti Hose	1
30	Spring Energiesed Seal	1
31	Main Flange	1
32	'O'Ring (Spindle)	1
33	Spring Washer	8
34	Soc.HD.Screw (M8)	8
35	Dowel Pin	1
36	Grub Screw (M8)	1
37	Soc.HD.Screw (M6)	8
38	Cam Ring	1
39	Sliding Coupling	1
40	Clamp (Coolant Ring)	4
41	CSK Screw (M5)	4
42	'O'Ring (Wiper Ring)	2
43	Poppet Seal	1
44	Coolant Poppet	1
45	Coolant Flange	1

No.	PART NAME	QTY
46	Coolant Spring	1
47	Grub Screw (M6)	2
48	Coolant Spring Seat	1
49	Washer (Main Body)	2
50	Fixed Coupling	1
51	Sliding Key	1
52	'O'Ring (Sliding Key)	1
53	Soc.HD.Screw (M5)	2
54	Spindle	1
55	Plug (Bearing)	2
56	Star Screw (M3)	4
57	Spacer (Ring Feder)	1
58	Ring Feder	2Set
59	'O'Ring (End Plate)	1
60	External Circlip (Ø12)	1
61	Drain Plug 1/2" Bsp	2
62	Copper Washer 1/2"	2
63	'O'Ring (End Plate)	1
64	Clamp (Ring Feder)	1
65	Soc.HD.Screw (M6)	8
66	Oil Seal	1
67	Key (Spindle)	1
68	Drive Pin	1
69	Drive Dog	1
70	Grub Screw (M4)	1
71	Key(Indexing Shaft)	1
72	Parallel Indexing Cam	1
73	Bearing (HK1012)	4
74	Cam Shaft	1
75	Key(Cam Shaft)	2
76	Deep Groove Ball Bearing	6
77	External Circlip (Ø15)	6
78		
79	Name Plate	1
80	Key(Drive Shaft)	1
81	Lock Nut (M15x1)	1
82	Drive Shaft Gear	1
83	Bearing Cover (DS)	1
84	Drive shaft	1
85	External Circlip (Ø35)	1
86	Soc.HD.Screw (M6)	6
87	Bearing Cover (CS)	2
88	Indexing Shaft	1
89	Grub Screw (M4)	8
90	Snap Ring	1

No.	PART NAME	QTY
91	Roller	8
92	Pin (Needle)	224
93	Pin (Roller Housing)	8
94	Proximity Sensing Gear	1
95	Indexing Shaft Gear	1
96	'O'Ring (Spring Seat)	2
97		
98	Coolant Plug	1
99	Reference Pin	2
100	Washer	8
101	Oil Indicatior Star	1
102	Soc.HD.Screw (M3)	1
103	Eye Bolt (M12)	1
104	Soc.HD.Screw (M5)	3
105	Soc.HD.Screw (M6)	16
106	Drain Plug 1/4"Bsp	4
107	Copper Washer 1/4"	4
108	'O'Ring (Oil Indicatior Star)	1
109	Oil Indicatior	1
110	Clamp (Coolant Flange)	4
111	Hexagon Screw (M6)	4
112	Proximity Clamp	1
113	Soc.HD.Screw (M6)	12
114	'O'Ring (Proximity Clamp)	1
115	Proximity Switch (M12x40)	1
116	Diamond Pin	1
117	Cylindercial Pin	1
118	Soc.HD.Screw (M4)	1
119	Soc.HD.Screw (M5)	1
120	Soc.HD.Screw (M8)	6
121	Soc.HD.Screw (M6)	6
122	Drain Plug 1/4"Bsp	1
123	Connector Bracket	1
124	'O'Ring (Connector Bracket)	1
125	Electric Motor (1500rpm)	1
126	Washer Plate	8
127	Copper Washer 1/4"	1

9.1 List of Spare Parts

No.	Part name	Page no	Part no	Odering code	Manufacturer	Quantity	Remarks
				GROUP ' A ' SPARES			
1.	Electric motor 3ph 440V 50/60 Hz 3ph 220V 50/60 Hz 3ph 110V 50/60 Hz	20	125	AM01 - 440 AM01 - 220 AM01 - 110	Pragati	1	
2.	Encoder 8 Stations 12 Stations	 21 21	 02 02	 AE01 AE02	Pragati	1	
3.	Proximity switch	20	115	ZEP-EGB12X02AP024-500L-C107	Technic	1	
4.	Indexing Shaft Gear	22	95	CB070601	Pragati	1	
5.	Cam Follower Roller Assembly	22	91	SB0706	Pragati	8	
6.	Cam Follower Roller Assembly With Pin	22	91	SB0712	Pragati	8	
7.	Track Roller Assembly	21	21	SB0710	Pragati	3	
8.	Track Roller Pin	21	21	CB070603	Pragati	3	
9.	Track Roller Assembly With Pin	21	21	SB0710	Pragati	3	
				GROUP ' B 'SPARES			
1.	Oil Seal	21	66	ZFSF15X30X7	Vako	1	15X30X7
2.	'O' Ring	21	08	ZSRS138x3	Vako	1	138X3
3.	'O' Ring	21	23	ZSRS42X3	Vako	1	42X2
4.	'O' Ring	21	26	ZSRS12X2	Vako	8/12	12X2
5.	'O' Ring	21	63	ZSRS140X3	Vako	1	140X3
6.	'O' Ring	21	59	ZSRS104X2	Vako	2	104X2
7.	'O' Ring	21	43	ZSRS9X1.5	Vako	2	9X1.5
8.	'O' Ring	21	52	ZSRS17X2	Vako	1	17X2
9.	'O' Ring	21	52	ZSRS54X3	Vako	1	54x3
				GROUP ' C 'SPARES			
1.	Spring Energised Seal	21	30	ZSS90X4.2	ELRING KLINGER	1	90X4.2
2.	Spagetti Hose	21	29	ZSL90X3	ELRING KLINGER	1	90X3
3.	'O' Ring	21	50	ZSRS88X3	Vako	1	88X3
4.	'O' Ring	21	50	ZSRS90X2	Vako	1	90X2
				GROUP ' D 'SPARES			
1.	Coolant Vale Button/ Poppet	21	44	CB070805	Pragati	1	
2.	Coolant Spring	21	46	CB070804	Pragati	1	
3.	'O' Ring	20	97	ZSRS6X1.5	Vako	2	6X1.5

NOTE :

Group 'A' : Relatively costly components. Only a small possibility of requiring replacement.

Group 'B' : Rubber seals. May require replacement if turret is totally dismantled for any reason.

Group 'C' : These components may have to be replaced during periodic inspection (about once in a year).

Group 'D' : Coolant valve. Relatively small value components . May require frequent changes.

10. INSTRUCTIONS FOR DISMANTLING

Turret may have to be opened up in following circumstances :
Mechanical jam of the turret. If turret cannot be indexed even by hand cranking, it will be necessary to open up the turret for inspection. Unusual knocking sound during indexing is also an indication of mechanical problem. Which can be caused due to accidental collision with lathe chuck or other components. If the turret does not function properly immediately after an accident, internal component damage can be suspected.

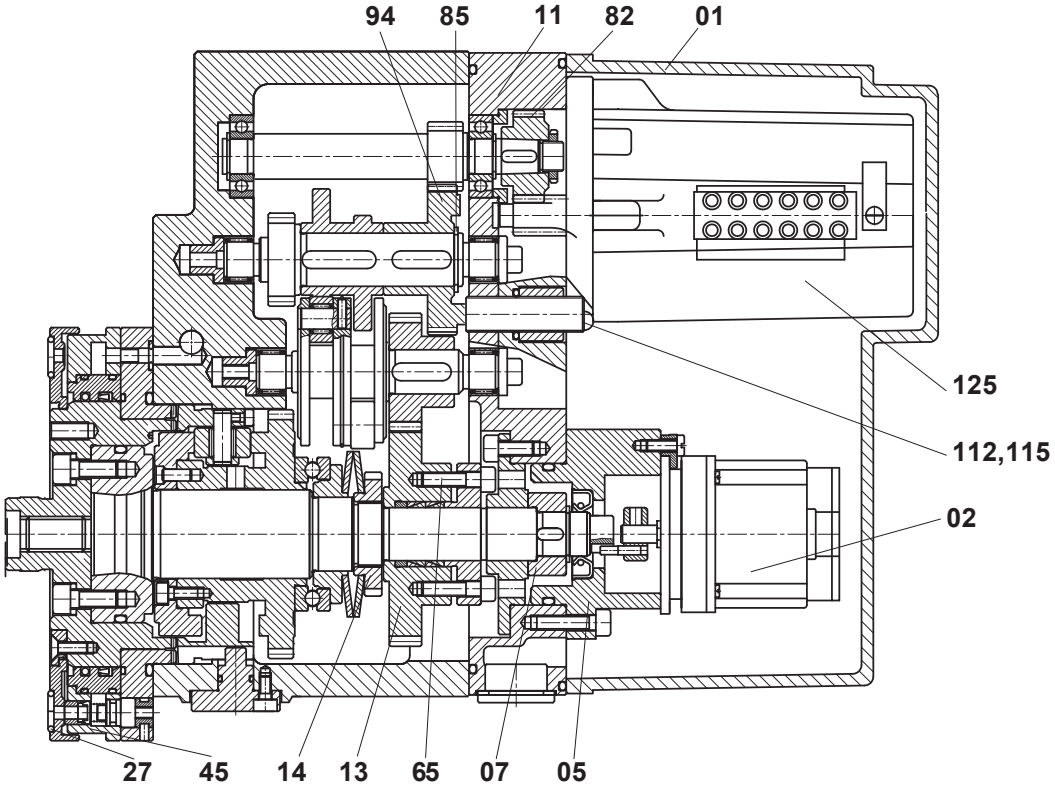


Fig 10.0

10.1 Instructions for dismantling

* Remove the turret from the lathe after draining lubrication oil.
* Remove coolant ring (27) and coolant flange (45).
* Remove Back cover (01).
* Remove motor (125).
* Remove encoder (02) and mounting Block (05).
* Remove Drive shaft gear & Lock Nut (82).
* Remove end spacer (07), and key on the spindle.
* Remove proximity (112),with clamp (113).
* Remove end plate with puller (11).
* Remove circlip (85), and proximity sensing gear (94).
* Loosen clamping screws (65) of friction ring coupling and pull out the indexing gear (13).
* Shafts II, III & IV can now be pulled out. If necessary, use threaded holes at the shaft centre for attaching puller.
* Remove anti-rotation key (51).
* Remove the spindle assembly from the turret front side.

10.2 Dismantling of disc spring and drum-cam assembly

* In the lock nut (82) can be loosened using a 'C' spanner, Disc spings can be easily removed now.
* Drum cam assembly along with the sliding coupling (39) can now be removed.
* Remove screws (65) to separate parts of Drum cam as well as the sliding coupling.

10.3 Inspection of mechanical components

* Check that the cam follower bearing are in good condition.
* Check that the working surfaces of indexing cam and Drum cam are in good condition.

3. Intermediate assembly

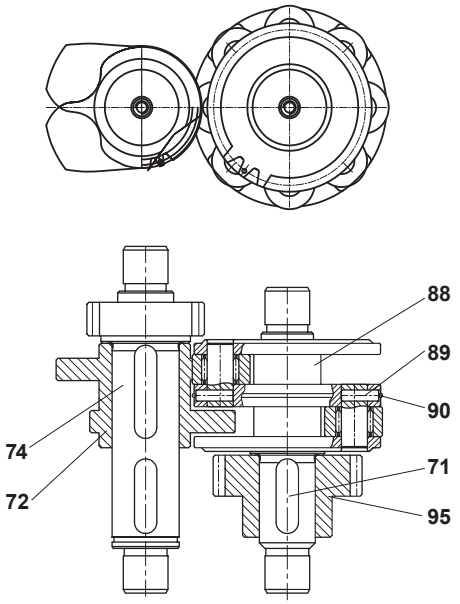


Fig 10.1

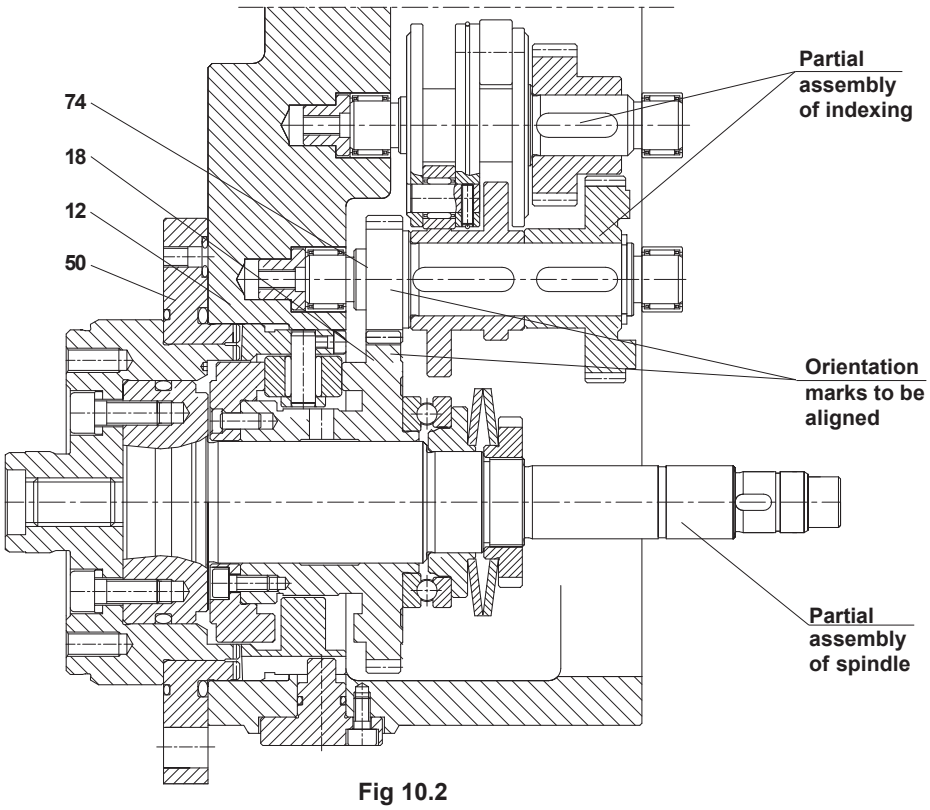


Fig 10.2

* Fit the partial spindle assembly (fig 7.8a,b,c) in main body (1). Don't forget 'O' ring (59).
* Fit Anti rotation Key (51).
* Hold indexing drive subassemblies side by side , in proper orientation as shown in fig10.5. orientation marks on gear (18) and Cam (74) Should be positioned as shown in figure10.5
* Fit These subassemblies in the mainbody without loosing their general orientation, Simultaneously it is neces sary to ensure that drive gear (74) and cam gear (18) mesh with orientation marks properly aligned.

4. Final assembly

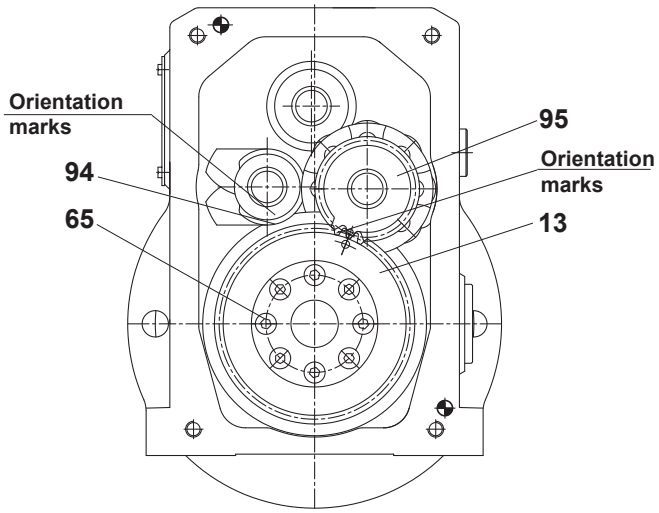


Fig 10.3

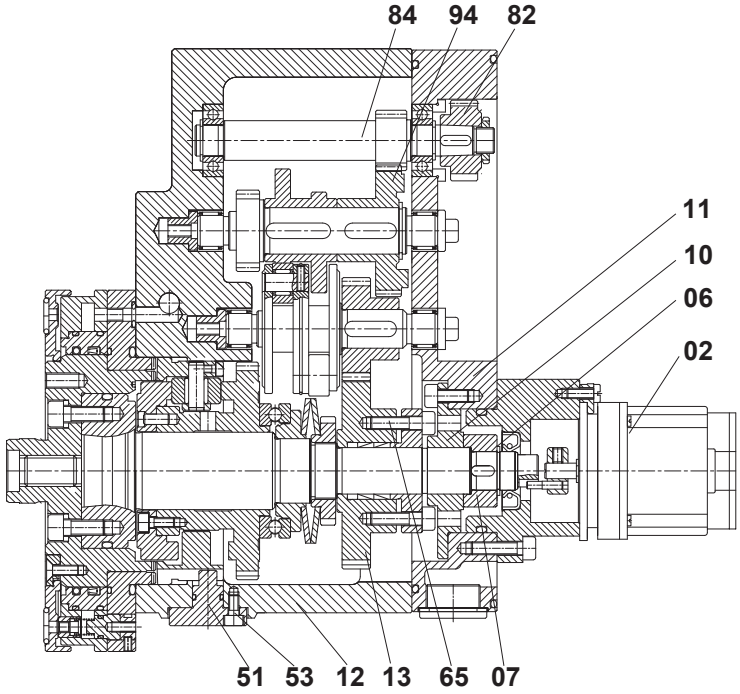


Fig 10.4

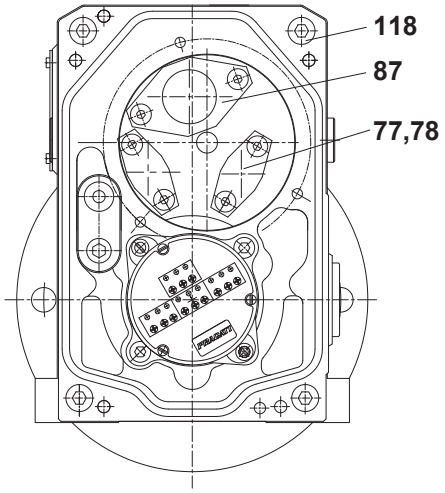


Fig 10.5

* Slide the indexing gear (13) subassembly on the spindle; taking care that the orientation marks on the indexing gear (13) and indexing pinion (95) are in alignment. However do not tighten Ringfeder clamping screws (65) at this stage.

* Assemble gear (94) and circlip (82) on cam shaft (Axis III) Also fix bearing (85) and its circlip (82).

* Fit pinion shaft (84) and its bearing in postion (i.e., Axis IV).

* Fit End-plate (11) on to Main body (12). Take care that bearings on axes II, III and IV are properly aligned and take proper entry into their seats, located in back plate. Clamp back plate to body with the help of bolts (116) and cylindrical pins (117).

* Now tighten bolts (65) to clamp indexing gear (13) onto the spindle. Bolts are approachable through holes in bearing flange (64). Bolts should be tightened in diagonal order, and in 3 or 4 stages.

* Fit thrust bearing ring (64) and Circlip (06) on the spindle.

* Fit bearing covers (78, 87, & 77), and fit gear (82) on pinion shaft (84).

* Fit motor in position, and check indexing movement by hand cranking the motor-shaft.

* Complete the assembly by fitting the remaining parts like encoder, proximity switch, end cover etc.

11. FAULTS AND CORRECTIVE ACTIONS :

	Faulty		Cause		Corrective action
1	Turret remains unlocked at end of indexing cycle complete signal not available even through the motor has stopped	A	Turret motor not stopping at specified time		
		A1	Faulty SSR	A1	Change SSR
		A2	Problem with turret control	A2	Check whether motor power switches OFF with in 5ms of prox. switch signal oscilloscope with memory
		B	Faulty prox. switch	A3	Replace switch
2	Tool disc goes on rotating without stopping at selected location	A	Faulty encoder	A	Hand crank the turret observe encoder signals if defective, replace the encoder
		B	Faulty prox. switch	B	Check whether proximity switch signal is present at proper time during hand cranking if in doubt replace proximity switch
		C	Faulty in control circuit	C	Check whether different siganls (As like tool demand encoder feed back, prox. switch ete). Are available in proper sequence and at proper time
3	Excessive noise during indexing	A	Slipping of ring feder joint	A	Lossen and reclamp the clamping bolts as per the instructions
4	Rotational action not smooth	A	Unbalance load on tool disc	A	Reposision the tools to improve the balance
5	Turret motor over heating signal	A	Excessive frequency of indexing cycle	A	Reduce the number of indexing cycles per min (Max.10cycles/min)
		B	Unbalance power supply	B	Check the voltage in all three phases, correct if neccessary

12. Effects and corrective actions

	Faulty		Cause		Corrective action
12.1	Accidents when Turret is in Locked Position				
	Change in centre height because of tool disc slipping within hole clearence.	A	Accident or heavy interrupted cut	A	Re-allign the tool disc
		B	Contact surface of Tool Disc not Flat or Concave	B	Tool disc surface to be ground to a given flatness. If tested with blue colour should all over or on outside part of contact area.
12.2	Accidents During Turret Indexing				
	Turret Doesnot index or make exccessive Noise.	A	Slipping of Ring feder joint	A	Re-adjust the Ring feder joint
		B	Damage to gears or cam rollers	B	Dismantle the Tool turret Replace deffective components

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