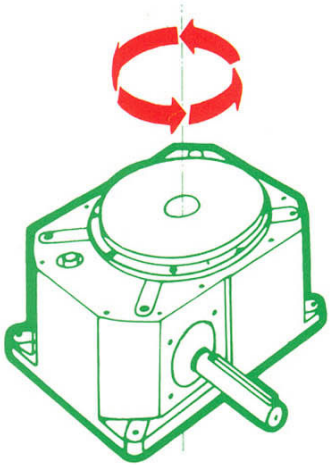
ROTARY INDEX TABLE SERIES 5



DIRECTIONS FOR USE AND MAINTENANCE

USA – 03-2005

ISO 9001-Cert. n°0360

autorotor

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DIRECTIONS FOR USE AND MAINTENANCE

March 05

CONTENTS.

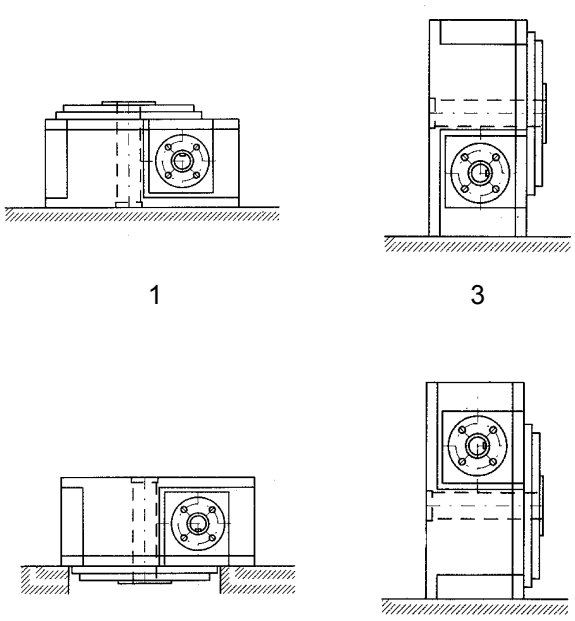
❋ ❋ ❋ ❋

1 MACHINE DESCRIPTION.

The rotary index table is a mechanical device that sets the output disk into intermittent motion. It can be motor driven.
The square axis mechanical unit transforms the uniform rotation of the inlet shaft in an intermittant rotation of the output disk by means of a cam and cam followers; the cam profile determine the indexer's transfer and dwell cycle:
The machine consists of a square axis rotary indexer and it is generally framed into another machine.

2 FORESEEN AND UNFORESEEN USE.

The rotary index table has been designed to set in motion equipment (conceived and developed by the customer, who is reliable for it), with mass, speed, movement law, system's rigidity, axial load, side load, torque within the limits set by the specifications shown in the technical data sheets (see from page 11 on).
Should the indexer be used with higher loads than the ones mentioned in customer's order, a defective working may result, along with a premature wear of the system. Said operating conditions can be anomalous also from the point of view of operator's safety.
A dynamic shock during the deceleration phase hints at a load exceeding the one expected when designing. The customer must carefully plan the overall safety conditions of the machine designed to frame the rotary index table Autorotor and must take into account the specific features of the indexer itself.



pict. 1 Operating positions of the rotary index table.

2.1 Table fixing.

The rotary index table must be suitably anchored and supported according to its own weight and to the loads applied to it (see . pict. 4, pict. 6 and table *4*).

2.2 Features of the tooling plate to be connected to the indexer.

They must be suitable for the table features.

2.3 Risk of crushing, trapping, cutting, friction; and that pieces are projected due to the tooling plate and to the parts/equipment moved by the table.

Should the a.m. risks be there, suitable protection screens are to be prepared. They have to be evaluated depending on what follows.

2.3.1 Motor stop in dwell position.

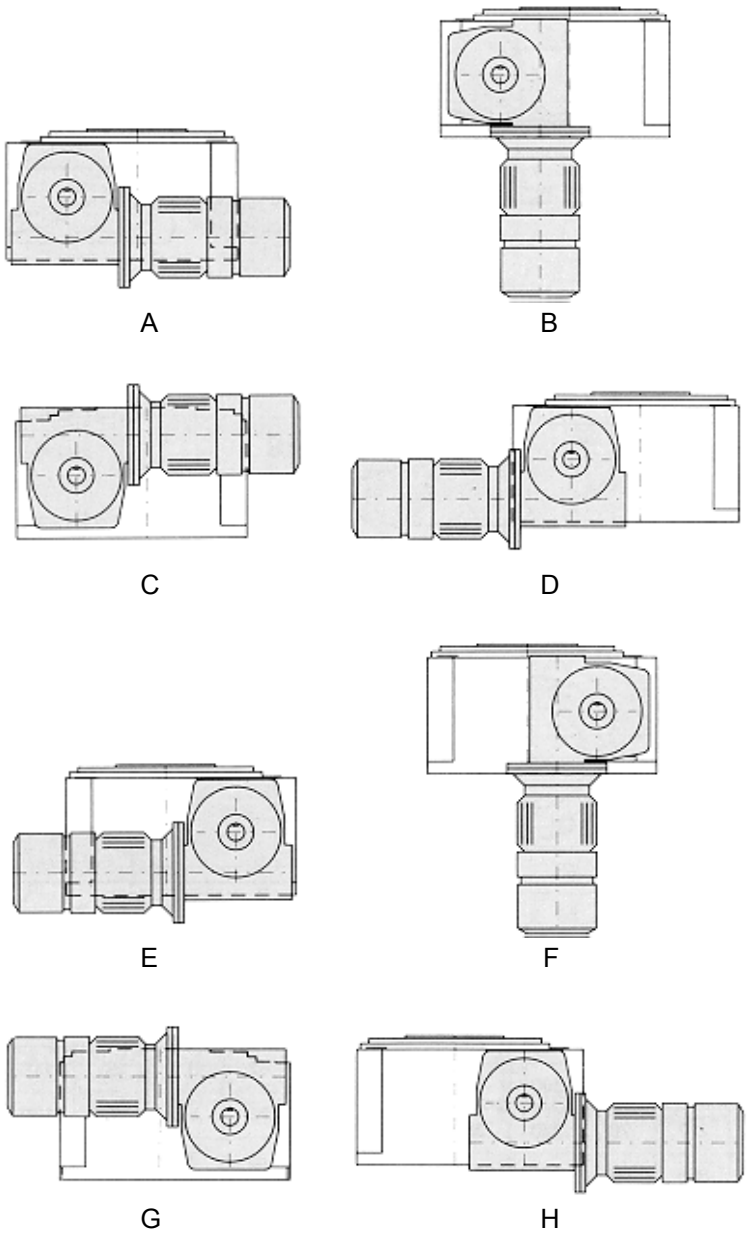
The table must not be stopped during the transfer phase. The cam holder shaft can be stopped during the disk dwell position, that is when the masses are still.
The (optional) position sensing device triggering the motor stop during the dwell position has a functional nature, and therefore it is not a safety device.
Should this stop have to be ensured to protect the safety of the machine in which the table is framed, then the a.m. sensing device must be replaced with another suitable one (possibly to be supplied by Autorotor).
The position sensing device must be adjusted while being installed (See § 6).

2.3.2 Motor stop due to power failure.

The stop of the system is triggered by the motor mechanical or dynamic brake if they are there (See § 2.3.3 and §3). Should the calculated values still entail residual unacceptable risks, interblocked protection systems are to be applied, or a different kind of indexer must be requested to Autorotor.

2.3.3 Emergency stop.

Although you mustn't stop the intermittent units during the transfer time, the Autorotor table is mechanically designed as to allow the emergency stop at any moment of the cycle. Furthemore an electric braking system in countercurrent - within the current values set in the table depicting the features of the electric system of the motor - can be added to the built-in brake motor braking.
The stop during the displacement phase entails a peak torque on the table output disk due to the inertia of the system causing a dynamic shock to occur, the intensity of which depends on the cam position at the very moment when the stop occurs. The dynamic shock discharges onto the intermittent unit and the reducer.
As the remaining life of the table is reduced by the stress of a dynamic shock, the use of emergency stop as an ordinary cycle stop is forbidden.
A torque limiter between table and reducer, limiter which under emergency stop conditions allows the motion to be continued and the kinetic energy accumulated to dissipate, reduces the effect of the dynamic shock on the mechanical parts.
The emergency stop does not cause the motion to come immediately to a standstill; in fact the output disk is likely to rotate, after the stop, for an angle, which depends on the initial mass inertia of the system and on the instant when the emergency stop occurs.



pict. 2 Power drive unit assembling position

The torque limiter must be checked every now and then to check that the original setting figure is kept.
In case it wasn't, it has to be set to the pristine value.

3 EMERGENCY STOP TIME CALCULATION.

The emergency stop time can be calculated from the balance between the braking action and the kinetic energy related to the table and motor inertia (passive phenomena are not taken into account).

- Maximum kinetic energy with respect to the motor shaft, brought about by the inertia of the rotating masses applied to the table output shaft or disk:

$$E_{k\,maxi} = \frac{1}{2} \cdot Jt \cdot \left(\omega_m \cdot \frac{2}{i} \cdot \frac{2\pi}{S \cdot \beta} \right)^2$$

- Motor kinetic energy

$$E_{k\,mot} = \frac{1}{2} \cdot Jm \cdot \omega_m^2$$

- Energy dissipated by the brake

$$E_f = \frac{1}{2} \cdot Mf \cdot \omega_m \cdot t_f$$

It is therefore possible to calculate the braking time and the slipping angle:

$$t_f = \left(\frac{\omega_m \cdot \left[Jm + Jt \cdot \left(\frac{2}{i} \cdot \frac{2\pi}{S \cdot \beta} \right)^2 \right]}{Mf} + t_i \right) \cdot K$$

$$\alpha_f = \omega_m \cdot t_f$$

Caption:

Mf	braking torque [Nm]
Jt	moment of inertia on the output shaft/disk [Kgm^2],
ω_i	input shaft angular speed [rad/s],
S	station number,
β	displacement angle [rad],
i	gearbox reduction ratio,
ω_m	motor shaft angular speed [rad/s],
Jm	inertia of the motor [Kgm^2]
t_f	braking time [s]
α_f	slipping angle [rad]
t_i	turn-on time of the brake [s]
K	safety factor (1.5 ÷ 2)

Check periodically the motor braking system efficiency.

4 GENERAL TECHNICAL DATA.

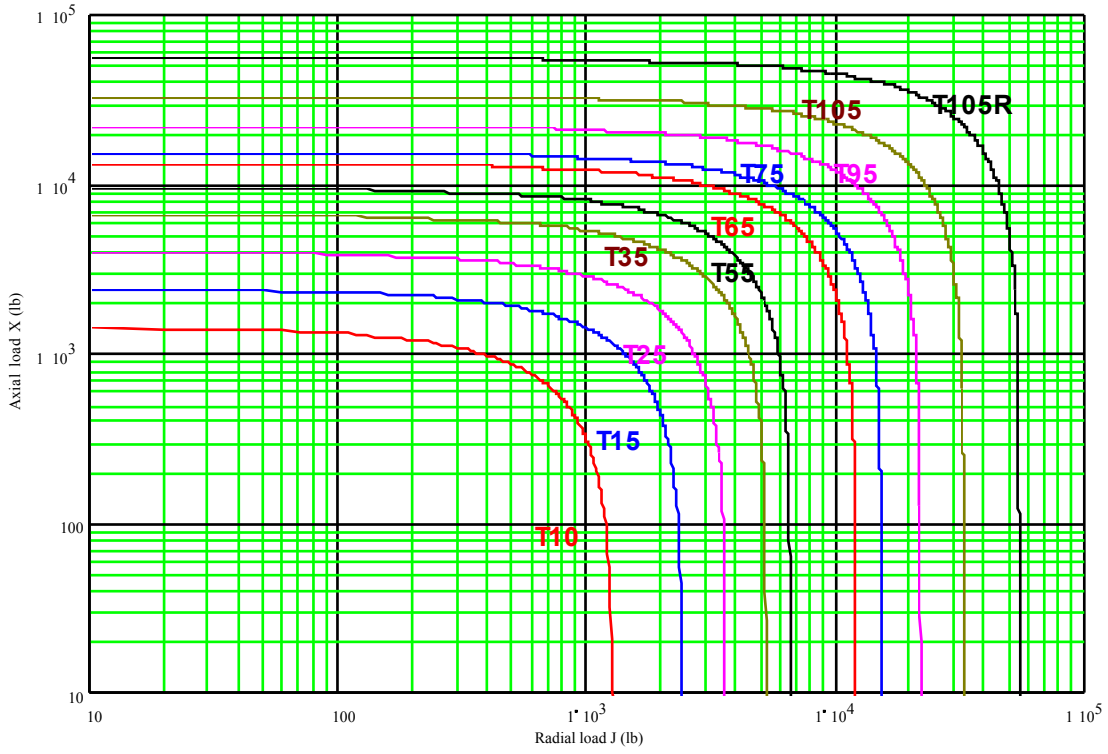
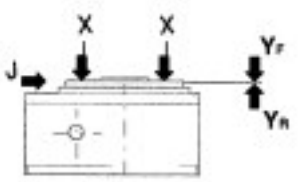


table 1: maximum axial and radial loads when applied simultaneously

Table type	Axial load X		Radial load J		Bending moment (Y_f·R)		Deflection moment (Y_f·R)	
	daN	lb	daN	lb	daNm	lb in	daNm	lb in
T10	650	1 433	580	1 279	18	1 593	9	797
T15	1 100	2 426	1 100	2 426	32	2 832	20	1 770
T25	1 800	3 969	1 650	3 638	68	6 018	38	3 363
T35	3 000	6 615	2 400	5 292	118	10 444	70	6 195
T55	4 300	9 482	3 000	6 615	248	21 950	140	12 391
T65	6 000	13 230	5 500	12 128	350	30 977	250	22 127
T75	7 000	15 435	7 000	15 435	450	39 828	350	30 977
T95	10 000	22 050	10 000	22 050	800	70 806	700	61 955
T105	15 000	33 075	15 000	33 075	1 100	97 358	1 000	88 507
T105R	25 000	55 125	25 000	55 125	1 750	154 887	1 500	132 761

table 2: maximum bearable single loads on output disk



pict. 3.
Load application

Type	Stations number						
	2 - 4 - 8	3 - 6	10 - 20	12 - 24	16	18	32
T 10	0.00232	0.00226	0.00238	0.00243	0.00232	0.00235	
T 15	0.00691	0.00678	0.00703	0.00716	0.00691	0.00697	
T 25	0.02470	0.02430	0.02510	0.02550	0.02620	0.02660	0.02620
T 35	0.07610	0.07330	0.07890	0.08170	0.08730	0.09010	0.08730
T 55	0.42900	0.42900	0.46500	0.46950	0.49600	0.51000	0.49600
T 65	1.63500	1.64800	1.66100	1.68700	1.73900	1.76500	1.73900
T 75	4.64300	4.64300	4.66300	4.69400	4.74400	4.77600	4.74400
T 95	10.85000	10.93700	11.01000	11.18000	11.50000	11.67000	11.50000
T 105	41.30000	41.30000	42.20000	41.30000	41.80000	42.00000	41.80000

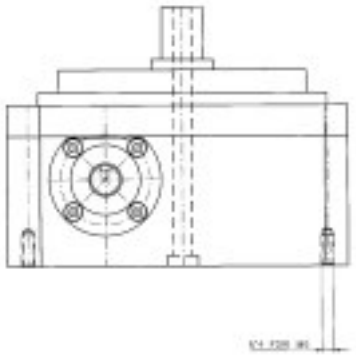
table 3: indexer's inside parts inertia J_a (Kg m²)

stations number	2	3	4	5	6	7	8	9	10	12	14	15	16	18	20	22	24	26	28	30	32
T10	8	6	8	10	6	7	8	9	10	12	7	15	8	9	10	11	12	13	14	15	16
T15	8	6	8	10	6	7	8	9	10	12	14	15	8	9	10	11	12	13	14	15	16
T25	8	6	8	10	6	7	8	9	10	12	14	15	16	18	10	11	12	13	14	15	16
T35	8	6	8	10	6	7	8	9	10	12	14	15	16	18	10	11	12	13	14	15	16
T55	6	6	8	10	12	7	8	9	10	12	14	15	16	18	10	11	12	13	14	15	16
T65	8	9	8	10	12	14	8	9	10	12	14	15	16	18	10	11	12	13	14	15	16
T75	8	9	8	10	12	14	8	9	10	12	14	15	16	18	10	11	12	13	14	15	16
T95	8	9	12	10	12	14	16	9	10	12	14	15	16	18	10	11	12	13	14	15	16
T105	8	9	12	10	12	14	16	9	10	12	14	15	16	18	10	11	12	13	14	15	16

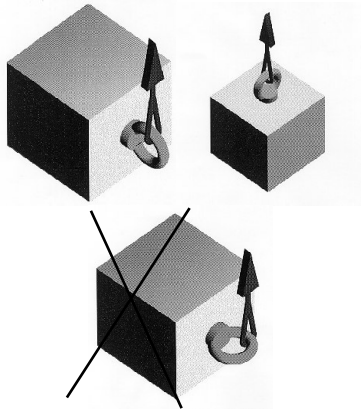
table 5: number of cam followers depending on the stations number.

5 HANDLING AND TRANSPORTATION.

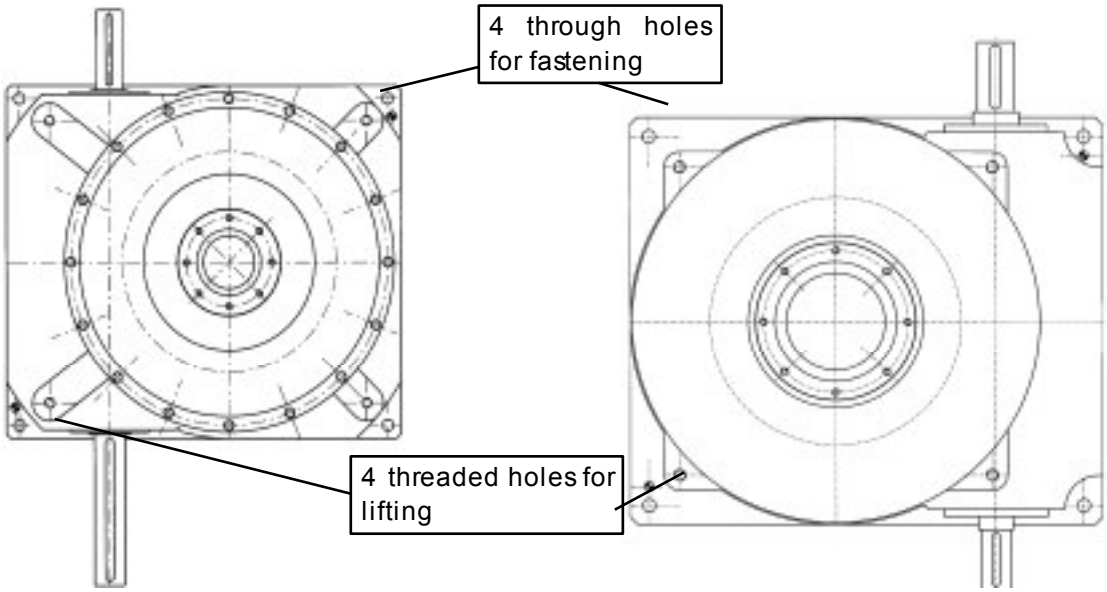
Since T10 and T15 weigh less than 25 Kg., they can be lifted manually.
The powered versions and the types weighing more must be lifted by means of lifting eyebolts to be locked in the suitable holes (pict. 4, pict. 5, pict. 6 and table *4*) in accordance with what stated by UNI ISO 3266 regulation.



pict. 4 Fastening holes T10



pict. 5 Lifting up through lifting eyebolts



pict. 6 Lifting up and fastening holes - tables T15/T55 and T75/T105

	weight		fastening screw	lifting eyebolts
	Kg	lb		
T10	9.5	21	TCEI M6X40	
T15	23	51	TCEI M8X40	2 TYPE 1 UNI ISO 3266 M8X15 (tilted lifting)
T25	46	102	TCEI M8X40	2 TYPE 1 UNI ISO 3266 M8X35 (tilted lifting)
T35	84	185	TCEI M10X60	2 TYPE 1 UNI ISO 3266 M10X50 (tilted lifting)
T55	181	399	TCEI M12X60	2 TYPE 1 UNI ISO 3266 M12X20 (tilted lifting)
T65	360	794	TCEI M16X70	2 TYPE 1 UNI ISO 3266 M16X60 + 35 mm spacer (tilted lifting)
T75	432	953	TCEI M16X70	2 TYPE 1 UNI ISO 3266 M16X60 + 35 mm spacer (tilted lifting)
T95	936	2064	TCEI M20X80	2 TYPE 1 UNI ISO 3266 M20X75 + 45 mm spacer (tilted lifting)
T105	2400	5292	TCEI M20X80	4 TYPE 1 UNI ISO 3266 M20X90 + 60 mm spacer (**vertical lifting**)

table 4: weight, fastening and lifting.

6 ASSEMBLY AND INSTALLATION.

The rotary index table must be only installed in one of the positions indicated in pict. 1, that is on fastening supports suitably designed so as to bear the load and to absorb vibrations and noise. The fastening must be performed through screws the type of which is described in table *4*.
The tooling plates must be designed and manufactured according to the technical features of the table and must fullfill the minimum safety and health requirements stated in the machines guideline.
To be transported, the table must be crated with the reducer mounted along its side. If the desired operating position is different, you must unscrew the gear box's adaptation flange to the table (be careful of not shacking the motoreducer), rotate the reducer to the desired position and then rescrew the flange to the table casing. See the table's serial number on the first page of this handbook to learn the electrical data.

6.1 Motion transmission to the unit.

Should the rotary index table be supplied without gearbox and motor, to have it run well you must

- consider the output torque of the reducer with reference to the data declared by the supplier. It must be less by
  - 35% for cam angles ranging from 180° to 330°
  - 65% for cam angles ranging from 90° to 150°
- check the maximum torque
- be sure of reduced backlash between the screws and the gear of the reducer
- consider a further reduction factor of the useful torque (K=1.3) for transmission through chains, joints, pulleys, bevel gears etc.
- pinions and pulleys must have the largest possible pitch diameter compatible with the overall needed dimensions; chains and belts must be inextensible, joints must be free of backlash.

As a consequence of what written above on the dynamic shock in case of stop during the table's displacement time, it is highly recommended to use a torque limiter, to avoid stresses which can bend and break the cam followers' pin.
The torque limiter is to be set at a torque value no more than 15% higher than the normally used torque.

6.2 Backlash on transmissions.

The transmissions rigidity is crucial to the good operating of the table. Check that there are no slacks between motor shaft and cam holder shaft. If any, by taking them away the pristine efficiency of the table is regained.

7 PUTTING INTO OPERATION.

Before putting the rotary table into operation you must:

- clean it carefully, by taking away dust and any foreign and smudging substance
- clear the rust inhibitor from the parts that are not painted
- adjust the position and operating of the position sensing device, if it is there, which stops the motor during the dwell position of the table
- check the right working of all protection and safety systems of the machine which incorporates the rotary index table

8 LUBRICATION.

Autorotor units are lubricated with longlife grease. Accessories, too, (reducers, speed variators, etc.) are adequately lubricated when supplied already assembled on the units.
The grease quantity in each unit depends on the operating position (pict. 1) and is shown in table *6*.

ROTARY INDEX TABLE	ASSEMBLY POSITION	LUBRICANT	Q.TY (GAL)	Q.TY (L)
T 10	1	•	0.07	0.25
T 15	1	•	0.09	0.35
T 25	1	•	0.24	0.90
T 35	1	•	0.40	1.50
T 55	1		0.92	3.50
T 65	1		1.06	4.00
T 75	1		1.06	4.00
T 95	1		3.17	12.00
T 105	1		6.60	25.00
T 10	2		0.07	0.25
T 15	2		0.09	0.35
T 25	2		0.24	0.90
T 35	2		0.40	1.50
T 55	2		0.92	3.50
T 65	2		1.06	4.00
T 75	2		1.06	4.00
T 10	3		0.07	0.25
T 15	3		0.09	0.35
T 25	3		0.24	0.90
T 35	3		0.40	1.50
T 55	3		0.92	3.50
T 65	3		1.06	4.00
T 75	3		1.06	4.00
T 95	3		3.17	12.00
T 105	3			
T 10	4		0.07	0.25
T 15	4		0.09	0.35
T 25	4		0.24	0.90
T 35	4	•	0.40	1.50
T 55	4	•	0.92	3.50
T 65	4		1.06	4.00
T 75	4	•	1.06	4.00
T 95	4	•	3.17	12.00
T 105	4	•		

• ROLOIL LITEX EP 00 C.A./ 73 S

Equivalent lubricants

ESSO	BEACON EPO
BP	ENER GREASE FG00EP
SHELL	SUPER GREASE EP0 TIVELA COMPOUND
AGIP	GR SLL

table 6: lubrication.

The lubricant quantity is checked through the level plugs. If you need any detail on lubricant quantities to be used in operating positions different from those as yet reported, please call the Autorotor Technical Dept.
Only for units operating at over 150 cycles/minute it is recommended a check on lubricant level every 2000 hours and lubricant replacement every 4000 hours.

9 MAJOR OVERHAULING.

Major overhauling is carried out at Autorotor workshop; please call after-sale service.

9.1 Spare parts.

In case of order for spare parts, please let us know the unit type and serial number (they are shown in the table plate) and the spare part number (see technical data sheets).

10 DISPOSAL OF HARMFUL SUBSTANCES AND DISMANTLING.

The table does not release any oil or grease in the environment. Should it be dismantled, lubricants must be disposed of in accordance with the laws currently in force.

11 NOISE PRODUCED BY THE TABLE.

The weighed steady sound pressure level of the rotary index table is less than 70 db (a).

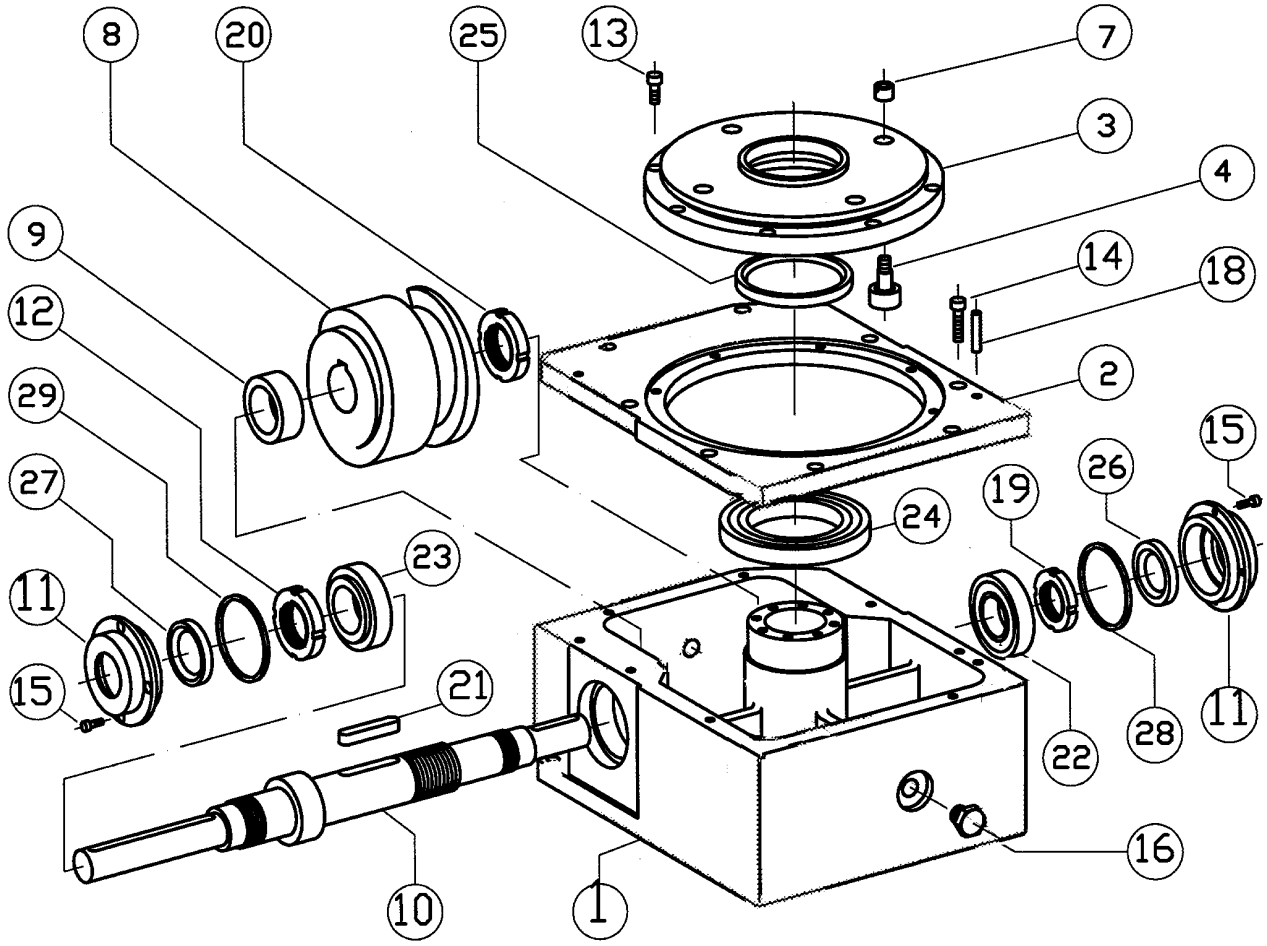
12 REFERENCE REGULATION FRAMEWORK.

DPR 547/55	Regulations for preventing industrial accidents
DPR 303/56	General industrial hygiene regulations
DPR 524/82	Application of the guideline 576/77 and 640/79 on safety signs
DPR 224/88	Liability for a defective product
EC GUIDELINE 98/37	Machines guideline and supplements to it
SPECIFICATION EN 292-1	Safety of the machines - general design principles, first section: terminology and methods
SPECIFICATION EN 292-2	Safety of the machines - general design principles, second section: specifications and technical principles

13 13 TABLES T10, T15, T25, T35.

13.1 13.1 Technical data sheets.

Table T10



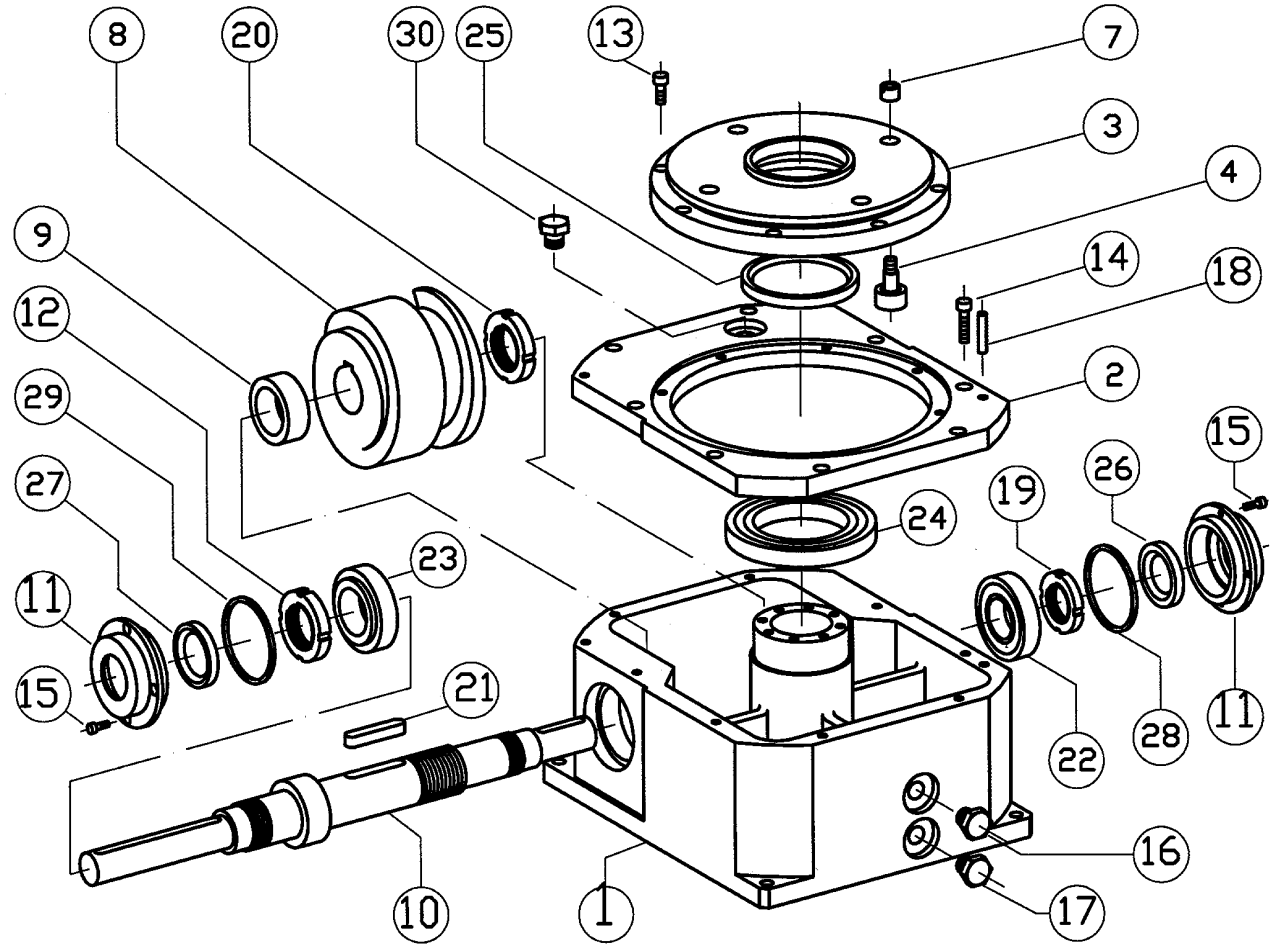
Ref.	Description	Q.
1	CASING	1
2	COVER	1
3	INDEXING DISK	1
4	CAM FOLLOWER-PIN-WASHER	S
7	NUT	S
8	CAM	1
9	SPACER RING	1
10	CAM SHAFT HOLDER	1
11	SIDE FLANGE 02462	2
12	THREADED LOCKING RING M15X1 E.STOP	1
13	HEXAGONAL SOCKET SCREW M3X16	8
13	HEXAGONAL SOCKET SCREW M3X20 (*)	4
14	HEXAGONAL SOCKET SCREW M4X20	6
15	HEXAGONAL SOCKET SCREW M5X16	8

Ref.	Description	Q.
16	OIL PLUG 58501 ELESA	2
18	PARALLEL PIN 5X25	2
19	THREADED LOCKING RING M15X1 E.STOP	1
20	THREADED LOCKING RING M17X1 E.STOP	1
21	KEYWAY 5X5X30	1
22	BEARING FAG 30202	1
23	BEARING FAG 30202	1
24	BEARING RIV 61804	1
25	SEAL ANGST+PFISTER A20327	1
26	SEAL ANGST+PFISTER A13265	1
27	SEAL ANGST+PFISTER A13265	1
28	SEAL OR 2125	1
29	SEAL OR 2125	1

(*)The screws which lock the fixed part of the indexing disk to the casing are shorter on the cam side than on the other sides

For S value see table 5 - page 6

Table T15

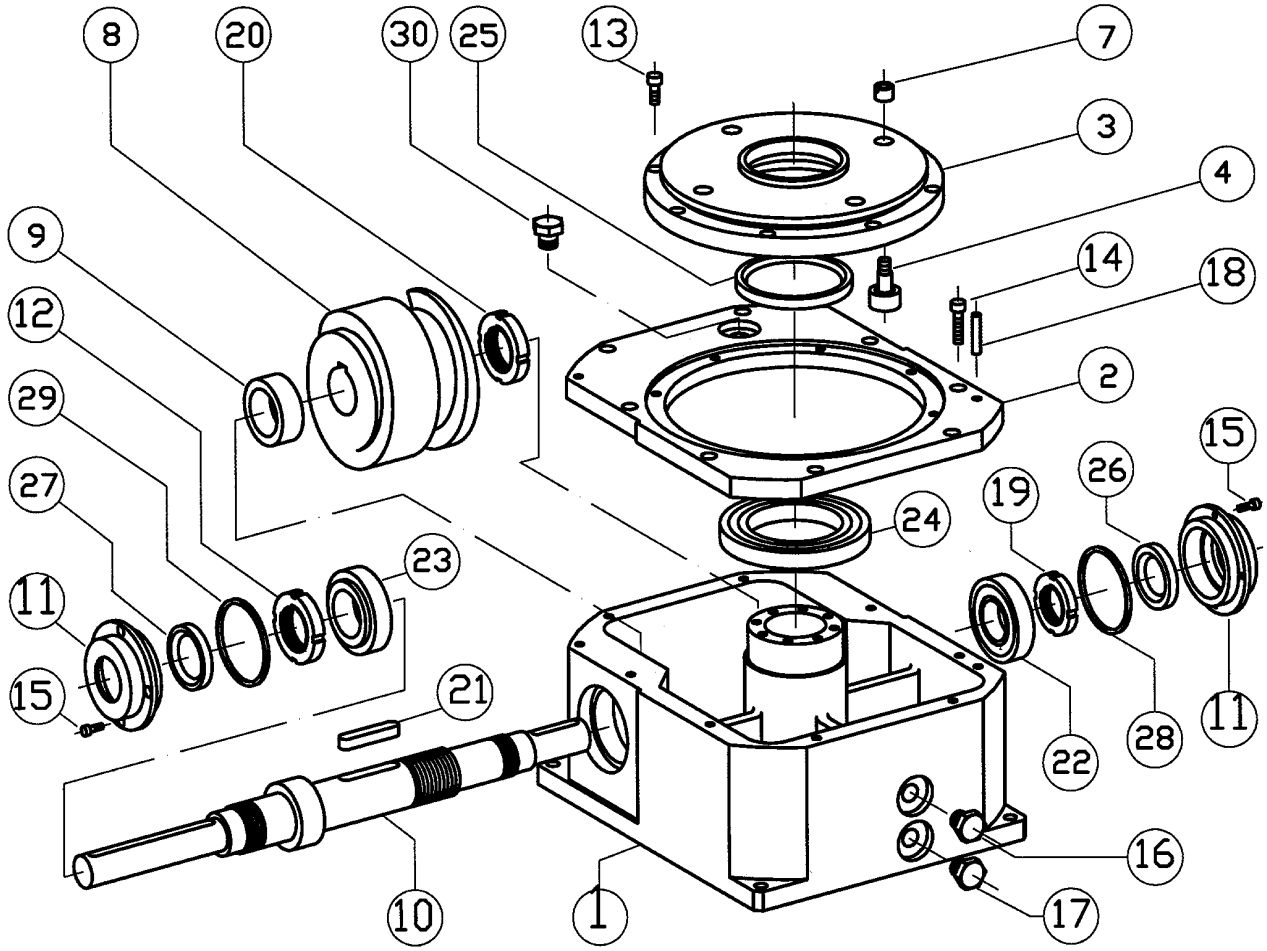


Ref.	Description	Q.		Ref.	Description	Q.
1	CASING	1		17	OIL PLUG 58501 ELESA	1
2	COVER	1		18	PARALLEL PIN 6X25	2
3	INDEXING DISK	1		19	THREADED LOCKING RING M20X1 E.STOP	1
4	CAM FOLLOWER-PIN-WASHER	S		20	THREADED LOCKING RING M25X1,5 E.STOP	1
7	NUT	S		21	KEYWAY 8X7X35	1
8	CAM	1		22	BEARING RIV 30204	1
9	SPACER RING	1		23	BEARING RIV 32005X	1
10	CAM SHAFT HOLDER	1		24	BEARING RIV 16009	1
11	SIDE FLANGE 02632	2		25	SEAL ANGST+PFISTER A45608	1
12	THREADED LOCKING RING 14269 M25X1,5	1		26	SEAL ANGST+PFISTER A18357	1
13	HEXAGONAL SOCKET SCREW M6X20	6		27	SEAL ANGST+PFISTER A24357	1
14	HEXAGONAL SOCKET SCREW M6X20	6		28	SEAL ANGST+PFISTER OR 3162	1
14	HEXAGONAL SOCKET SCREW M6X12(*)	2		29	SEAL ANGST+PFISTER OR 3162	1
15	HEXAGONAL SOCKET SCREW M6X16	8		30	OIL PLUG WITH VENT TCF 58901 ELESA	1
16	OIL PLUG 58501 ELESA	1				

(*)The screws which lock the fixed part of the indexing disk to the casing are shorter on the cam side than on the other sides

For S value see table 5 - page 6

Table T25



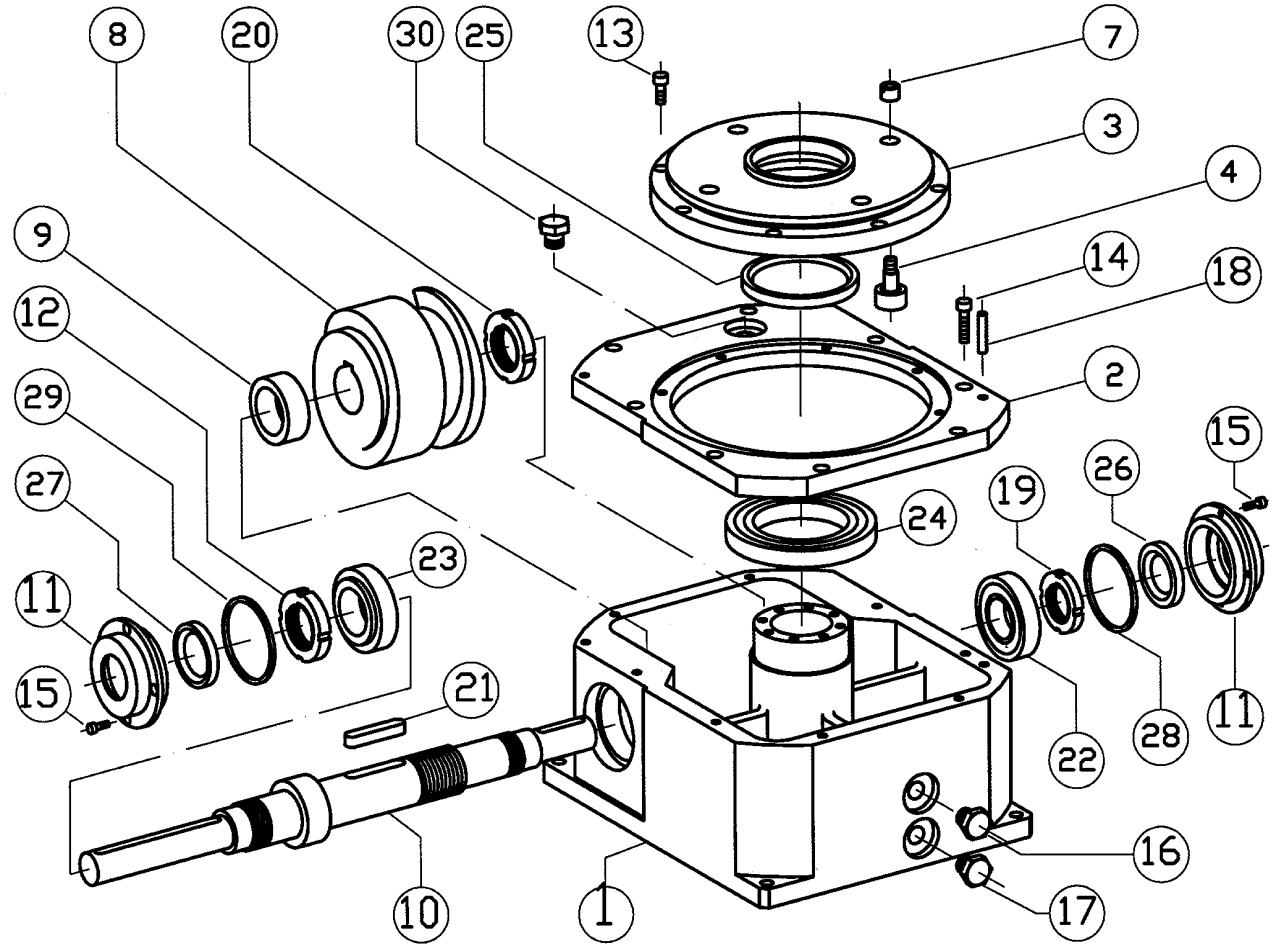
Ref.	Description	Q.
1	CASING	1
2	COVER	1
3	INDEXING DISK	1
4	CAM FOLLOWER-PIN-WASHER	S
7	NUT	S
8	CAM	1
9	SPACER RING	1
10	CAM SHAFT HOLDER	1
11	SIDE FLANGE 02674	2
12	THREADED LOCKING RING M35X1,5 E.STOP	1
13	HEXAGONAL SOCKET SCREW M6X20	7
13	HEXAGONAL SOCKET SCREW M6X14 (*)	1
14	HEXAGONAL SOCKET SCREW M6X25	8
15	FLAT HEAD SOCKET SCREW M4X12	4
16	OIL PLUG 58501 ELESA	1

Ref.	Description	Q.
17	OIL PLUG 58501 ELESA	1
18	PARALLEL PIN 6X30	2
19	THREADED LOCKING RING M30X1,5 E.STOP	1
20	THREADED LOCKING RING M35X1,5 E.STOP	1
21	KEYWAY 10X8X50	1
22	BEARING RIV 30206	1
23	BEARING RIV 32007X	1
24	BEARING RIV 16014	1
25	SEAL ANGST+PFISTER A70858	1
26	SEAL ANGST+PFISTER A28477	1
27	SEAL ANGST+PFISTER A32477	1
28	SEAL ANGST+PFISTER OR 3231	1
29	SEAL ANGST+PFISTER OR 3231	1
30	OIL PLUG WITH VENT TCF 58901 ELESA	1

(*)The screws which lock the fixed part of the indexing disk to the casing are shorter on the cam side than on the other sides

For S value see table 5 - page 6

Table T35



Ref.	Description	Q.
1	CASING	1
2	COVER	1
3	INDEXING DISK	1
4	CAM FOLLOWER-PIN-WASHER	S
7	NUT	S
8	CAM	1
9	SPACER RING	1
10	CAM SHAFT HOLDER	1
11	SIDE FLANGE 02674	2
12	THREADED LOCKING RING M35X1.5 E.STOP	1
13	HEXAGONAL SOCKET SCREW M6X20	11
13	HEXAGONAL SOCKET SCREW M6X18 (*)	1
14	HEXAGONAL SOCKET SCREW M8X30	8
15	FLAT HEAD SOCKET SCREW M4X12	4
16	OIL PLUG 58501 ELESA	1

Ref.	Description	Q.
17	OIL PLUG 58501 ELESA	1
18	PARALLEL PIN 8X30	2
19	THREADED LOCKING RING M35X1.5 E.STOP	1
20	THREADED LOCKING RING M40X1.5 E.STOP	1
21	KEYWAY 10X8X70	1
22	BEARING FAG 32007X	1
23	BEARING FAG 32007X	1
24	BEARING FAG 16015	1
25	SEAL ANGST+PFISTER A7510010	1
26	SEAL ANGST+PFISTER A32477	1
27	SEAL ANGST+PFISTER A32477	1
28	SEAL ANGST+PFISTER OR 3231	1
29	SEAL ANGST+PFISTER OR 3231	1
30	OIL PLUG WITH VENT TCF 95801 ELESA	1
		1

(*)The screws which lock the fixed part of the indexing disk to the casing are shorter on the cam side than on the other sides

For S value see table 5 - page 6

13.2 13.2 Anomalies when operating, non routine maintenance and repairing.

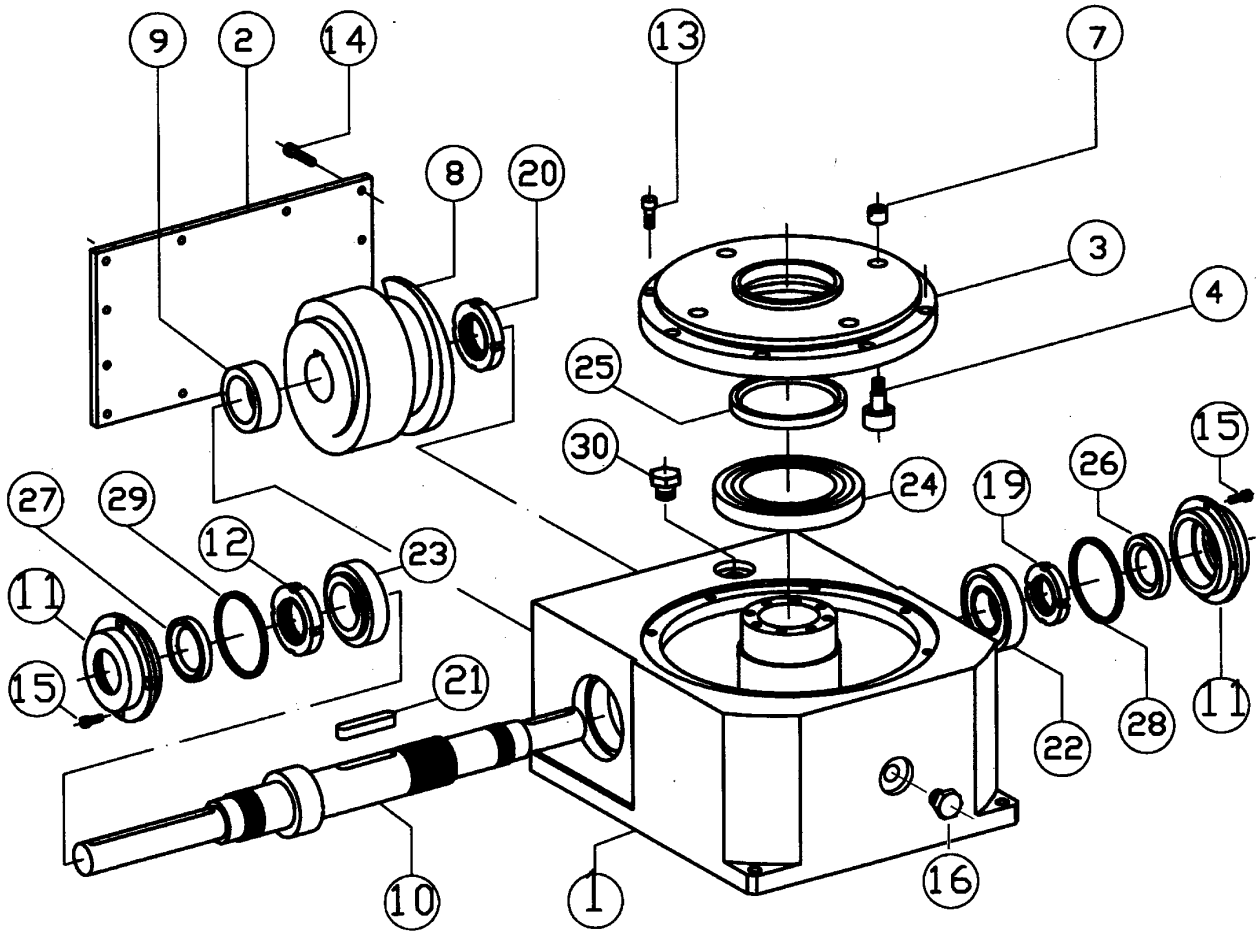
Observed anomaly	Cause	Actions to be taken
♦ The disk moves during the dwell position of the cam	♦ loose ring nuts No.12 or No.19 on the cam holder shaft (which moves therefore along its axis)	a) remove the flanges No.11 by unscrewing the screws No.15 b) screw a ring nut (for instance No.19) c) check how it works; the rotation of the cam in touch with the cam followers must be smooth. If it is not, unscrew the ring nut No.19, thus restoring the previous conditions. Repeat the same operation on the ring nut No.12. The shaft rotation must be slighty forced (preload on the taper roller bearings No.22 and 23)
♦	♦ loosening of the ring nut locking the cam	d) take away the cover No.2 by removing the screws No.14. Remove the cover through threaded pullers acting on the two threaded holes near the fixing pins (see note 1) e) screw the ring nut No.20 f) mount the cover No.2 with the cam followers g) check how it works: the rotation of the cam in touch with the cam followers must be smooth h) take off again the cover No.2; clean the contact surface of the cover No.2 and the casing No.1. Apply a small quantity of fluid sealant and then reassemble again and lock by the screws No.14.
♦	♦ wear of pins and cam followers ♦ ovalisation of the table's output disk's holes housing the pins ♦ pins' bending	i) execute point d) j) replace pins and cam followers: take off the nut No.7 and pull out the pin forced in the hole (note 2) k) execute point g) and h)
♦ The torque needed to displace the disk to the stations is not consistent	♦ pins' bending	l) replace pins and cam followers as described in the a.m. point.
♦ Stop at a station during normal operation	♦ a cam follower's pin is broken	m) replace pins and cam followers as described in the a.m. point.

note 1: ATTENTION: as to the tables with customized applications (tooling plate, turret, etc...), it is necessary to mark the position of the application with respect to the the table output disk, of the output disk and the cam with respect to the casing before taking them away. While assembling them again, it is absolutely necessary to keep the pristine phasing between cam, disk and application.

note 2: the cam followers are determined by the table serial number, that must be made known to Autorotor in order to allow the required spare parts to be sent immediately. Before replacing pins and cam followers you must check the holes, where the pins are forced. If the pins are bent or broken there must have occured a dynamic shock exceeding the highest carriable torque. It follows that the holes may result ovalized on the lower side of the output disk. Ovalization must be eliminated carefully, restoring the hole roundness. The diameter of the new pins to be used must be higher than the original pins' to make sure that these pins are forced into the holes.

14 TABLE T55.

14.1 Technical data sheet.



Ref.	Description	Q.
1	CASING	1
2	FRONT PLATE 32597	1
3	INDEXING DISK	1
4	CAM FOLLOWER-PIN-WASHER	S
7	NUT	S
8	CAM	1
9	SPACER RING	1
10	CAM SHAFT HOLDER	1
11	SIDE FLANGE 02659	2
12	THREADED LOCKING RING M50X1,5 E.STOP	1
13	HEXAGONAL SOCKET SCREW M6X25	16
14	HEXAGONAL SOCKET SCREW M5X25	12
15	FLAT HEAD SOCKET SCREW M3X12	8

Ref.	Description	Q.
16	OIL PLUG 58501 ELESA	1
19	THREADED LOCKING RING M45X1.5 E.STOP	1
20	THREADED LOCKING RING M50X1.5 E.STOP	1
21	KEYWAY 14X9X120	1
22	BEARING RIV 33109	1
23	BEARING RIV 33010	1
24	BEARING RIV 16024	1
25	SEAL ANGST+PFISTER A12015012	1
26	SEAL ANGST+PFISTER A42628	1
27	SEAL ANGST+PFISTER A48628	1
28	SEAL ANGST+PFISTER OR 4287	1
29	SEAL ANGST+PFISTER OR 4287	1
30	OIL PLUG WITH VENT TCF 58901 ELESA	1

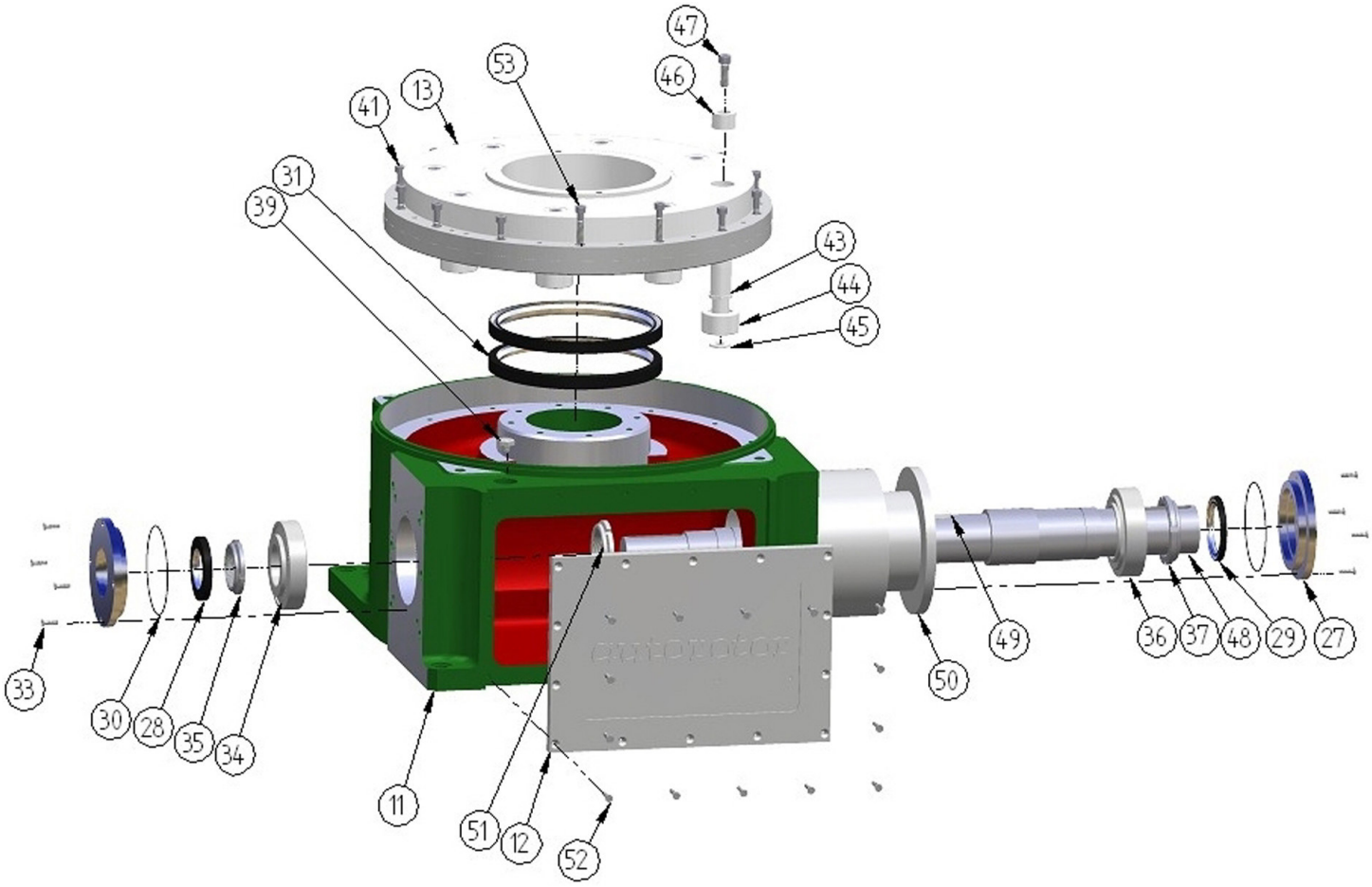
For S value see table 5 - page 6

14.2 14.2 Anomalies when operating, non routine maintenance and repairing.

Observed anomaly	Cause	Actions to be taken
♦ The disk moves during the dwell position of the cam	♦ loose ring nuts No. 12 or No.19 on the cam holder shaft (which moves therefore along its axis)	a) remove the flanges No.11 by unscrewing the screws No.15 b) screw a ring nut (for instance No.19) c) check how it works; the rotation of the cam in touch with the cam followers must be smooth. If it is not, unscrew the ring nut No.19 thus restoring the previous conditions. Repeat the same operation on the ring nut No.12. The shaft rotation must be slighty forced (preload on the taper roller bearings No.22 and 23)
	♦ loosening of the ring nut locking the cam	d) take away the front plate No.2 by removing the screws No.14. Before doing that the table must be emptied of the lubricant. This action can be avoided if the maintenance is made with the table tilted at 45° (the side of the table from which the front plate No.2 has been removed resulting therefore positioned higher than the opposite side). Thus the lubricant flows into the back part of the table and may be kept inside the table during the maintenance. e) screw the ring nut No.20 f) check how it works: the rotation of the cam in touch with the cam followers must be smooth g) clean the contact surfaces of the front plate No.2 and the casing No.1. Apply a small quantity of fluid sealant and then reassemble and lock by the screws No.14. h) pour the lubricant again into the table if the table has been emptied
♦	♦ wear of pins and cam followers ♦ ovalisation of the table's output disk's holes housing the pins ♦ pins' bending	i) take away the table output disk by removing the screws No.13. Remove it through threaded pullers acting on the threaded holes near the fixing pins (see note 1 on page 15). Check in the meanwhile that the seal strip of the bearing doesn't stick to the casing and consenquently is damaged j) clean carefully the surface of the disk and of the casing k) replace pins and cam followers: remove the nut No.7 and pull out the pin forced into the hole (see note 2 on page 15) l) mount the output disk and check how it works. Remove it again m) execute point g) and h) n) coat the surface of the disk No.3 which is housed in the casing with flange sealant (loctite 510 for die-cast surfaces) and mount the disk once more
♦ The torque needed to displace the disk to the stations is not consistent	♦ pins' bending	o) replace pins and cam followers as described in the a.m. point.
♦ Stop at a station during normal operation	♦ a cam follower's pin is broken	p) replace pins and cam followers as described in the a.m. point.

15 TABLE T65

15.1 Technical data sheet.



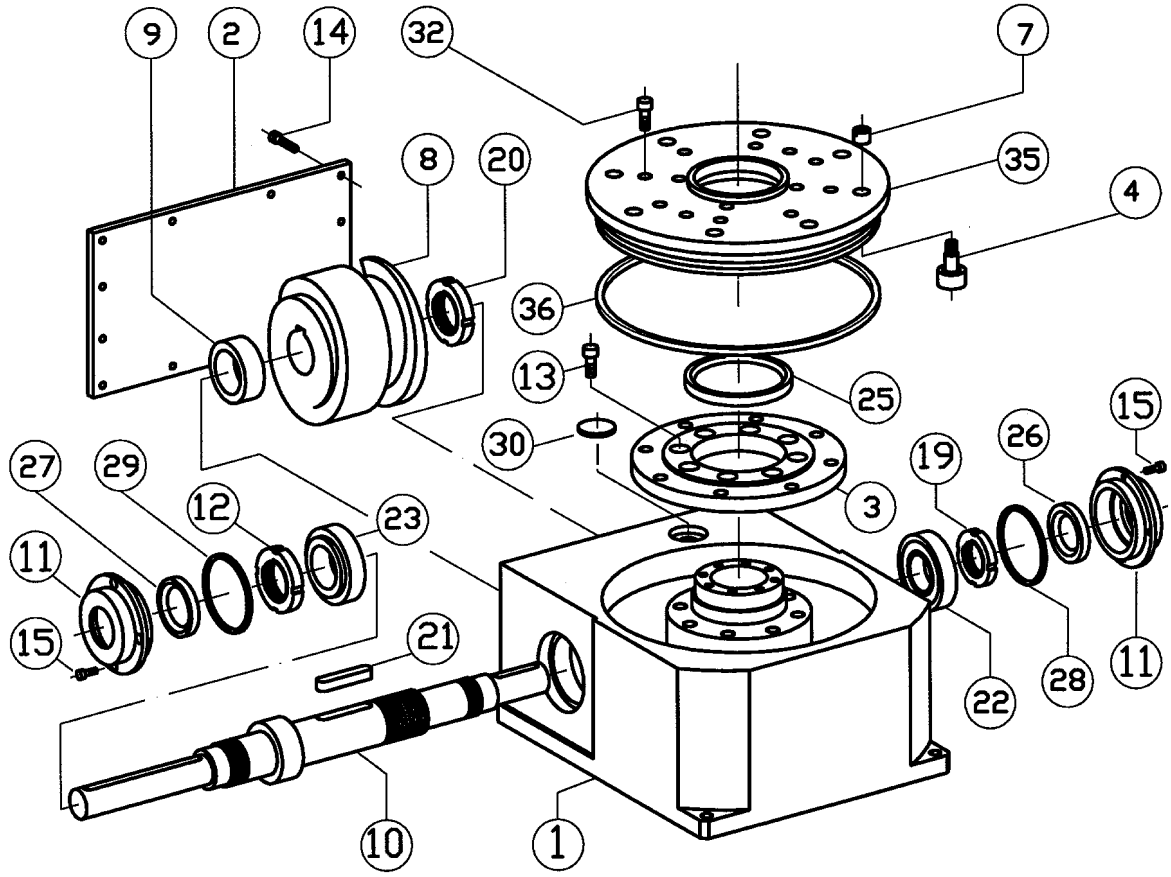
Rif.	Denominazione	Q.tà
11	CASING	1
12	FRONT PLATE	1
13	INDEXING DISK +BEARING 410	1
27	SIDE FLANGE	2
28	SEAL A458010	1
29	SEAL A60808	1
30	SEAL OR 2425	2
31	SEAL A19021516	2
33	FLAT HEAD SOCKET SCREW M05X20	8
34	BEARING 30310	1
35	THREADED LOCKING RING M50X1.5	1
36	BEARING 33113	1
37	THREADED LOCKING RING M65X2	1

Rif.	Denominazione	Q.tà
39	OIL PLUG WITH VENT 58651	1
41	HEXAGONAL SOCKET SCREW M8X45	12
43	PIN	S
44	CAM FOLLOWER	S
45	WASHER	S
46	NUT	S
47	HEXAGONAL SOCKET SCREW M10X30	S
48	CAM SHAFT HOLDER	1
49	KEYWAY 18X11X120	1
50	CAM	1
51	THREADED LOCKING RING M60X2	1
52	FLAT HEAD SOCKET SCREW M05X25	14
53	HEXAGONAL SOCKET SCREW M8X40	2

For S value see table 5 - page 6

16 TABLE T75.

16.1 Technical data sheet.



Ref.	Description	Q.
1	CASING	1
2	FRONT PLATE 32602	1
3	BEARING W1.1063	1
4	CAM FOLLOWER-PIN-WASHER	S
7	SPECIAL NUT	S
8	CAM	1
9	SPACER RING	1
10	SHAFT	1
11	SIDE FLANGE 02714	2
12	THREADED LOCKING RING M65X2 E.STOP	1
13	HEXAGONAL SOCKET SCREW M12X40 (12K)	12
14	HEXAGONAL SOCKET SCREW M5X30	14
15	FLAT HEAD SOCKET SCREW M5X20	8
19	THREADED LOCKING RING M50X1.5 E.STOP	1

Ref.	Description	Q.
20	THREADED LOCKING RING M60X2 E.STOP	1
21	KEYWAY 18X11X120	1
22	BEARING SKF 30310	
23	BEARING SKF 33113	1
25	SEAL ANGST+PFISTER A21024015	1
26	SEAL ANGST+PFISTER A458010	1
27	SEAL ANGST+PFISTER A60808	1
28	SEAL ANGST+PFISTER OR 2425	1
29	SEAL ANGST+PFISTER OR 2425	1
30	OIL PLUG TCDF 58651	1
32	HEXAGONAL SOCKET SCREW M12X50 (12K)	12
35	INDEXING DISK	1
36	SEAL 05027	1

For S value see table 5 - page 6

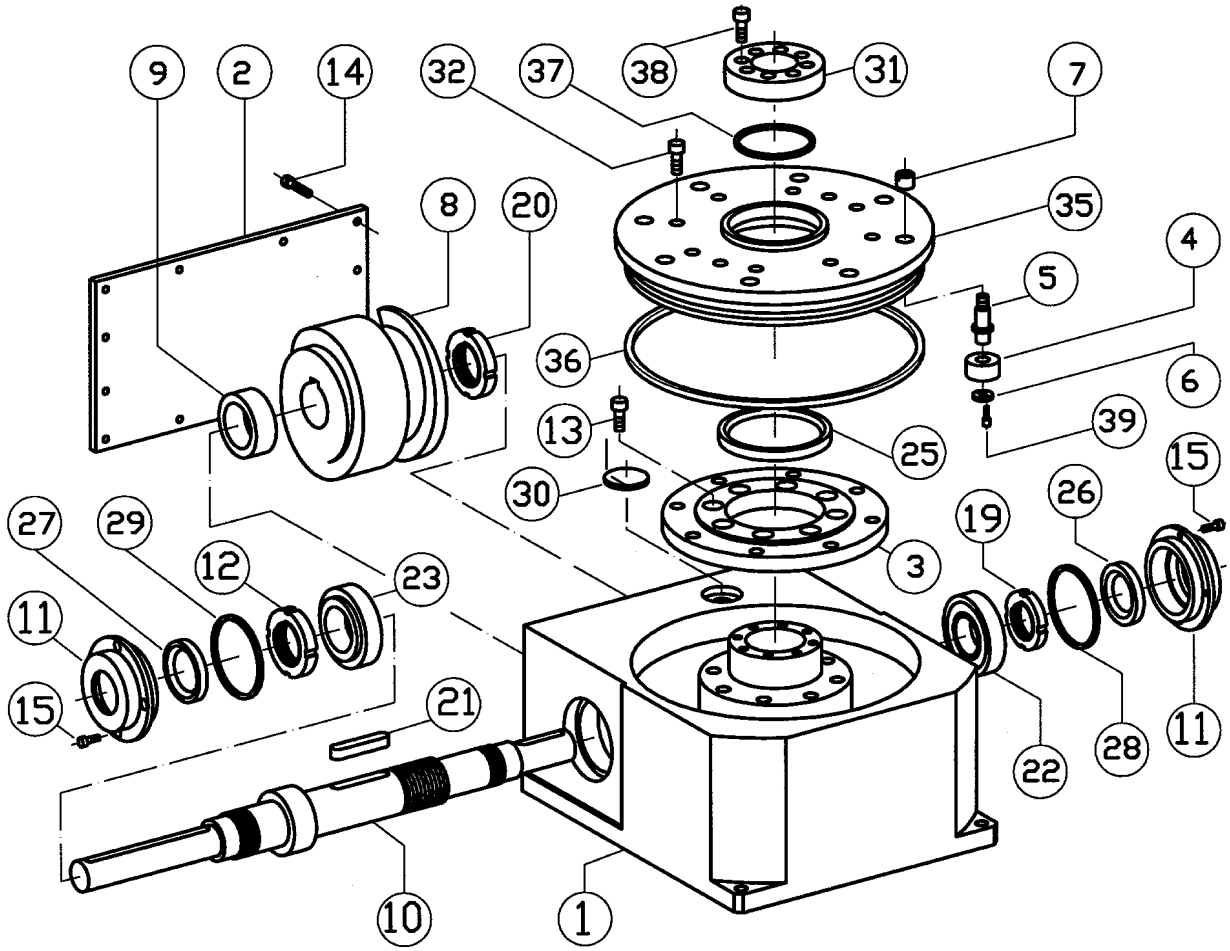
16.2 Anomalies when operating, non routine maintenance and repairing.

Observed anomaly	Cause	Actions to be taken
♦ The disk moves during the dwell position of the cam	♦ loose ring nuts No.* 35 or No.19 on the cam holder shaft (which moves therefore along its axis)	a) remove the flanges No.11*27 unscrewing the screws No.15 *33 b) screw a ring nut (for instance No.19 *35) c) check how it works; the rotation of the cam in touch with the cam followers must be smooth. If it is not, unscrew the ring nut 19*35 thus restoring the previous conditions. Repeat the same operation on the ring nut No.12. The shaft rotation must be slighty forced (preload on the taper roller bearings No.22,23*34*36)
♦	♦ loosening of the ring nut locking the cam	d) take away the front plate 2*12 by removing the screws 14*52 Before doing that the table must be emptied of the lubricant. e) screw the ring nut No.20*51 f) check how it works: the rotation of the cam in touch with the cam followers must be smooth g) clean the contact surfaces of the front plate 2*12 and the casing . . Apply a small quantity of fluid sealant and then reassemble and lock by the screws No.14*52 h) pour the lubricant again into the table
	♦ wear of pins and cam followers ♦ ovalisation of the table's output disk's holes housing the pins ♦ pins' bending	i) take away the table output disk by removing the screws 32*41 . Remove it through threaded pullers acting on the threaded holes near the fixing pins (see note 1 on page 15). j) replace pins and cam followers: remove the nut7*46* and pull out the pin forced into the hole (see note 2 on page 15) k) reassemble the cam followers holder disk keeping the original phasing with the bearing 3 *13. Said phasing is shown by a letter stamped on the surface of the bearing and of the disk l) check how it works m)execute point g) and h)
♦ The torque needed to displace the disk to the stations is not consistent	♦ pins' bending	n) replace pins and cam followers as described in the a.m. point.
♦ Stop at a station during normal operation	♦ a cam follower's pin is broken	o) replace pins and cam followers as described in the a.m. point.

17 TABLES T95 AND T105.

17.1 Technical data sheet.

Table T95

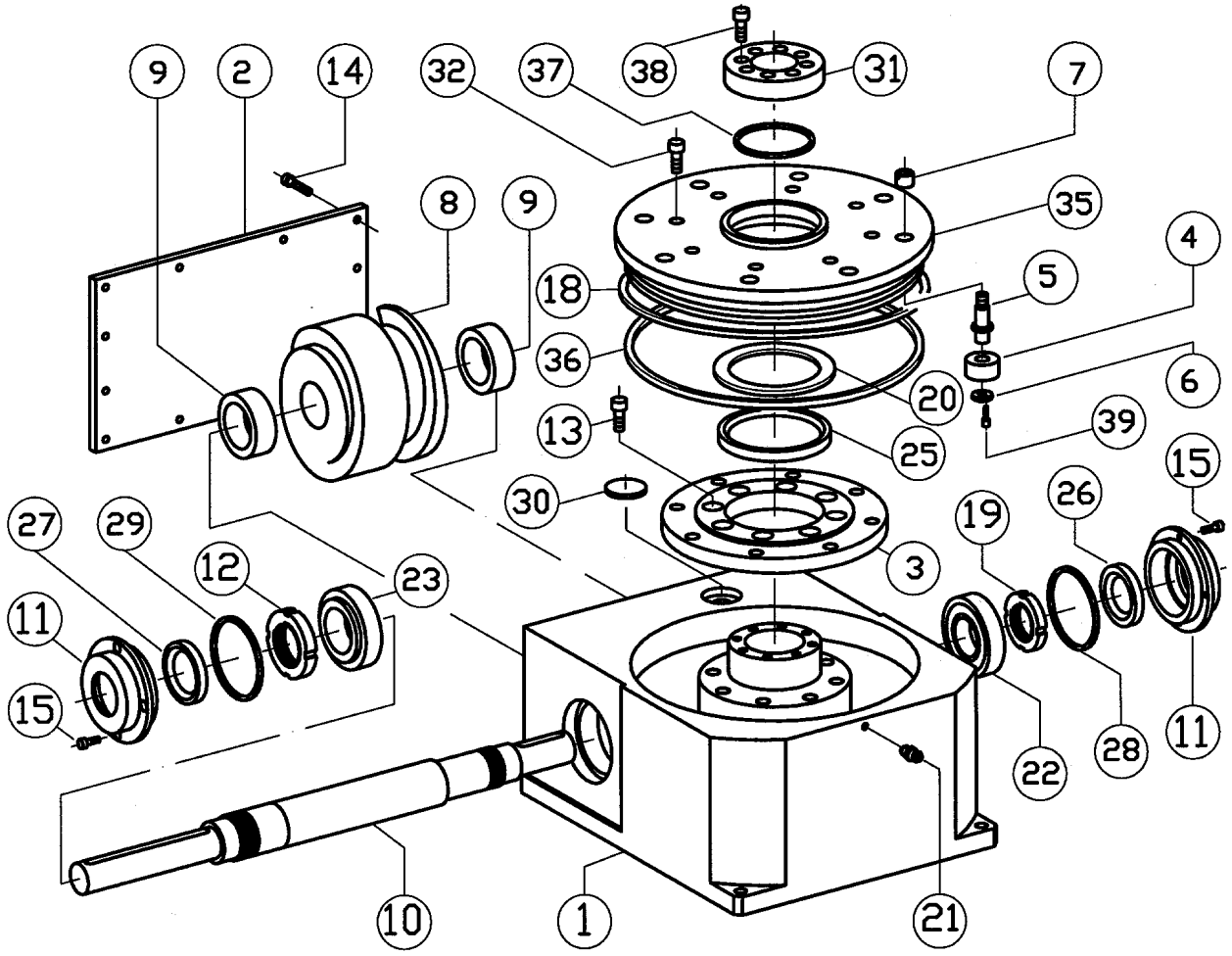


Ref.	Description	Q.
1	CASING	1
2	FRONT PLATE 32603	1
3	BEARING W1.1063	1
4-5-6	CAM FOLLOWER-PIN-WASHER	S
7	NUT	S
8	CAM	1
9	SPACER RING	1
10	CAM SHAFT HOLDER	1
11	SIDE FLANGE 02716	2
12-19	THREADED LOCKING RING M75X2 E.STOP	2
13	HEXAGONAL SOCKET SCREW M12X50 (12K)	12
14	HEXAGONAL SOCKET SCREW M6X30	14
15	FLAT HEAD SOCKET SCREW M6X20	8
20	THREADED LOCKING RING M80X2 E.STOP	1

Ref.	Description	Q.
21	KEYWAY 22X14X160	1
22/23	BEARING SKF 33015	2
25	SEAL ANGST+PFISTER AS30034018	1
26/27	SEAL ANGST+PFISTER AS709010	2
28/29	SEAL ANGST+PFISTER OR 4425	2
30	OIL PLUG TCDF 58651	1
31	FIXED RING 02717	1
32	HEXAGONAL SOCKET SCREW M12X60 (12k)	12
35	INDEXING DISK	1
36	SEAL 05027	1
38	HEXAGONAL SOCKET SCREW M12X50 (12K)	1
37	SEAL ANGST+PFISTER OR 3850	1
39	SCREW M4X15	6S

For S value see table 5 - page 6

Table T105



Ref.	Description	Q.
1	CASING 31322	1
2	FRONT PLATE 32606	1
3	BEARING LEZ 570	1
4	CAM FOLLOWER-PIN-WASHER	S
7	NUT	S
8	CAM	1
9	SELF LOCKING BUSH MAV 4061	2
10	SHAFT	1
11	SIDE FLANGE 02761	2
12-19	THREADED LOCKING GUK M95X2 E.STOP	2
13	HEXAGONAL SOCKET SCREW M12X50 (12K)	14
14	HEXAGONAL SOCKET SCREW M8X35	16
15	HEXAGONAL SOCKET SCREW M5X16	8
18	SEAL 05027	1

Ref.	Description	Q.
20	RING 131279	1
21	LUBRICATION HOLE	1
22/23	BEARING SKF 33019	2
25	SEAL ANGST+PFISTER A34038018	1
26/27	SEAL ANGST+PFISTER AS9012012	2
28/29	SEAL ANGST+PFISTER OR4550	2
30	OIL PLUG TCDF 58651	1
31	FIXED RING 131280	1
32	HEXAGONAL SOCKET SCREW M12X120 (12K)	14
35	INDEXING DISK	1
36	SEAL 05027	2
37	SEAL ANGST+PFISTER OR 41200	1
38	HEXAGONAL SOCKET SCREW M12X80	8
39	HEXAGONAL SOCKET SCREW M4X16	6

For S value see table 5 - page 6

17.2 Anomalies when operating, non routine maintenance and repairing.

Observed anomaly	Cause	Actions to be taken
♦ The disk moves during the dwell position of the cam	♦ loose ring nuts No. 12 or No.19 on the cam holder shaft (which moves therefore along its axis)	a) remove the flanges No.11 by unscrewing the screws No.15 b) screw a ring nut (for instance No.19) c) check how it works; the rotation of the cam in touch with the cam followers must be smooth. If it is not, unscrew the ring nut No.19 thus restoring the previous conditions. Repeat the same operation on the ring nut No.12. The shaft rotation must be slighty forced (preload on the taper roller bearings No.22 and 23)
♦	♦ loosening of the ring nut locking the cam	d) take away the front plate No.2 by removing the screws No.14. Before doing that the table must be emptied of the lubricant. e) screw the ring nut No.20 f) check how it works: the rotation of the cam in touch with the cam followers must be smooth g) clean the contact surfaces of the front plate No.2 and the casing No.1. Apply a small quantity of fluid sealant and then reassemble and lock by the screws No.14. h) pour the lubricant again into the table
	♦ wear of pins and cam followers ♦ ovalisation of the table's output disk holes housing the pins ♦ pins' bending	i) remove the flange No.31 by unscrewing the screws No.38 j) take away the table output disk by unscrewing the screws No.32. Remove it through threaded pullers acting on the threaded holes near the fixing pins (see note 1 on page 15). k) replace pins and cam followers: remove the nut No.7 and pull out the pin forced into the hole (see note 2 on page 15). If this defects is only due to the cam follower, this latter can be replaced without pulling out the pin, that is simply by unscrewing the screws No.39 and by removing the washer No.6 l) reassemble the cam followers holder disk keeping the original phasing with the bearing No.3. Said phasing is shown by a letter stamped on the surface of the bearing and of the disk m) check how it works n) execute point g) and h) o) reassemble the flange No.31
♦ The torque needed to displace the disk to the stations is not consistent	♦ pins' bending	p) replace pins and cam followers as described in the a.m. point.
♦ Stop at a station during normal operation	♦ a cam follower's pin is broken	q) replace pins and cam followers as described in the a.m. point.