

SQUARE AXIS INTERMITTENT \ OSCILLATING DRIVES

TRANSLATION OF MANUAL
FOR USE AND WARNINGS



autorotor

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TRANSLATION OF MANUAL FOR USE AND WARNINGS

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SERIAL N°	
CALIBRATION	

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1 MACHINE DESCRIPTION

The square axis intermittent drive (IT) is a mechanical device that sets the output shaft into intermittent motion. It can be motor driven.

The square axis oscillating drive (OP) is a mechanical device that sets the output shaft into oscillating motion. It can be motor driven.

The IT/OT are square axis mechanical units which transform the uniform rotation of the inlet shaft into an intermittent/oscillating rotation of the output shaft by means of a cam and cam followers. The cam profile determines the indexer's transfer and dwell cycle.

They are generally framed into another machine.

2 FORESEEN AND UNFORESEEN USE

The square axis intermittent / oscillating drive 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 13).

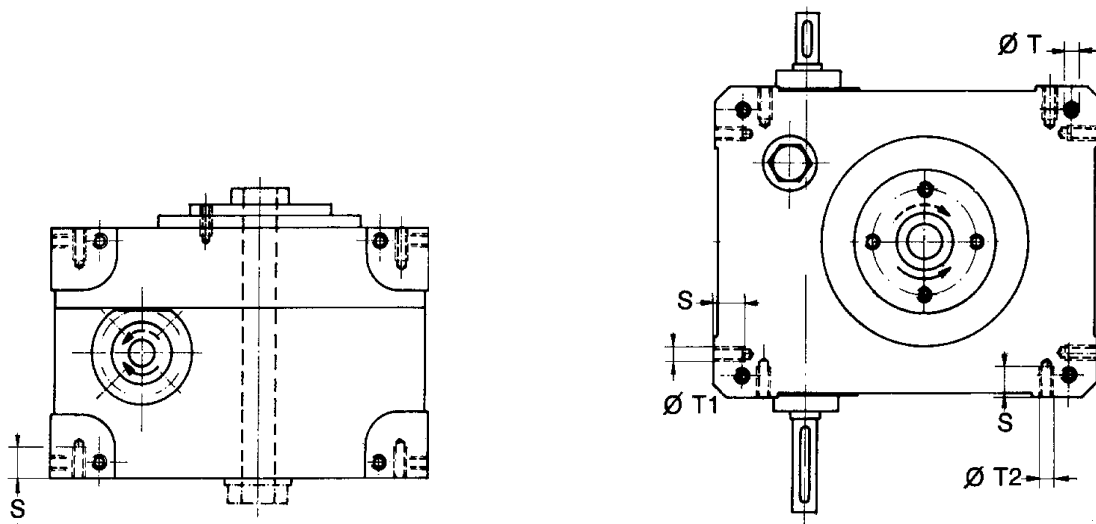
Should the indexer be used with higher loads than the ones mentioned in customer's order, a defective working may result, along with a premature wear of the system. Said operating conditions can be anomalous also from the point of view of operator's safety.

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 intermittent / oscillating drive Autorotor and must take into account the specific features of the indexer itself.

2.1 IT / OT indexer's casing fixing

The IT/OT casing is machined on four sides, to allow mounting in several position.

The parallel axis intermittent / oscillating drive must be suitably anchored and supported according to their own weight and to the loads applied (see Pict.2 and table 3).



pict. 2 Lifting up and fastening holes

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

They must be suitable for the IT/OT features.

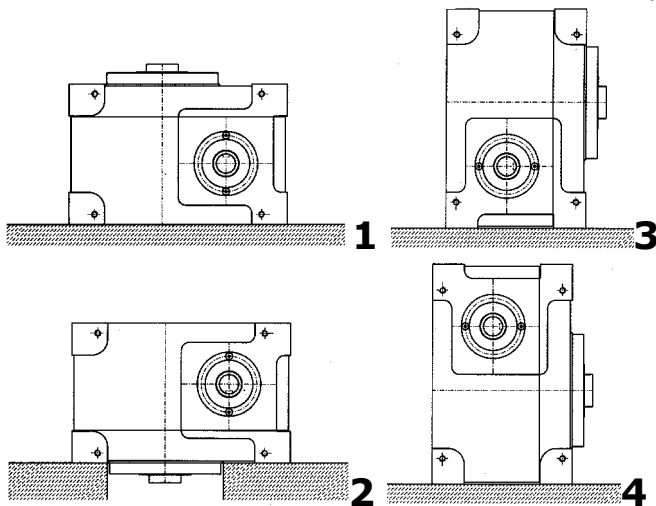
2.3 Risk of crushing, trapping, cutting, friction; and that pieces are projected due to the tooling plate and to the parts/equipment moved by the table

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 square axis intermittent / oscillating drive 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.



pict. 3 Operating position of the rotary index table

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 § 4). Should the calculated values still entail residual unacceptable risks, interlocked 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 / oscillating units during the transfer time, the Autorotor IT/OT are mechanically designed as to allow the emergency stop at any moment of the cycle. Furthermore 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.

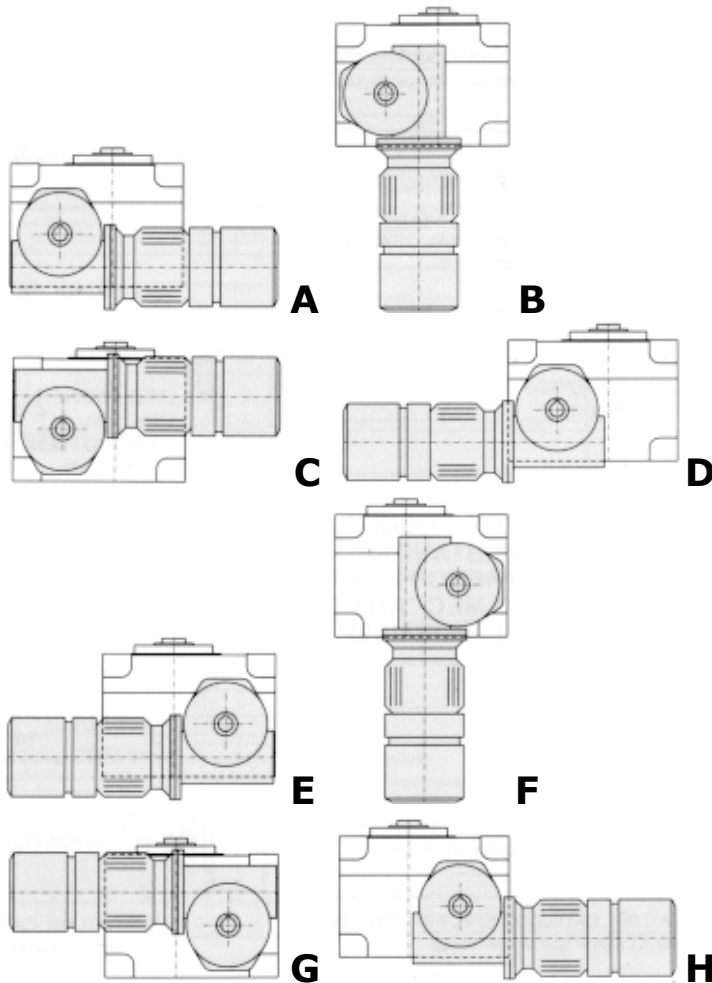
The stop during the displacement phase entails a peak torque on the IT/OT output disk due to the inertia of the system causing a dynamic shock to occur, the intensity of which depends on the cam position at the very moment when the stop occurs. The dynamic shock discharges onto the intermittent unit and the reducer.

As the remaining life of the square axis intermittent / oscillating drive 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 IT/OT 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.

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.



pict. 4 Power drive unit assembling position

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:

$$E_{k_{max_i}} = \frac{1}{2} \cdot J_t \cdot \left(\omega_m \cdot \frac{2}{i} \cdot \frac{2\pi}{S \cdot \beta} \right)^2$$

- 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:

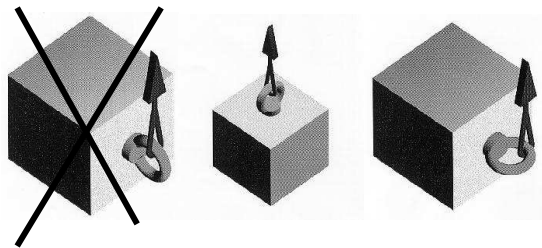
Mf	braking torque [Nm]
Jt	moment of inertia on the output shaft/disk [Kgm ²],
ω_i	input shaft angular speed [rad/s],
S	number of stations,
β	displacement angle [rad],
i	gearbox reduction ratio,
ω_m	motor shaft angular speed [rad/s],
Jm	inertia of the motor [Kgm ²]
t_f	braking time [s]
α_f	slipping angle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

Check periodically the motor braking system efficiency.

4 HANDLING AND TRASPORTATION

Since IT/OT10 and IT/OT15 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. 2, pict. 14, and table 3*) in accordance with what stated by UNI ISO 3266 regulation.



pict. 14 Lifting up through lifting eyebolts

	weight Kg	fastening screw	lifting trebolts
IT/OT 10	5	M6X15	
IT/OT15	11	M8X12	2 TYPE 1 UNI ISO 3266 M8X12 (tilted lifting)
IT/OT25	42	M8X20	2 TYPE 1 UNI ISO 3266 M8X20 (tilted lifting)
IT/OT35	78	M10X20	2 TYPE 1 UNI ISO 3266 M10X20 (tilted lifting)
IT/OT55	143	M12X25	2 TYPE 1 UNI ISO 3266 M12X25(tilted lifting)

table 3: weight, fastening and lifting

5 ASSEMBLY AND INSTALLATION

The square axis intermittent / oscillating drive must be only installed in one of the positions indicated in pict. 3, 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 3.

What applied (equipment, tooling, etc.) to the IT/OT output shaft must be designed and manufactured according to the technical features of the indexer and must fulfil 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 IT/OT casing. See the table's serial number on the first page of this handbook to learn the electrical data.

5.1 Motion transmisson of the unit

Should the square axis intermittent / oscillating drive 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.

5.2 Backlash on transmission

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.

6 PUTTING INTO OPERATION

Before putting the square axis intermittent / oscillating drive 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 AP/OP

check the right working of all protection and safety systems of the machine which incorporates the rotary index table

7 LUBRIFICATION

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. 3) and is shown in table 5.

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.

8 MAJOR OVERHAULING

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

8.1 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).

9 DISPOSAL OF HARMFUL SUBSTANCES AND DISMANTLING

The indexer 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.

10 NOISE PRODUCED BY THE INDEXER

The weighed steady sound pressure level of the parallel axis intermittent / oscillating drive is less than 70 db (a).

11 REFERENCE REGULATION FRAMEWORK

- Leg.D. 81/2008 Regulations for safety at work.
- DPR 303/56 General industrial hygiene regulations.
- Leg.D. 493/96 Safety signs at work.
- DPR 802/82 Application of the guideline 181/80 unità di misura.
- Leg.D. 25/2001 Liability for a defective product.
- EC GUIDELINE 2006/42 Machines guideline and supplements to it.
- SPECIFICATION EN ISO 12100-1:2005 Safety of the machines
 - general design principles, first section: terminology and methods.
- SPECIFICATION EN ISO 12100-2:2005 Safety of the machines
 - general design principles, second section: specifications and technical principles

Displacement angle	30°	45°	60°	75°	90°
OT15	3	3	3	4	4
OT25	3	3	3	4	4
OT35	3	3	3	4	4
OT55	3	3	3	4	4

stations number	2	3	4	5	6	7	8	9	10	12	14	15	16	18	20	22	24	26	28	30	32
IT10	8	6	8	10	6	7	8	9	10	12	7	15	8	9	10	11	12	13	14	15	16
IT15	8	6	8	10	6	7	8	9	10	12	14	15	8	9	10	11	12	13	14	15	16
IT25	8	6	8	10	6	7	8	9	10	12	14	15	16	18	10	11	12	13	14	15	16
IT35	8	6	8	10	6	7	8	9	10	12	14	15	16	18	10	11	12	13	14	15	16
IT55	6	6	8	10	12	7	8	9	10	12	14	15	16	18	10	11	12	13	14	15	16

table 4: number of cam followers (S) depending on the stations number (standard configurations).

INDEXER		ASSEMBLY POSITION	LUBRICANT	Q.TY (GAL)	Q.TY (L)
IT	10	1	C. A. / 7 3 S	0.04	0.15
IT	15	1		0.11	0.40
IT	25	1		0.26	1.00
IT	35	1		0.53	2.00
IT	55	1		1.59	6.00
IT	10	2		0.04	0.15
IT	15	2		0.09	0.35
IT	25	2		0.26	1.00
IT	35	2		0.53	2.00
IT	55	2		1.59	6.00
IT	10	3		0.04	0.15
IT	15	3		0.08	0.30
IT	25	3		0.13	0.50
IT	35	3		0.53	2.00
IT	55	3		1.32	5.00
IT	10	4	0.04	0.15	
IT	15	4	0.08	0.30	
IT	25	4	0.13	0.50	
IT	35	4	0.53	2.00	
IT	55	4	1.32	5.00	
Equivalent lubricants					
AGIP	GR SLL				
BP	ENER GREASE FG00EP				
ESSO	BEACON EPO				
SHELL	SUPER GREASE EP0 TIVELA COMPOUND				

table 5: lubrication

N.B.: for tables that relate to food or pharmaceutical applications in the field (if known) is used lubricant Q8 ROSSINI EP 00

12 TECHNICAL DATA SHEET INTERMITTENT DRIVE IT10

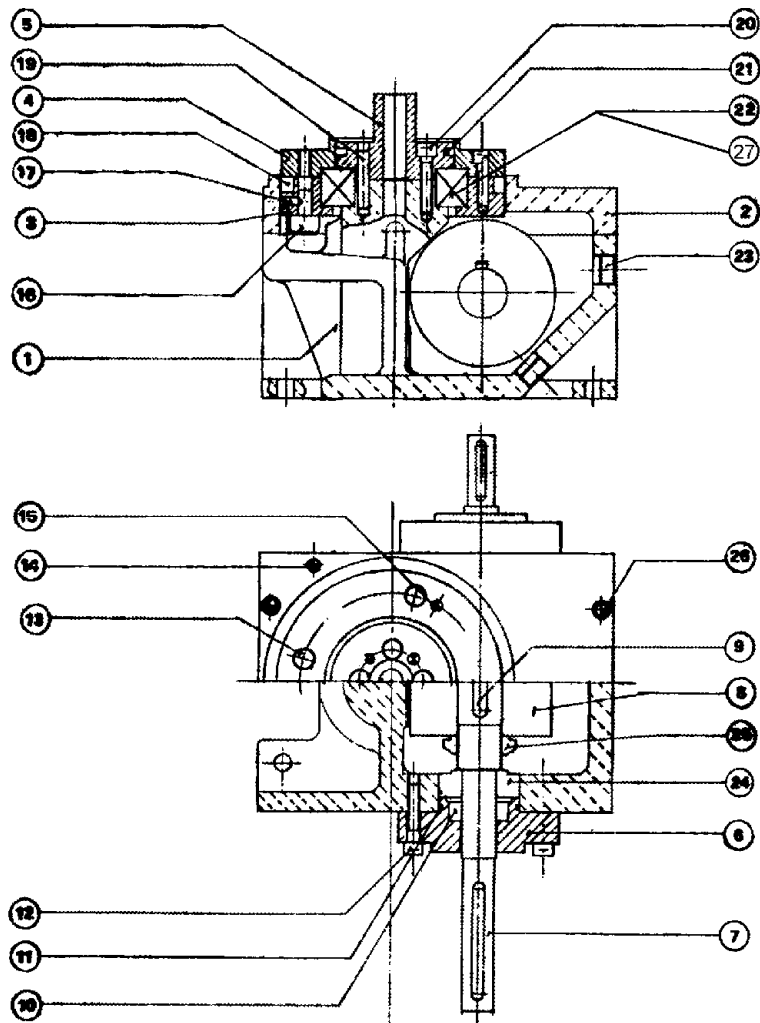
12.1 Anomalies when operating, non routine maintenance and repairing

Observed anomaly	Cause	Actions to be taken
♦ The output shaft moves during the dwell position of the cam	♦ loosening of flanges No. 6 locking the cam holder shaft (which moves therefore along its axis)	a) check that screw No. 12 keep well fixed flanges No. 6
	♦ loosening of the ring nuts No. 25 locking the cam	b) take away the cover No. 2 and the lubricant in the IT10 (see note 1) c) adjust the cam position by screwing the ring nuts No. 25. Check how its works: the rotation of the cam against the cam followers must be smooth d) pour again the lubricant int the IT10 e) take away again the cover No. 2. Clean the contact surfaces of the cover No. 2 and the casing No. 1, apply a small quantity of fluid sealant and then reassemble and lock by the screw No. 26
	♦ wear of pins and cam followers ♦ ovalisation (in the indexing disk) of the holes housing the pins ♦ pins bending	f) execute point b) g) remove the central shaft group, consisting of the parts No. 3, 4, 5, 13, 15, 16,17,18,19,20,21,22, 27 h) replace pins and cam followers;: remove the headless screws No. 17 and pull out the pin forced into the hole (see note 2) i) force the new pins in the hole and fix by means of the the headless screw No. 17 j) mount again the central shaft group; check how the mechanism works. k) execute points d) and e)
♦ The torque needed to displace the output shaft 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 IT/OTs with customized applications (toolings, turret, etc...), it is necessary to mark the position of the application with respect to the the table output shaft, of the output shaft and of the cam (input shaft) with respect to the casing before taking them away. While assembling them again, it is strictly necessary to keep the pristine phasing between output shaft, input shaft and application.

note 2: The cam followers are determined by the IT/OT serial number, that must be made known to Autorotor in order to allow the required spare parts to be shipped 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 occurred a dynamic shock exceeding the highest carriable torque. It follows that the holes may result ovalized on the lower side of the cam followers' holding 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.

12.2 Intermittent drive IT10



Ref	Part name	Q.	Ref.	Part name	Q.
1	CASING	1	15	PARALLEL PIN Ø5X25	2
2	COVER	1	16	CAM FOLLOWER	S
3	CAM FOLLOWER HOLDING PLATE	1	17	HEADLESS SCREW M3X8	S
4	DISK	1	18	RING-FLON-RP6337/95 + OR	1
5	CENTRAL PIN	1	19	PARALLEL PIN Ø5X25	2
6	SIDE FLANGE 02590	2	20	HEXAGONAL SOCKET SCREW M5X20	4
7	CAMSHAFT HOLDER	1	21	SEAL PK50 AIRZET	1
8	CAM	1	22	RINGS 131305 + 131306	1+1
9	KEY 6X6X30	1	23	OIL PLUG ¼" GAS	1
10	SEAL ANGST+PFISTER A15267	2	24	TAPER ROLLER BEARING 30202 FAG	2
11	SEAL ANGST+PFISTER OR2125	2	25	RING NUT GUK M20X1 E.STOP	2
12	HEXAGONAL SOCKET SCREW M5X25	8	26	HEXAGONAL SOCKET SCREW M5X25	4
13	HEXAGONAL SOCKET SCREW M5X16	4	27	THRUST BEARING AX3552	2
14	PARALLEL PIN Ø5X25	2			

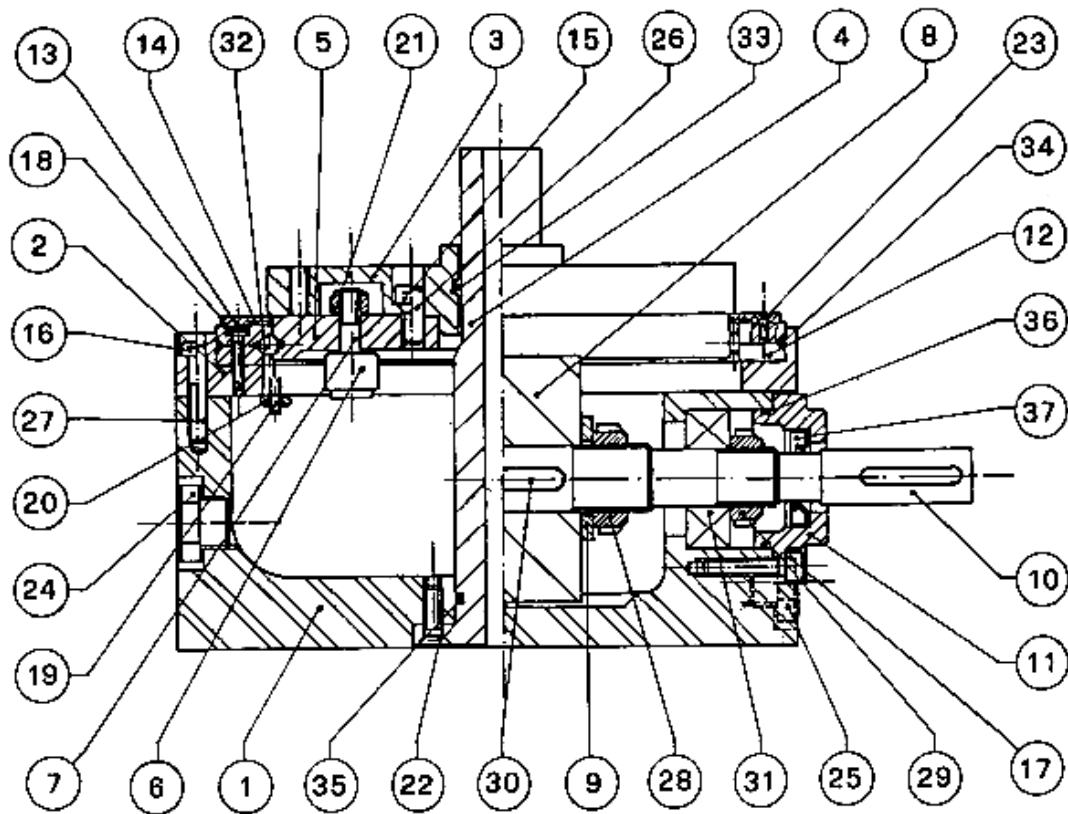
For S value see table 4 - page 11

13 TECHNICAL DATA SHEET OSCILLATING DRIVE OT10

13.1 Anomalies when operating, non routine maintenance and repairing

Anomalia rilevata	Causa	Intervento da effettuare
♦ Movimento dell' albero in uscita durante la fase di pausa della camma.	♦ allentamento delle ghiera 29 sull' albero portacamma (l' albero si sposta)	a) smontare le flange 11 rimuovendo le viti 17 b) avvitare una delle ghiera 29 (per esempio la destra). c) verificare il funzionamento: la rotazione della camma a contatto con i rulli deve essere scorrevole. Se la rotazione è faticosa è necessario svitare la ghiera destra ripristinando le condizioni precedenti e ripetere l'operazione sulla ghiera sinistra. La rotazione dell' albero deve essere leggermente forzata (precarica su cuscinetti conici 31).
	♦ allentamento della ghiera che blocca la camma	d) smontare il coperchio 2 rimuovendo le viti 16; (vedi nota 1 di pag. 11); rimuovere il gruppo albero centrale 4 e) avvitare la ghiera 28 f) riposizionare il gruppo albero centrale e montare il coperchio 2 g) verificare il funzionamento: la rotazione della camma a contatto con i rulli deve essere scorrevole. h) Rismontare il coperchio 2. Pulire le superfici di contatto del coperchio 2 e della scatola 1, spalmare una piccola quantità di guarnizione liquida, rimontare bloccando con le viti 16
	♦ usura dei perni e dei rulli ♦ ovalizzazione dei fori sede dei perni nel disco divisore ♦ piegatura dei perni	i) eseguire il punto d) j) sostituire i perni e i rulli: rimuovere il dado 21 ed estrarre il perno forzato nel foro (vedi nota 2 di pag. 11) k) eseguire i punti g), h) e i).
♦ Non omogeneità nella coppia necessaria allo spostamento delle diverse stazioni	♦ piegatura dei perni	l) sostituire i perni e i rulli come nel caso precedente
♦ Arresto su una stazione durante il normale funzionamento	♦ rottura di un perno portarullo	m) sostituire i perni e i rulli come nel caso precedente

13.2 Oscillating drive OT10



Ref.	Part name	Q.	Ref.	Part name	Q.
1	CASING	1	20	NUT M3	4
2	COVER	1	21	SELF-LOCKING NUT E.STOP	S
3	DISK	1	22	SCREW UNI 5933 M 5X12	6
4	CENTRAL PIN	1	23	SCREW UNI 5933 M 3X8	4
5	CAM FOLLOWER HOLDING PLATE	1	24	OIL PLUG ¼" ELESA	1
6	CAM FOLLOWER	S	25	OIL PLUG ¼" ELESA	1
7	PIN	S	26	PARALLEL PIN Ø 6X20	2
8	CAM	1	27	PARALLEL PIN Ø 5X24	2
9	SPACER RING	2	28	RING NUT E.STOP M17X1	2
10	CAMSHAFT HOLDER	1	29	RING NUT E.STOP M15X1	2
11	SIDE FLANGE	2	30	KEY 5X5X30	1
12	EXTERNAL RING	1	31	TAPER ROLLER BEARING 30202 FAG	2
13	RING	1	32	SPHERE Ø 4, 762 SKF	36
14	SEAL	1	33	SEAL ANGST+PFISTER OR3081	1
15	SCREW UNI 5931 M 5X15	4	34	SEAL ANGST+PFISTER Ø1.78 X 435	1
16	SCREW UNI 5931 M 4X20	6	35	SEAL ANGST+PFISTER OR2081	1
17	SCREW UNI 5931 M 5X15	8	36	SEAL ANGST+PFISTER OR2125	2
18	SCREW UNI 5931 M 3X14	8	37	SEAL ANGST+PFISTER 1326/27	2
19	SCREW UNI 5931 M 3X20	4			

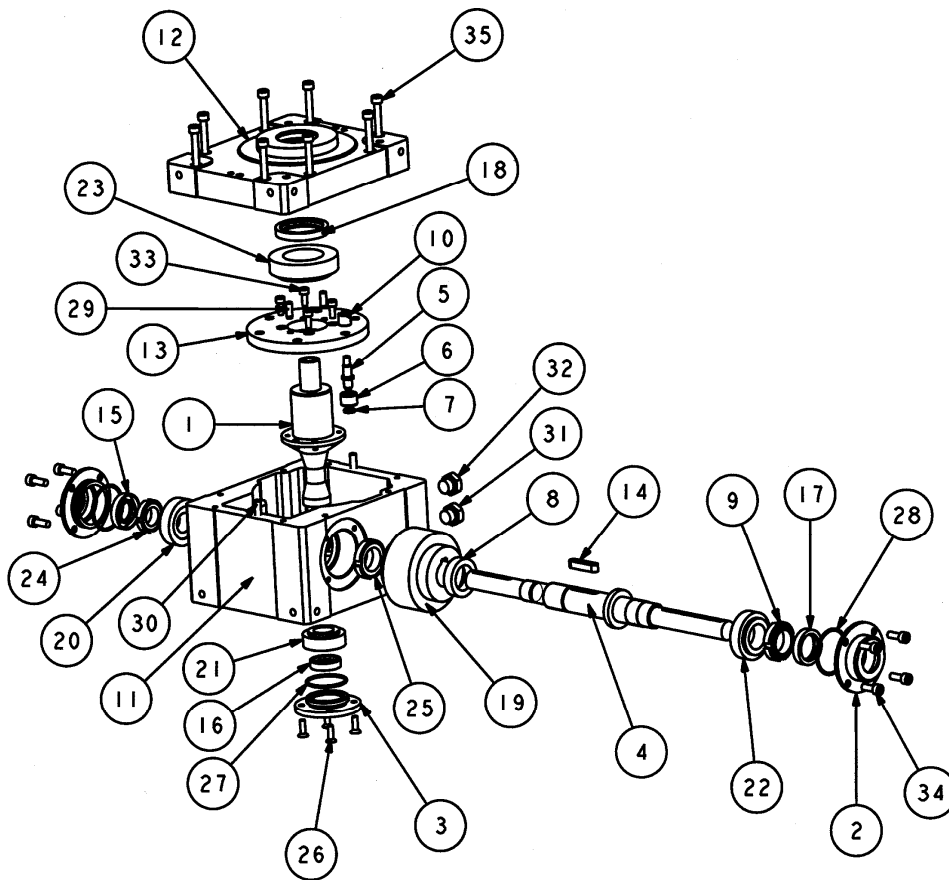
For S value see table 4 - page 11

14 TECHNICAL DATA SHEETS INTERMITTENT DRIVE IT15, OSCILLATING DRIVE OT15

14.1 Anomalies when operating, non routine maintenance and repairing

Observed anomaly	Cause	Actions to be taken
♦ The output shaft moves during the dwell position of the cam	♦ loosening of ring nuts No. 9 or No. 24 on the cam shaft (which moves therefore along its axis)	a) remove the flanges No.2 by unscrewing the screws No.34 b) screw a ring nut (for instance No.9) c) check how it works; the rotation of the cam against the cam followers must be smooth. If it is not, unscrew the ring nut No.9, thus restoring the previous conditions. Repeat the same operation on the ring nut No.24. The shaft rotation must be slightly forced (preload on the taper roller bearings No.20/22)
	♦ loosening of the lower flange No. 3.	d) check if the screws No. 26 are well tightened to flange No. 3.
	♦ loosening of the ring nuts No. 25 locking the cam	e) take away the cover No.12 by removing the screws No.35. (see note 1, page 14); take away the central shaft group No. 1+13+33+18 f) screw the ring nut No.25 g) mount the central shaft group and the cover h) check how it works: the rotation of the cam against the cam followers must be smooth i) take off again the cover No.12; clean the contact surface of the cover No.12 and the casing No.11. Apply a small quantity of fluid sealant and then reassemble again and lock by the screws No.35
	♦ wear of pins and cam followers 5/6/7 ♦ ovalisation (in the indexing disk) of the holes housing the pins ♦ pins bending	j) execute point e) k) remove the central shaft group, consisting in the parts No. 1+13+18+33 l) replace pins and cam followers: take off the nut No. 10 and pull out the pin forced in the hole (see note 2, page 14) m) force the new pins in the hole and fix by means of the nut No. 10 n) execute points g), h), i)
♦ The torque needed to displace the output shaft 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

14.2 Intermittent drive IT15, Oscillating drive OT15



Ref.	Part name	Q.	Ref.	Part name	Q.
1	CENTRAL PIN	1	19	CAM	1
2	SIDE FLANGE	2	20	TAPER ROLLER BEARING RIV 30204	
3	LOWER FLANGE	1	21	TAPER ROLLER BEARING RIV 32004X	1
4	CAMSHAFT HOLDER	1	22	TAPER ROLLER BEARING RIV 32005X	1
5	PIN	S	23	TAPER ROLLER BEARING RIV 32008X	1
6	CAM FOLLOWER	S	24	RING NUT E.STOP M20X1	2
8	SPACER RING	2	25	RING NUT E.STOP M25X1.5	1
9	RING NUT E.STOP M25X1.5	1	27	SEAL ANGST+PFISTER OR3143	1
10	SELF-LOCKING NUT E.STOP	S	28	SEAL ANGST+PFISTER OR3162	2
11	CASING	1	29	PARALLEL PIN Ø 6X16	2
12	COVER	1	30	PARALLEL PIN Ø 6X25	2
13	CAM FOLLOWER HOLDING PLATE	1	31	OIL PLUG HFE9 ELESA	1
14	KEY 8X7X35	1	32	OIL PLUG TSO ¼" ELESA	1
15	SEAL A+P A18357	1	33	SCREW UNI 5931 M 5X12	4
16	SEAL ANGST+PFISTER A20307	1	34	SCREW UNI 5931 M 6X16	8
17	SEAL A+P A24357		35	SCREW UNI 5931 M 6X35	8
18	SEAL ANGST+PFISTER A40527	1			

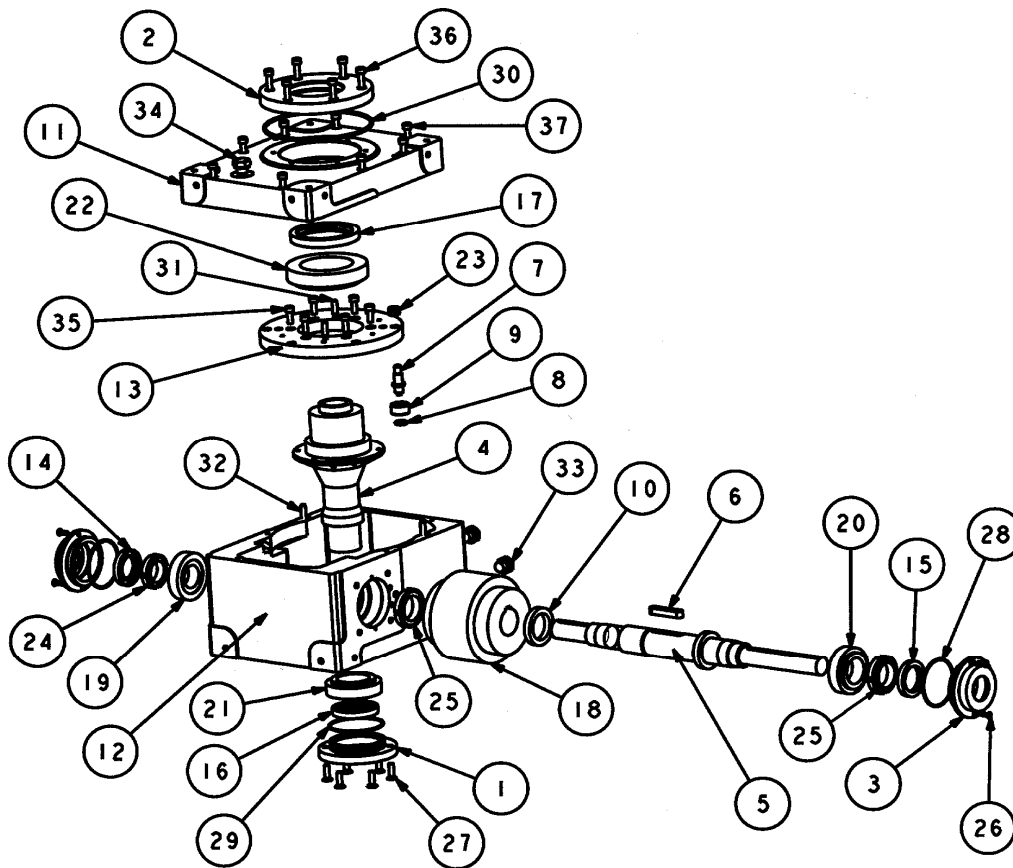
For S value see table 4 - page 11.

15 TECHNICAL DATA SHEETS IT25, IT35, IT55 AND OT25, OT35, OT55

15.1 Anomalies when operating, non routine maintenance and repairing

Observed anomaly	Cause	Actions to be taken
♦ The output shaft moves during the dwell position of the cam	♦ loosening of ring nuts No.24 or No.24/25 on the cam holder shaft (which moves therefore along its axis)	a)remove the flanges No.3 by unscrewing the screws No.26 b)screw a ring nut (for instance No.24 on the left) c) check how it works; the rotation of the cam against the cam followers must be smooth. If it is not, unscrew the ring nut No.24(left), thus restoring the previous conditions. Repeat the same operation on the ring nut No.25 (or 24 right). The shaft rotation must be slightly forced (preload on the taper roller bearings No.19/20)
	♦ loosening of the lower flange No. 1	d)Check if the screws No. 27 are well tightened to flange No. 1.
	♦ loosening of the ring nut No. 25, locking the cam	e)take away the cover No.11 by removing the screws No.37. (see note 1, page 14); take away the central shaft group No. 4+13+22. f) screw the ring nut No.25 g)mount the central shaft group and the cover h)check how it works: the rotation of the cam against the cam followers must be smooth i) take off again the cover No.11; clean the contact surface of the cover No.11 and the casing No.12. Apply a small quantity of fluid sealant and then reassemble again and lock by the screws No.37.
	♦ wear of pins and cam followers 7/8/9 ♦ ovalisation (in the indexing disk) of the holes housing the pins ♦ pins bending	j) execute point e) k)replace pins and cam followers 7/8/9: take off the nut No. 23 and pull out the pin forced in the hole (see note 2, page 14) l) execute points g), h) and i)
♦ The torque needed to displace the output shaft to the stations is not consistent	♦ pins bending	m)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	n)replace pins and cam followers as described in the a.m. point.

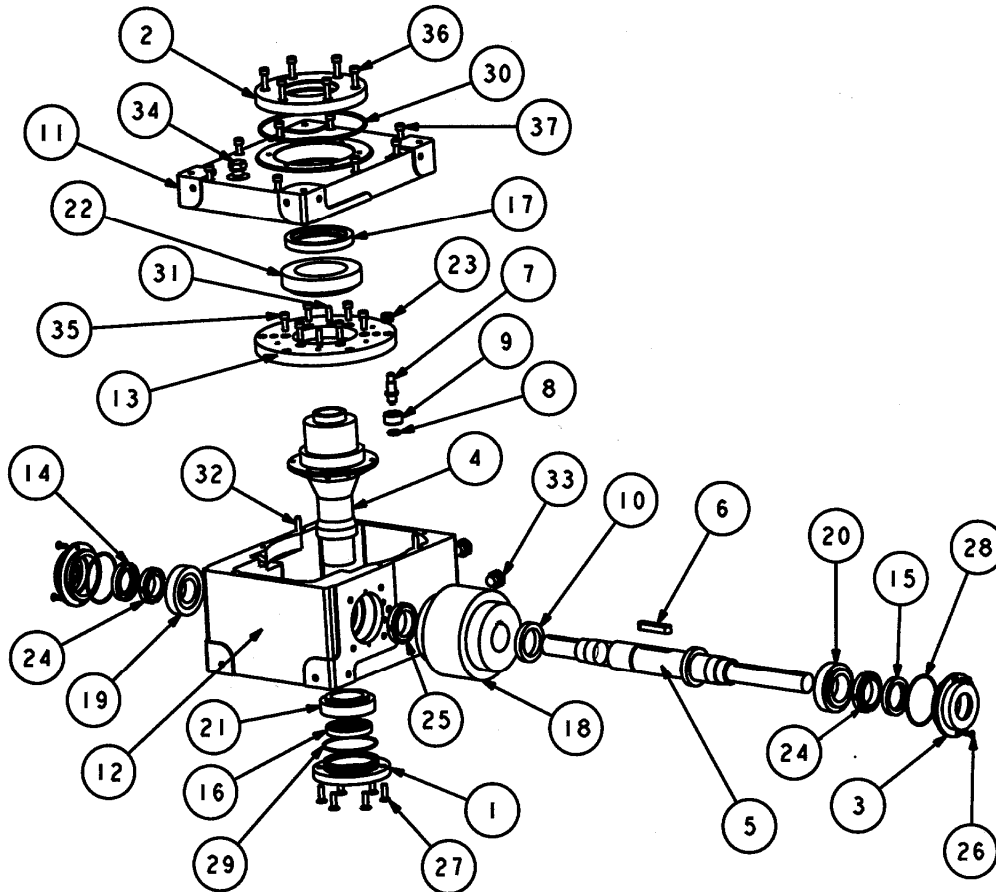
15.2 Intermittent drive IT25, Oscillating drive OT25



Ref.	Part name	Q.	Ref.	Part name	Q.
1	LOWER FLANGE 02452	1	20	T.R. BEARINGS RIV 32007X	1
2	UPPER FLANGE 02463	1	21	TAPER ROLLER BEARING RIV 32008X	1
3	SIDE FLANGE 02674	2	22	TAPER ROLLER BEARING RIV 32013X	1
4	CENTRAL PIN	1	23	SELF-LOCKING NUT E.STOP	S
5	CAMSHAFT HOLDER	1	24	RING NUT GUK M30X1.5 E.STOP	1
6	KEY 10X8X50	1	25	RING NUT GUK M35X1.5 E.STOP	2
7	PIN	S	26	SCREW M 4X16	4
8	WASHER	S	27	SCREW M 6X20	6
9	CAM FOLLOWER	S	28	SEAL ANGST+PFISTER OR3231	2
10	SPACER	1	29	SEAL ANGST+PFISTER OR3250	1
11	COVER	1	30	SEAL ANGST+PFISTER OR4512	1
12	CASING	1	31	PARALLEL PIN Ø6X20	2
13	CAM FOLLOWER HOLDING PLATE	1	32	PARALLEL PIN Ø6X40	2
14	SEALS ANGST+PFISTER A28477	1	33	OIL PLUG TYPE T 58501	2
15	SEALS ANGST+PFISTER. A32477	1	34	OIL PLUG TYPE TCF 58901	1
16	SEAL ANGST+PFISTER A4056/8	1	35	HEXAGONAL SOCKET SCREW M 6X16	6
17	SEAL ANGST+PFISTER A658510	1	36	HEXAGONAL SOCKET SCREW M6X20	6
18	CAM	1	37	HEXAGONAL SOCKET SCREW M 6X40	8
19	T.R. BEARINGS 30206X	1			

For S value see table 4 - page 11.

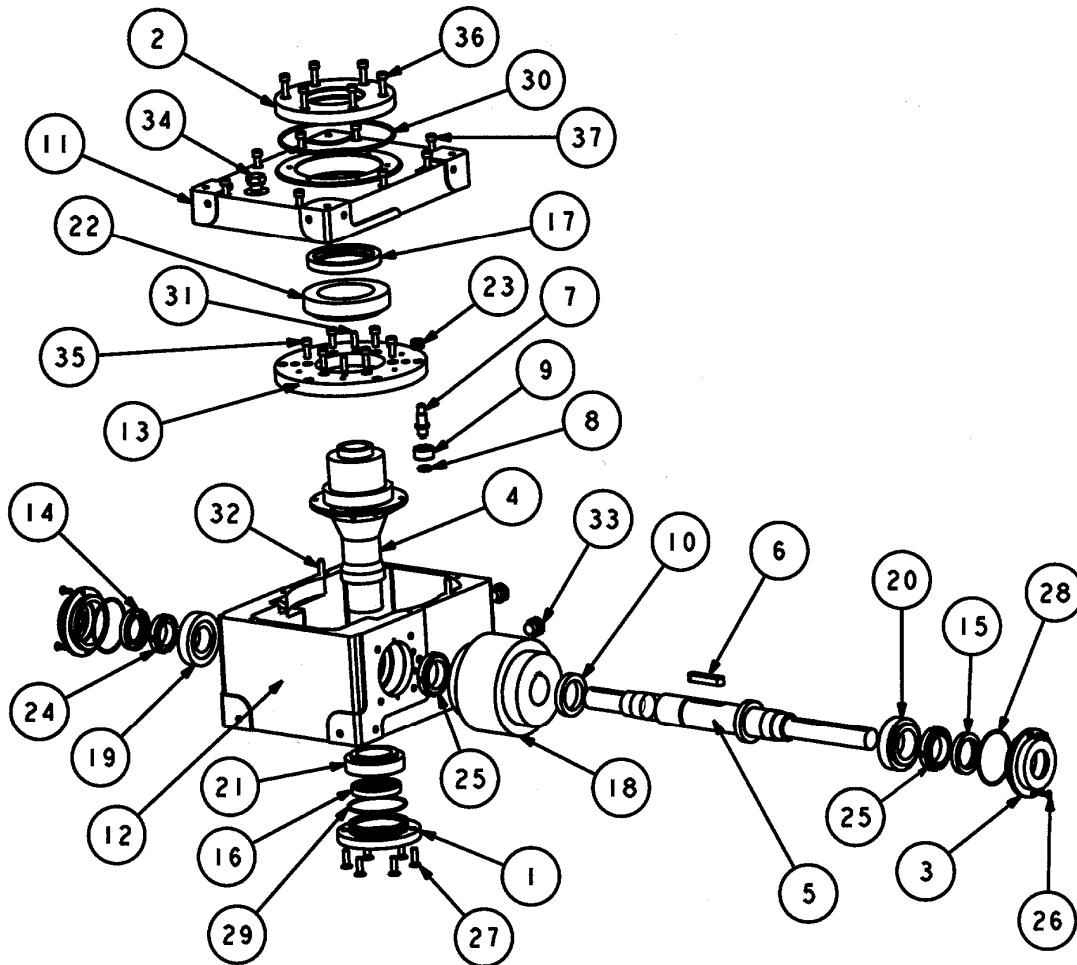
15.3 Intermittent drive IT35, Oscillating drive OT35



Ref.	Part name	Q.	Ref.	Part name	Q.
1	LOWER FLANGE 02564	1	20	T.R. BEARINGS RIV 32007X	1
2	UPPER FLANGE 02457	1	21	TAPER ROLLER BEARING RIV 32010X	1
3	SIDE FLANGE 02674	2	22	TAPER ROLLER BEARING RIV 32015X	1
4	CENTRAL PIN	1	23	SELF-LOCKING NUT E.STOP	S
5	CAMSHAFT HOLDER	1	24	RING NUT GUK M35X1.5 E.STOP	2
6	KEY 10X8X70	1	25	RING NUT GUK M40X1.5 E.STOP	1
7	PIN	S	26	SCREW M 4X16	4
8	WASHER	S	27	SCREW M 6X20	6
9	CAM FOLLOWER	S	28	SEAL ANGST+PFISTER OR3231	2
10	SPACER	1	29	SEAL ANGST+PFISTER OR4287	1
11	COVER	1	30	SEAL ANGST+PFISTER OR4462	1
12	CASING	1	31	PARALLEL PIN Ø8X25	2
13	CAM FOLLOWER HOLDING PLATE	1	32	PARALLEL PIN Ø8X40	2
14	SEALS ANGST+PFISTER A32477	1	33	OIL PLUG TYPE T 58501	2
15	SEALS ANGST+PFISTER. A32477	1	34	OIL PLUG TYPE TCF 58901	1
16	SEAL ANGST+PFISTER A50658	1	35	HEXAGONAL SOCKET SCREW M 8X16	6
17	SEAL ANGST+PFISTER A759510	1	36	HEXAGONAL SOCKET SCREW M6X25	6
18	CAM	1	37	HEXAGONAL SOCKET SCREW M 8X50	8
19	BEARING RIV 32007X	1			

For S value see table 4 - page 11.

15.4 Intermittent drive IT55, Oscillating drive OT55



Ref.	Part name	Q.	Ref.	Part name	Q.
1	LOWER FLANGE 02576	1	20	T.R. BEARINGS RIV 33010	1
2	UPPER FLANGE	1	21	TAPER ROLLER BEARING RIV 33114	1
3	SIDE FLANGE 02659	2	22	TAPER ROLLER BEARING RIV 32024X	1
4	CENTRAL PIN	1	23	SELF-LOCKING NUT E.STOP	S
5	CAMSHAFT HOLDER	1	24	RING NUT GUK M45X1.5 E.STOP	1
6	KEY 14X9X120	1	25	RING NUT GUK M50X1.5 E.STOP	2
7	PIN	S	26	SCREW M 3X12	8
8	WASHER	S	27	SCREW M 8X25	6
9	CAM FOLLOWER	S	28	SEAL ANGST+PFISTER OR4287	1
10	SPACER	2	29	SEAL ANGST+PFISTER OR4437	1
11	COVER	1	30	SEAL ANGST+PFISTER OR4725	1
12	CASING	1	31	PARALLEL PIN Ø8X30	2
13	CAM FOLLOWER HOLDING PLATE	1	32	PARALLEL PIN Ø10X40	2
14	SEALS ANGST+PFISTER A48628	1	33	OIL PLUG TYPE T	2
15	SEALS ANGST+PFISTER. A48628	1	34	OIL PLUG TYPE TCF	1
16	SEAL ANGST+PFISTER 709513	1	35	HEXAGONAL SOCKET SCREW M 8X25	6
17	SEAL ANGST+PFISTER 12015012	1	36	HEXAGONAL SOCKET SCREW M 6X25	6
18	CAM	1	37	HEX. SOCKET SCREW M 10X50	8
19	T.R. BEARINGS 33109	1			

For S value see table 4 - page 11.

16 DECLARATION OF INCORPORATION FOR PARTLY COMPLETED MACHINERY ANNEX II 1.B (UNDER DIRECTIVE 2006/42/EC)

TRANSLATION OF ORIGINAL DECLARATION

AUTOROTOR SRL, Via dell'Industria, 4 - I-26010 Vaiano Cremasco (CR) - Italy

STATES THAT THE PARTLY COMPLETED MACHINERY

PRODUCT NAME	
SERIAL N°	
TORQUE LIM. SET	

COMPLIES WITH

the Directive 2006/42/EC of the European Parliament and the Council of 17 May 2006 on machinery and amending Directive 95/16/EC as regards the EHSR Annex I below:

- | | |
|---|--|
| 1.3.1 Risk of loss of stability | 1.3.4 Risks due to surfaces, edges or angles |
| 1.3.2 Risk of break-up during operation | 1.5.8 Noise |

The relevant documentation has been prepared in accordance with Annex VII Part B.

AUTOROTOR SRL undertakes to provide, in response to duly reasoned request by the competent national authorities, relevant information on partly completed machinery.

It is prohibited from putting into service of the partly completed machinery described above before the machine where it is incorporated or assembled has been declared in conformity with the provisions of Directive 2006/42/EC.

The person authorized to provide the relevant technical documentation, established in the Community is Mr. Ferdinando Bertolotti, Via dell' Industria 4, 26010 Vaiano Cremasco (CR).

Vaiano Cremasco, 01/01/2010.

General manager



F. Bertolotti.

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