







OperatorService



The good functioning and the efficiency of the mechanical components mainly depend on a constant and correct maintenance.



TAKING VISION OF THE ENTIRE MANUAL allows to properly perform the operations of ordinary and extraordinary maintenance.

The lack of the recommended operations can compromise the lifetime and the integrity of the transmission and bring to failure or injury to the operator.

In the event of breakdown or anomaly, the prompt reaction from the specialized personnel will guarantee a higher lifetime of the assembly, preventing further damage in the years.

GENERAL SAFETY RECOMMENDATIONS

IMPORTANT:



Before starting any operation, read this paragraph carefully.

Safety precautions

The correct use and the correct repair of the assembly and its components are very important for security and reliability. The recommended procedures, that are listed on this service manual, have been tested as operative ways to act. Strictly follow each procedure making use both of writings and illustrations.

Some of these procedures show the usage of pertinent tools designed to perform every operation clearly and correctly.

Some specific tools must be used, where necessary, to perform some proper operations. It is impossible to manage every working procedure or all the possible methods with their own risks, therefore whoever uses not recommended tools must be aware that the safety of the operator and the boat will be endangered.

Recall icons







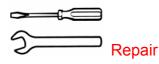
= OPERATION REQUIRING PARTICULAR ATTENTION AND PRECISION FROM THE

OPERATOR



= OPERATION DAMAGING THE COMPONENT OR PRODUCT IF NOT PERFORMED

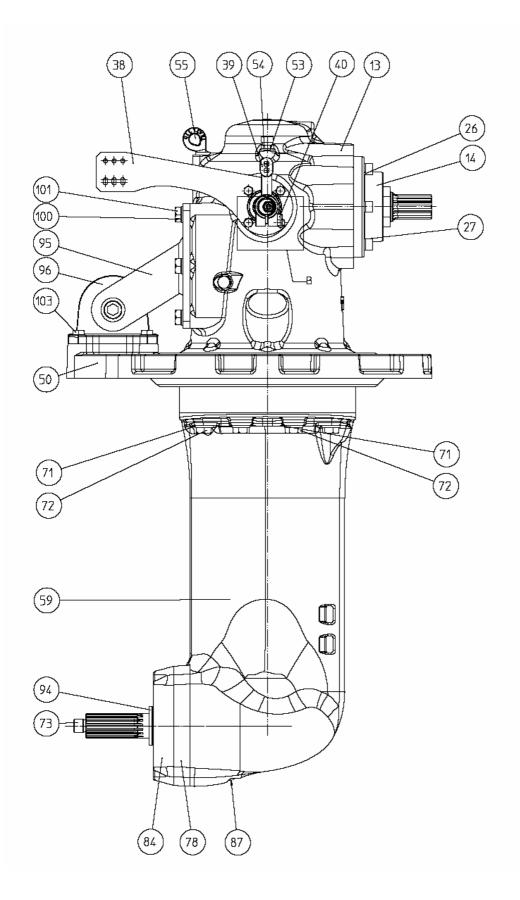
CORRECTLY

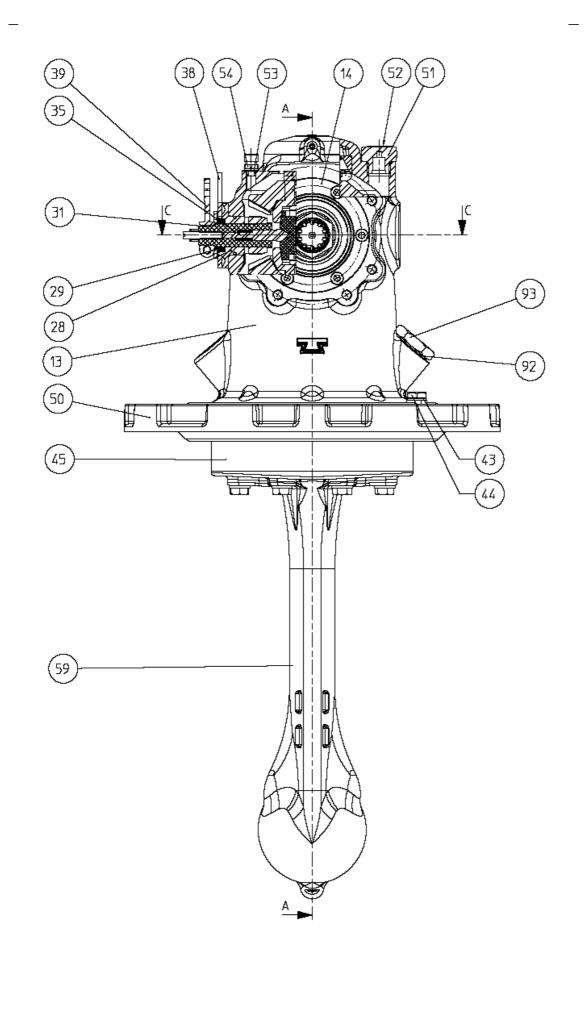


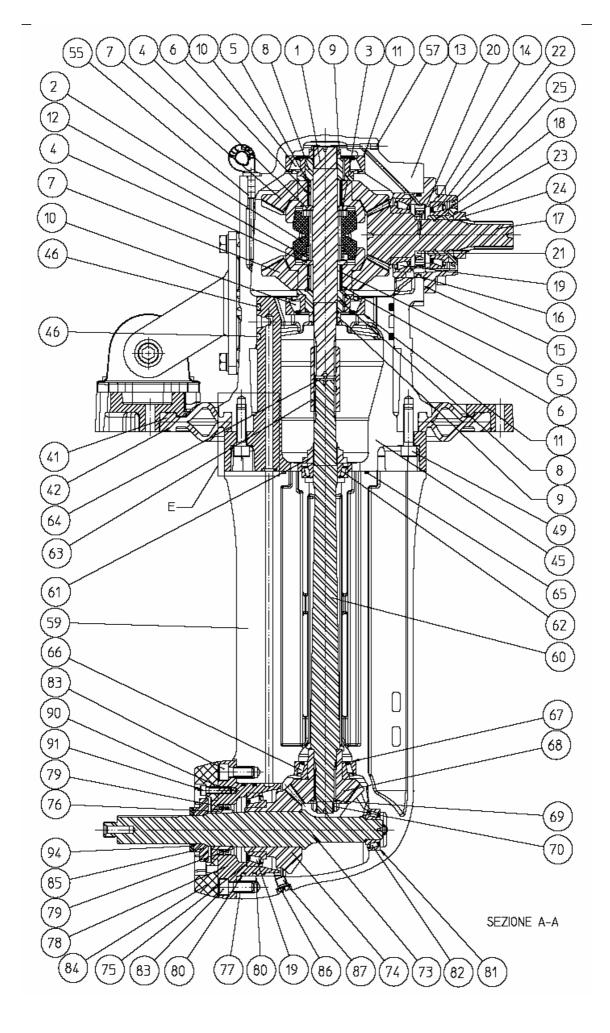
The procedure for assembly / disassembly of the transmission allows to perform the complete overhaul of the group and is assisted with photos, for a complete and safe guide for each operation. It is assumed that the transmission has been removed from the vessel. The deep knowledge of the assembly allows the correct estimate of the kind of procedure to be followed, which may only require the disassemble of a few components, operating on a part of the transmission only.

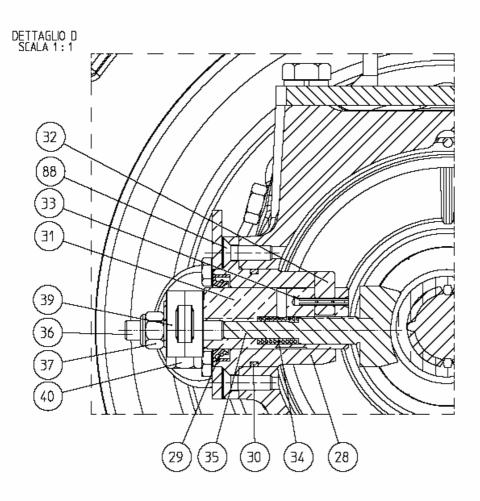
Recommended tightening torque, based to the screw type

Filettatura	8,8 (8G)	10,9 (10K)	12,9 (12K)
vite	Nm	Nm	Nm
M 2	0,37	0,52	0,63
М 2,3	0,60	0,84	1,01
M 2,6	0,86	1,21	1,45
М 3	1.34	1,88	2,26
М 3,5	2,06	2,89	3,48
M 4	3,04	4,31	5,15
М 5	6,03	8,48	10,2
М 6	10,3	14,71	17,65
М 7	17,16	24,52	28,44
M 8	25,50	35,30	42,17
M 10	50,01	70,61	85,32
M 12	87,28	122,58	147,10
M 14	138,27	194,17	235,36
M 16	210,84	299,1	357,94
M 18	289,3	411,88	490,34
M 20	411,88	578,50	696,28
M 22	558,98	784,54	941,44
M 24	710,99	1000,28	1196,42
M 27	1049,32	1480,81	1775,01
M 30	1421,97	2010,38	2402,64

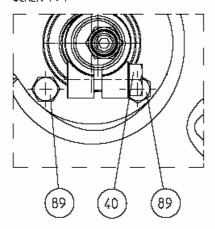




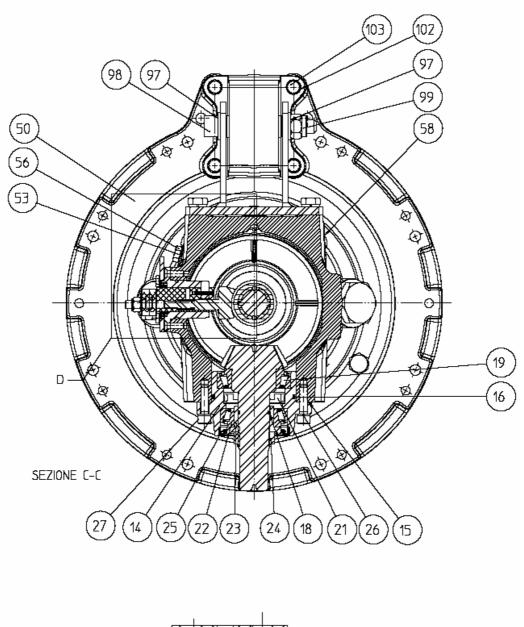


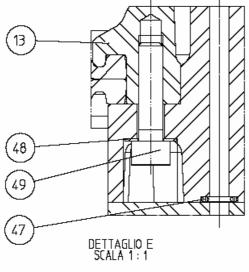


DETTAGLIO B SCALA 1 : 1



Rapp.	Pas. n° 68 Pignone codice n°	Pas. nº 74 Corana codice nº	Assieme Sea prop 60 codice nª
19/22 2.373	2061692	2061691	1013180
21/22 2.14	2061694	2061693	1013181





Pos nº	Descrizione	Qta	Codice	Rev
1	Albero secondaria TMC S	1	2021516	00
2	Corpa frizione Sea Prop 60	1	2056151	00
3	Spessore registro albero sec. Sea Prop 60	4	2013715	00
4	Rasamento su albero secondario TMC 40	2	2016024	00
5	Anello interno FAG JR25x30x26.5	2	4584029	
6	Gabbia a rullini FAG K30-35-13	4	4604054	
7	Ingranaggio campana frizione Sea Prop 60	2	2061695	00
8	Supporto cuscinetto albero sec. Sea Prop 60	2	2030079	01
9	Dado fissaggio albero sec. Sea Prop 60	2	2038030	00
10	Cuscinetto 30208A (40x80x19.75)	2	4622051	
11	Spessore di registro	2	2013189	01
12	Molla sostegno corpo frizione	1	2020088	01
13	Scatola superiore Sea Prop 60	1	2009153	00
14	Coperchia albera ingresso Sea Prop 60	1	2010365	00
15	Spessare registro albero ingr. Sea Prop 60	2	2013714	00
16	Guarnizione OR 4312	1	4598054	
17	Albero ingresso rapp. 0.49 Sea Prop 60	1	2021606	00
18	Guarnizione OR 2112	1	4598151	
19	Cuscinetto 32009X (45x75x20)	2	4622060	
20	Vite TCEI UNI 5931 M3x10	1	4615101	
20	Girante pompa Sea Prop 60	1	2056150	00
	Cuscinetto 32008XA (40x68x19)	1	4622050	
22 23	Supporto cuscinetto albera ingr. Sea Prop 60	1	2030080	00
24	Dado bloccaggio albero ingr. Sea Prop 60	1	2030000	00
		-		00
25	Anella di tenuta 55x72x8 vitan	1	4597172	
26	Rosetta DIN 7980- 8.2	6	4611508	
27	Vite TCEI UNI 5931 M8x30	6	4615220	- 04
28	Coperchio comando laterale Sea Prop 60	1	2010366	01
29	Anello di tenuta 25x35x7	1	4595083	
30	Guarnizione OR 3137	1	4598135	
31	Albero di camando TMC 40	1	2021419	04
32	Spina di fermo albero comando	1	2035054	00
33	Spina Elastica UNI 6874 3x20	1	4613034	
34	Molla carico pattino TMC 60	1	2020068	00
35	Pattino di comando TMC 40	1	2056022	E0
36	Vite STEI M8x40 UNI 5923 - 12.9	1	4581017	
37	Dado autofrenante UNI 7473 M8	1	4634008	
38	Staffa telecomando Sea Prop 60	1	2004036	00
39	Leva di comando	1	2037036	04
40	Vite TE ISO 4017 M8x25	1	4615214	
41	Guarnizione in gomma+sensore Sea Prop 60	1	2012176	00
42	Guarnizione in gomma Sea Prop 60	1	2012175	00
43	Rosetta UNI 6592 1/4" GAS	1	4609032	
44	Tappo 1/4" GAS	1	4588001	
45	Supporto inferiore gruppo frizione	1	2030077	00
46	Guarnizione OR 208	2	4598164	
47	Guarnizione OR 112	1	4598165	
48	Rasetta ondulata DIN 137 B d.10 inox A2	8	4611211	
49	Vite TCEI UNI 5931 M10x40 inox A4	8	4615810	
50	Flangia chiusura membrana Sea Prop 60	1 1	2043039	00
51	Tappo M24x2 con OR 2081	1	4588120	+

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52	Targhetta olio ATF per invertitori	1	2028012	00
53	Rosetta UNI 6592 10x14	2	4609011	
54	Tappo di sfiato	1	2055032	01
55	Asta livella olio Sea Prop 60	1	2070065	
56	Тарро ТЕ DIN 7604 M10х1	1	4588030	
57	Vite STEL M6x8 UNI 5923 - 12.9	1	4581004	+
58	Targhetta per invertitore	1	2028008	02
59	Scatala inferiore Sea Prop 60	1	2009155	00
60	Albero comando Sea Prop 60	1	2021607	00
61	Ghiera di bloccaggio	1	2038028	00
62	Cuscinetto 32005 (25x47x15)	1	4622015	
63	Giunto trascin. albera com. Sea Prop 60	1	2062312	00
64	Seeger d.19 UNI 7437	1	4601019	
65	Guarnizione OR 4325	1	4598011	
66	Cuscinetto 32007X (35x62x18)	1	4622040	
67	Spessore di registra d.62	2	2013192	01
68	Pignone rinvio rapp. 0.86 Sea Prop 60	1	2061692	
69	Rosetta DIN 988 17x24	2	4573016	
70	Ghiera autobloccante M17x1	1	4575016	
70	Rosetta UNI 6592 10.5x21 inox A4	8	4610011	
72	Vite TE ISO 4014 M10x35 inox A4	8	4615805	
73	Albero elica Sea Prop 60	1	2021608	01
74	Corona rinvio rapp.0.86 Sea Prop 60	1	2021606	00
75	Spessore di registra d.74.8	2	2013624	00
76	Boccola asse elica Sea Prop 60	Z	2013024	00
77	Helicoil M10x1.5 - 1.5d	2	4631001	00
78	Supporto albero elica Sea Prop 60	1	2030076	00
79	Anello di tenuta 40x52x7 viton	2	4597133	
80	Guarnizione OR 4350	Z	4598085	00
81	Spessore registro albero uscita	3	2013716	02
82	Cuscinetto 32004X (20x42x15)	1	4622010	
83	Vite TCEI UNI 5931 M10x25 inox A4	2	4615797	
84	Anodo zinco Sea Prop 60	1	2050039	00
85	Distanziale x elica a pale fisse	1	2013728	00
86	Guarnizione OR 2031	1	4598035	
87	Tappo scarico olio Sea Prop 60	1	2055073	00
88	Vite TSPEL UNI 5933 M6x20	4	4615154	
89	Vite TE ISO 4017 M6x10	4	4615132	
90	Helicoil M6x1-2d	З	4631004	
91	Vite TCEI UNI 5931 M6x25 inox A4	3	4615644	
92	Rosetta UNI 6592 1" GAS	1	4609031	
93	Tappo DIN 7604 1" GAS	1	4588119	
94	Distanziale aggiuntivo x elica a pale abbattibili	1	2013729	00
9 5	Staffa per supporto ontivibrante Sea Prop 60	1	2004037	00
96	Supporta antivibrante Sea Prop 60	1	2030082	00
97	Rosetta UNI 6592 14x28	2	4610014	
98	Vite TCEI UNI 5931 M14x100	1	4615455	
99	Dado autobloccante UNI 7473 M14	1	4634014	
100	Rosetta elastica UNI 1751 A-10.2	6	4611110	
101	Vite TE ISO 4017 M10x30	6	4615301	
102	Rosetta andulata DIN 137 B d.8	4	4611208	
103	Vite TE ISO 4017 M8x30	4	4615218	

SAIL DRIVE SP 60 SHOP MANUAL

PREASSEMBLY OF CLUTCH GROUP



Put shim (ref. $n^{\circ}3$) into the shaft (ref. $n^{\circ}1$) until it hits the splined part of the shaft.



Put shim (ref. $n^{\circ}4$) all the way down into the shaft.



Warm the ring (ref n°5) up to 120 °C, put the ring into shaft (ref n°1) as per picture, with the help of a cylindrical stopper if necessary



Put the two cages (ref. n°6) into the ring (ref. n°5)



Put on the clutch gear (ref. n°7)



Put on the bearing housing (ref. n°8), screw the lock nut (ref. n° 9)



Put the clutch body (ref. $n^{\circ}2$) into the sahft (ref. $n^{\circ}1$), make sure it has enough play to the spline and it moves freely. Put on the opposition spring (ref. $n^{\circ}12$)



Put on shim (ref. $n^{\circ} 4$) all the way down



Warm up ring (ref. n°5) up to 120 °C, position it all the way down into the shaft. Insert the two cages (ref. n° 6) Put on the clutch gear (ref. n° 7) Position the bearing housing (ref. n°8)



Insert and tighten the fixing nut (ref. n°9)

Secure the clutch group in a vise with the proper tool (tool SP 60-01) to avoid to damage the spline on the shaft, proceed screwing both nuts on the end of the shaft.



Measure the height of the clutch group, the value must be 83.02 mm. If it is not, increase or decrease the thickness by adding or removing some shims (ref. n° 3)



Remove the fixing nuts (ref. n° 9) Warm the bearings (ref. n° 10) up to 120 °C, put them on the bearing housing (ref. n° 8)



Screw the fixing nuts (ref. n°9), tighten and rivet the thread with a punch, in the position of the markings on the thread.

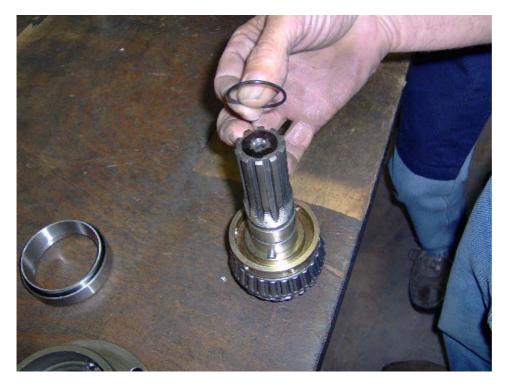


Position the preassembled clutch group with the thrust blocks of the respective bearings

PREASSEMBLY OF THE INPUT GEAR GROUP



Warm up bearing (ref. $n^{\circ}19$) up to 120 °C Put it as per picture all the way down into the shaft (ref n° 17) Insert the drag pin of the oil pump (ref. n° 20)



Put in the rotor of the oil pump (ref. n° 21) Put on O-ring ref. n° 18.



Put the bearing bowl (ref. 19 and 22) into the bearing housing (ref. n° 14) all the way down.



Put on the previously assembled shaft internally to the bearing housing. Put bearing (ref. n°22) onto the bearing housing (ref. n° 23) Put the bearing all the way down into the shaft



Insert and tighten the fixing nut (ref. n° 24) Rivet the thread using a pin to avoid its unscrewing, in two opposite locations



Put the oil seal (ref. n° 25) in its position, adding grease in its location to make the assembly easier.

Position the oil seal with a stopper.

PREASSEMBLY OF THE DRIVE GROUP



Put on the oil seal (ref. n° 29) internally to the support of the drive group (ref. n° 28) Grease the oil seal location to make easier the insertion, put it down using a stopper if necessary



End up the preassembly inserting:

Drive shaft (ref. n° 31), stop pin (ref. n° 31), pin ref. n° 33, opposition spring (ref. n° 34), sliding block drive (ref. n° 35), adjusting pin (ref. n° 36), lock nut (ref. n° 37), O-ring pos. 30, drive lever (ref. n° 39)

PREASSEMBLY OF THE DRIVE COVER GROUP



Put the bearing bowl (ref. n° 10) into the cover group (ref. n° 11)



Put on the clutch group previously preassembled



Insert the tooling (tool SP 60-02) to center the clutch group into the cover upper assy. Tighten it with the two screws.



Inserit the gear group previously preassembled, apply tooling (tool SP 60-03) as per the picture, on the input shaft.

Screw the centre pin until the gear gets the position



Verify the measurement on the top of the shaft with a depth gauge. Disassemble tool SP 60-02, remove the gear group, remove the clutch group. Adjust the bearings, applying a 0,05 mm preload, dividing the shims into equel parts under the thrust blocks of the bearings (ref. n° 10)



Put the o-rings (ref. n° 45) on their locations of the lower support, apply some grease



Insert the preassembled clutch group. Put the sleeve (ref. n° 63) into the shaft. Put in the two membranes ref. n.41 and later ref. n.42.



Put on the lower support (ref. n° 45) as shown by the picture.

Put them in position making sure that the rubber membranes are correctly positioned on the internal of their locations.

Tighten the fixing screws.



Put the gear group into the cover group, verify the left distance between the gear group and the case



Put on as shims as to add 0.05 mm to the value detected by the thickness gauge. Put the o-ring (ref. $n^{\circ}16$) in its location, add grease if necessary.



Put the gear group into the cover group, tighten the fixing screws, Put on the oil seal (ref n° 18)



Apply layer of sealant paste as shown by the picture, insert the drive group previously assembled



Put in the fixing screws (ref. n° 88) with thread locker, and tighten. Put on the drive bracket (ref. n° 38), tighten the fixing screws. Out the bushing for the breather plug into the threaded hole. Screw the breather plug (ref. n° 53 e 54).

SEAPROP ASSEMBLY – PDF NUMBER 1

ARRANGE GEARS FOR LOW COVER ASSEMBLY

Detect the measurement shown by the drawing and note it on the form. Assemble the gear on the shaft, and then the internal part of the bearing on the gear.

59.75 = measurement showing the distance of the position of the mounting face from the generating (where it is needed to position the gear plus or minus 0,05)

36.25 = measurement to detect on each single gear.

To assemble the gear, use induction frequency heater for bearings like STAR 220-Z serial 900601/6.

To assemble the gear, it must be set at 150 °C for 300 seconds.

To assemble the bearing, it must be set at 120 °C for 220 seconds.

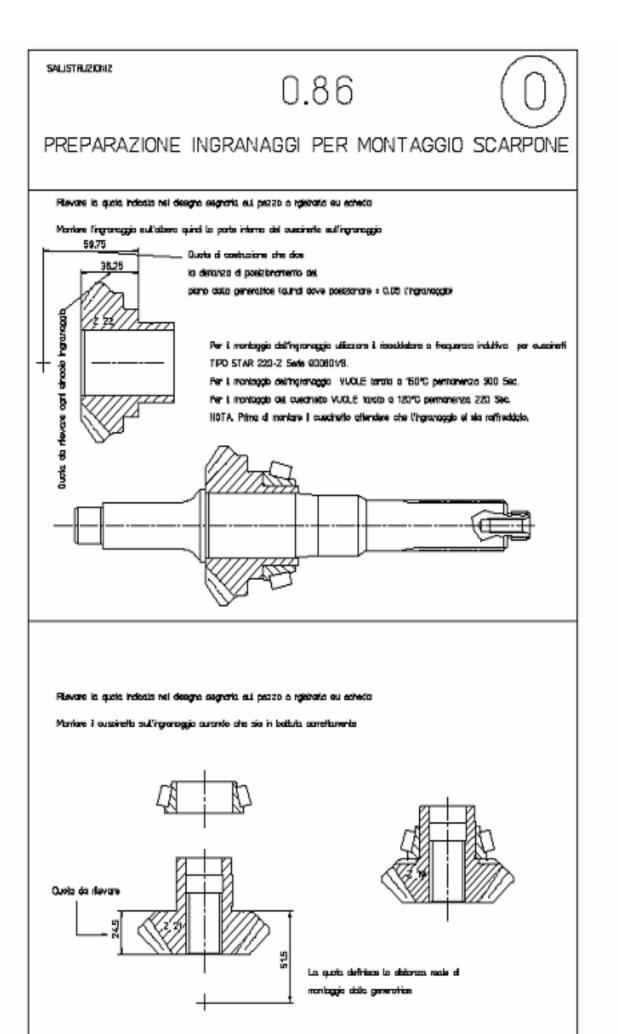
NOTE: before to assemble the bearing, wait for the gear to cool down.

Detect the measurement shown by the drawing and write it down on the form or on the item.

Assemble the bearing on the gear paying attention at the correct position all the way down.

Measurement to be taken: 24.5

51.5 = the measurement defines the real distance from the generating.



ADJUSTMENT OF THE OUTPUT SHAFT

Scheme n° 1

Adjustment position gear Z 22 Assemble tool (1) fixing it with the vertical tension rod. Assemble the bushing (2) replacing the pilot bearing on the lower cover group. Temporarily close the support to the lower cover group. With dial gauge, measure the axial play (C) i.e. 0.26

HOW MUCH TO ADJUST

A + B -59.75 = X X + C = shims to add

Example

23.49 + 36.25 -59.75 = -0.01 -0.01 + 0.26 = 0.25

WHERE TO ADJUST

Add shims between support and bearing as shown by the *

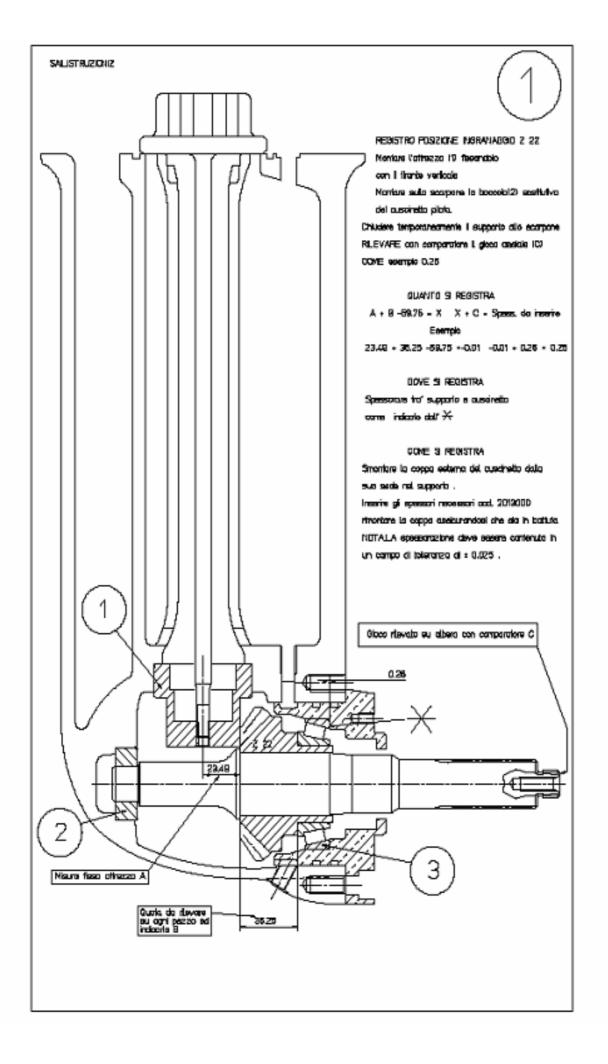
HOW TO ADJUST

Remove the outer bowl of the bearing from its bearing housing. Add as many shims as necessary, part number 2013000. Reassemble the bowl making sure it is in the correct position all the way down. NOTE: shims must be added in a tolerance range between -0.025 and +0.025

PLAY DETECTED ON A SHAFT WITH DIAL GAUGE C

23.49 = fixed measurement tool A

36.25 = measurement to be detected on each item as B measurement.



Measure gear (ref. n° 74) as shown by scheme n°1. Insert tool SP60-04 securing it as shown by the scheme.



Put the gear (ref. n°74) on shaft (ref. n° 73). Insert bearing (ref. n° 82), with the help of a stopper if necessary (tool SP60-05)



Put the bearing bowl (ref. n°82) into the lower cover group. Insert the output gear group, already preassembled.



Put the bearing bowl (ref. n° 19) into the bearing housing (ref. n° 78). Insert the support and use the bolts to fix it.

On the end of the shaft, screw the proper tool for bearings adjustment (tool SP60-06). With a gauge, measure the shifting of the output shaft.

Adjust the bearings adding shims (rif. $n^{\circ} 75 - 81$) as shown by scheme $n^{\circ}1$.

ADJUSTMENT OF THE VERTICAL TRANSMISSION SHAFT Scheme n° 3 $\,$

ADJUSTMENT POSITION GEAR Z 19

First operation is to check the thickness of gear C measurement.

Mount bowl (FAKE 1) of the bearing on the lower cover group and the internal part (ACTUAL 2) on gear Z 19.

Recall that the gears are coupled.

Place gear / bearing in postion. Couple the gear to the shaft and lock it temporarily with a nut.

Holding the axis vertically, fit the tooling (3). Then fit tool (4) to put the shaft in line. With the dial gauge in position *, check play B moving the shaft vertically.

HOW MUCH TO ADJUST

A + B + C - D = shims to add

Example

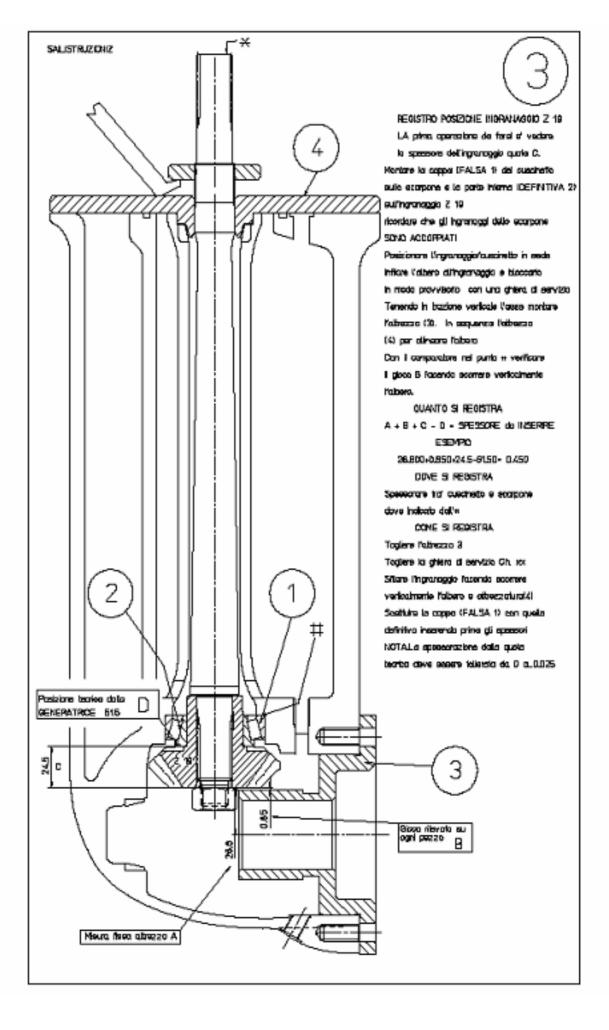
26.600 + 0.850 + 24.5 - 51.50 = 0.450

WHERE TO ADJUST

Add shims between bearing and case where shown by the #

HOW TO ADJUST

Remove tool n°3. Remove the temporary nut. Remove the gear moving the shaft vertically and tooling (4). Replace the bowl (FAKE 1) with the final one adding the shims for first. NOTE: The theoretical tolerance with be from 0 to -0.025.





Put the bearing bowl (ref. n° 66) on its location



Detect gear (ref. n° 68) measurement as per scheme n° 3. Put the bearing (ref. n° 66) on the gear, insert transmission shaft (rif. n° 60), assemble the gear and screw the lock nut (rif. n° 70)



Insert bearing (rif. n° 62), insert and screw lock nut (rif. n° 61)



With the proper tool (tool SP60 -07), hold steady the shaft in order to prevent its spin, screw lock nut (rif. n° 70) and (rif. n° 61)



Insert and screw the centering tooling (tool SP60-08) as shown by scheme $n^\circ\,3$



On the end of the shaft, assemble a dial gauge and detect the axial shifting as per scheme $n^{\circ}3$.

Go ahead with the gear adjustment, by adding shims (rif. n° 67)



Disassemble the adjustment tooling, position the shims, reassemble the components as shown previously, when reassembling the nut (rif. n° 70) use drops of thread locker.



Put oil seals (ref. n° 79) in the support (ref. n° 78) as shown by the cross section drawing. Assemble the O-rings (rif. n° 80) and grease their surface to make their assembly easier.



Position the support all the way down. Put in the fixing screws (rif. n° 83) applying a drop of thread locker Tighten and fit the helicoil (rif. n° 90)



Assemble the zinc (rif. n° 84) and tighten with screws (rif. n° 91)



Manually check the shaft spin and the play between the tapered pairs. There should be no crawling during the spinning



Put the o-ring (rif. n° 65) in its location, apply grease to make the assembly easier



Insert the retaining ring (rif. n° 50) Join the upper part with the lowe part of the gearbox, place the fixing screws (rif. n° 72) and tighten



Put the fitting on the location of the breather plug, screw the fitting all the way, positioning the chamfered part as per the photo. Screw the breather plug (rif. n° 53)



Place the spacers (rif. n°85) on the output shaft, protecting the splined part applying a damping layer.



Finish the upper part of the gearbox, applying the oil dipstick and the oil filling plug. Apply and tighten the lock plug on the membrane(rif. n° 44)



Apply support (rif. n° 95) and tighten with bolts (rif. n° 101) Apply antivibrating bracket (rif. n° 96) and fixing screw (rif. n° 98), tightening it



Make the adjustment of the drive system..

Put thread locker on the dowel pin (rif. n° 59). With the drive lever (ref. n° 73) in the neutral position, manually spin the output axis (rif. n° 73), screwing the dowel pin (ref. n° 59) at the same time, until you feel like the rotation of the output shaft is resisting. Unscrew the dowel by $\frac{3}{4}$ of a revolution and lock it in position with the lock nut.