ORSTA hydraulik

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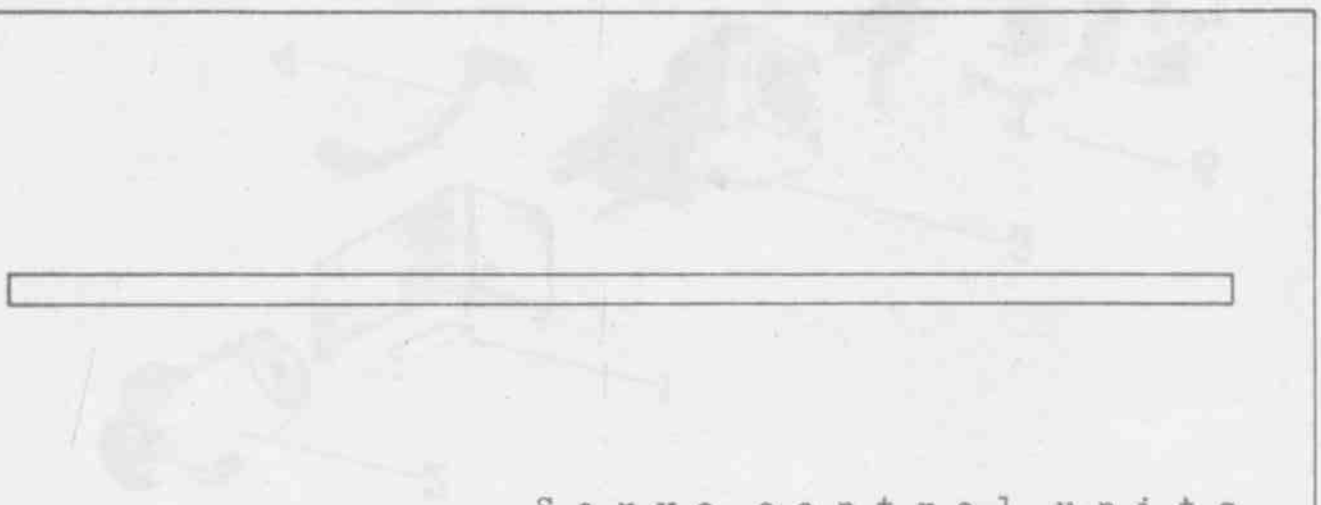
O P E R A T I N G I N S T R U C T I O N S
and Spare parts list



S e r v o c o n t r o l u n i t s

TGL 10887/04 and TGL 10888/04

for unit-constructed radial piston pumps

Brochure 6

Contents

This brochure is valid only in connection with the operating instructions for unit-principle radial piston pumps brochure 1 or brochure 2.

- 1981 edition -

1. General

Servo control units have the function to infinitely vary the volumetric flow of the radial piston pumps TGL 10868 and TGL 10869.

Adjustment of the volumetric flow beyond the zero position (reversing the direction of delivery while the direction of rotation of the radial piston pump remains the same) is possible. The control unit consists of the housing with two or four bores and the appropriate control pistons. Fastening of the control unit to the mounting face of the radial piston pump is accomplished through an intermediate plate by screwing. Hydraulic control pistons whose two sides are alternately loaded by a control volume (low pressure) via an installed directional control valve with sequencing control act upon the tilting block via the tilting piece, the tilting block serving to vary the volumetric flow.

The servo control units may be actuated via levers, cams, cables etc., or electrically, via d.c. push-type control magnets.

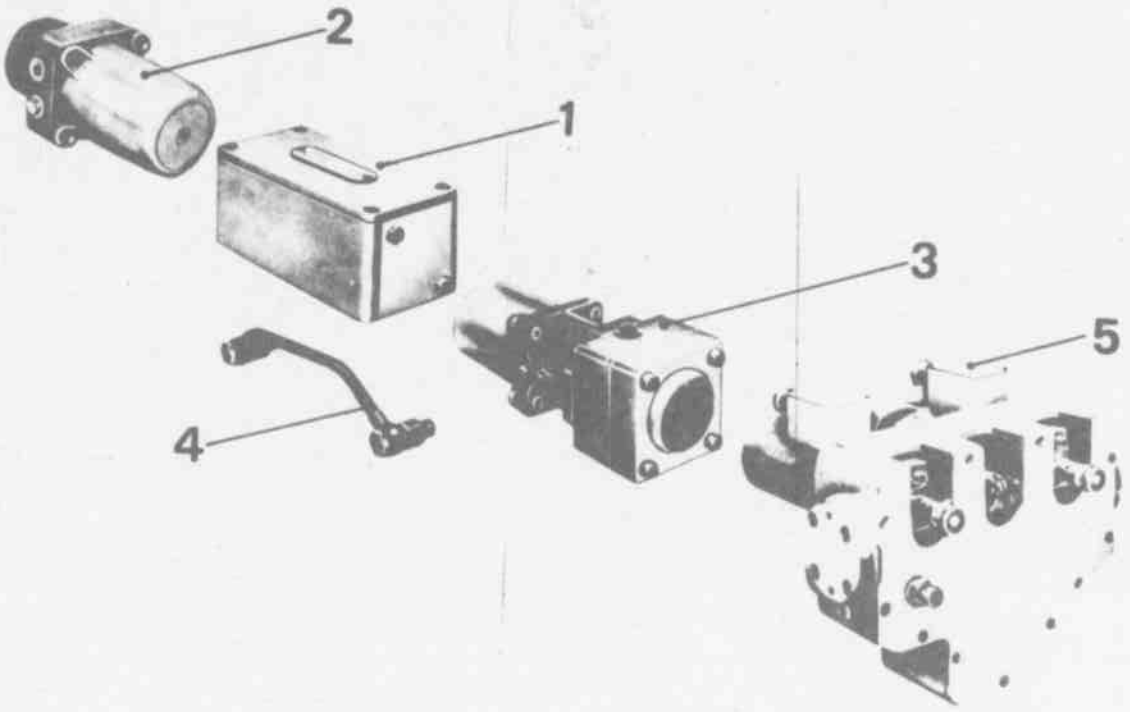


Figure 1 Exploded view of the control unit showing the various sub-assemblies

1 Housing, complete (with indication)
2 Control piston, complete (hydraulic piston)
3 Control piston, complete (servo-spool)
4 Control duct, complete
5 Magnetic unit, complete (two magnets)

The two independent volumetric flows of the radial piston pumps TGL 10869 are regulated either individually or jointly (by means of reversing lever) depending on the version.

Basic versions:

Single-flow versions TGL 10887 for
Radial piston pumps TGL 10868
Double-flow versions TGL 10888 for
Radial piston pumps TGL 10869

2. Servo control units with servo-spool C 20

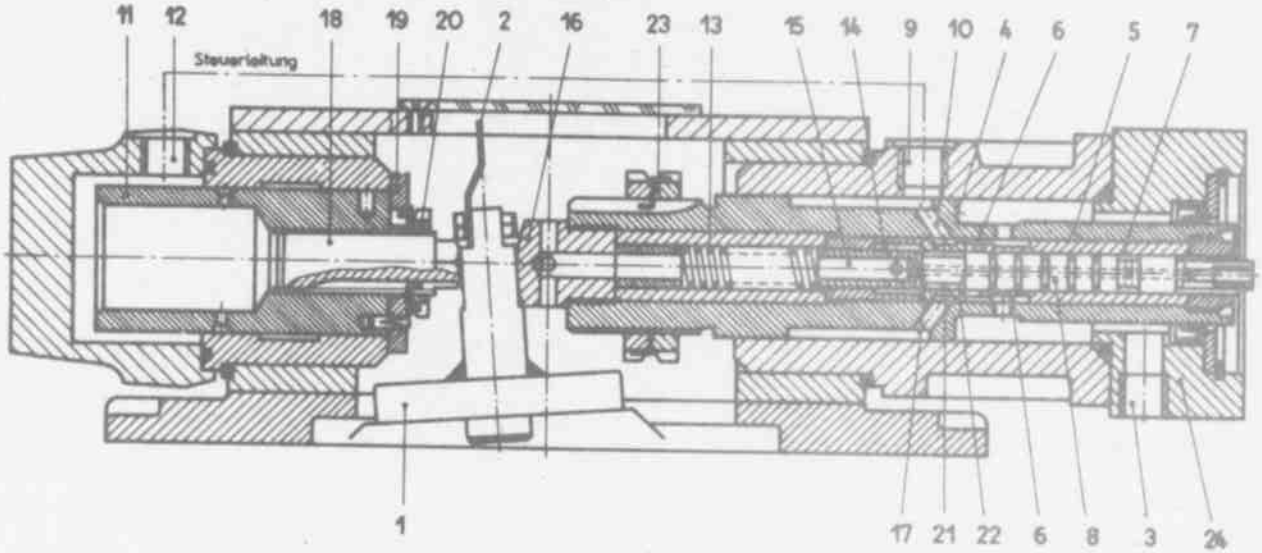


Figure 2 Servo control unit with servo-spool C 20.11 (with rough indication)

1 Tilting piece
2 Pointer
3 Inlet, control flow
4 Annular face, servo-spool
5 Servo-spool
6 Port in bushing
7 Bushing
8 Control piston
9 Connection of control duct
10 Port, servo-spool
11 Piston
12 Connection of control duct
13 Helical compression spring
14 Annular chamber
15 Longitudinal bore, control piston
16 Forcing screw
17 Metering edge
18 Stop screw
19 Stop washer
20 Slotted nut
21 Annular chamber
22 Metering edge
23 Slotted nut
24 Flange

2.1. Construction and mode of operation

No adjusting motion

The control flow delivered by the drive bearing B or C, TGL 10870, or by an external pressure generator enters the unit through inlet (3).

The control flow is continuously admitted to the annular face (4) of the servo-spool (5). The control piston (8) is not operated. In this position it blocks port (6) in the bushing (7) and port (10) in the servo-spool (5).

Therefore, the fluid behind the piston (11) cannot flow off as the return via port (10) is blocked. The two hydrostatically loaded spools of opposed action clamp the tilting piece (1) and, thus, the tilting block in any set position safely.

The fluid, after having reached the maximum control pressure (see 2.2.),flows off via a pressure limiting valve that has been set accordingly.

Corrective motion with the control piston pushed

If an actuating force pushes the piston (8) towards the tilting piece against the force of the helical compression spring (13), the fluid entrapped behind the piston (11) can flow off via the control duct arranged outside the housing, the port (10), annular chamber (14), longitudinal bore (15) and the bored forcing screw (16) into the housing of the radial piston pump.

The steady control pressure acting on the annular face (4) of the servo-spool now causes the servo-spool to follow the control piston in the same direction.

This follow-up motion stops when the metering edge (17) blocks the return flow of the fluid from the chamber behind the piston (11).

Corrective motion with the control piston relieved

If the actuating force is reduced the piston (8) will slide in the opposite direction (away from the tilting piece) by a certain amount so that port (6) communicates with the annular chamber (21) and port (10).

The control flow which acts continuously upon the annular face (4) of the servo-spool at the same time flows via port (6), annular chamber (21), port (10), connection (9), control duct and connection (12) into the chamber behind the piston (11). The piston area of the piston (11) is fully loaded. As the loaded area of piston (11) is larger than that of the servo-spool (5), piston (11) moves towards the tilting piece until the metering edge (22) blocks the

supply. The piston (11) causes the tilting piece (1) and the servo-spool to move by the same distance.

2.2. Technical data

Position of installation	optional for all devices
Fluid, viscosity and temperature ranges and ambient temperature range	the operating instructions "Unit-constructed radial piston pumps, TGL 10866, brochure 1 or 2" are binding
Actuating force for control piston	≧ 2 kgf required (piston to be actuated by pressure acting in axial direction)
Displacement of the control piston	± 5 mm from zero position

Displacement of the servo-spool

Nominal size of control unit	Control pressure min. MPa	Control pressure max. MPa	Displacement $0 \rightarrow Q_{max.}$ mm
- 12.5/16	1.2	6.3	13.7
- 5 /32			10.8
- 32 /16	1.6		17.7
- 12.5/32			13.6
- 80 /16			18.4
C 20. ... - 32 /32			17.7
-125 /16	2.6		19.9
- 80 /32			21.1
5- 5 /16	1.8		19.4
32- 32 /16	2.5		17.2
125-125 /16	3.5		26.5
160-160 /10			24.8

Time of adjustment	from minimum position to maximum position approx. 300 ms; in case of adjustment beyond zero position twice the time
Control pressure	dependent on the nominal size and the working pressure of the associated radial piston pump. The maximum control pressure must not exceed 6.3 MPa (63 kgf/cm²). For the minimum control pressure required at the nominal pressure of the radial piston pump, see table!

2.3. Trouble-shooting and fault clearance

On the expiration of the period of guarantee faults of the servo control units, if any, may be eliminated according to the following instructions by the user himself. Assembling and disassembling work should be done only by repair specialists who are acquainted with the structure and the function of the servo control units. Basic requirements for carrying out repairs are cleanliness, disconnection of the plant from the mains and zero pressure in the circuit.

Trouble	Possible cause	Remedy
Servo-spool (5), control piston (8) or piston (11) moves heavily	Contamination	Lap piston (11); replace complete control piston (servo-spool)
Control pressure does not act upon servo control unit (see table, page 5)	Defective pressure limiting valve for control oil	Check pressure limiting valve; readjust pressure, replace pressure limiting valve
Leakages at servo-spool or between the housing parts of the servo control unit	Lip-type packing ring defective, O-rings defective	Replace packing(s)
Maximum and/or minimum volumetric flow is not reached	Forcing screw (16), nut (20) or (23) have slackened	Tighten forcing screw or nut(s). Readjust volumetric flow.

2.4. Adjustment of the volumetric flows

General

The maximum limitation in the control unit must correspond to the rated volumetric flow of the radial piston pump.

The minimum limitation of the volumetric flow depends on the nominal size of the radial piston pump.

The final position of the servo-spool (5) is defined by the resting of the nut (23) on the flange bushing. Adjust the nuts in such a way that the volumetric flow required is ensured.

The final position of the opposite side is determined by the resting of the stop disk (19) on the bushing. Adjust the stop screw (18) in such a way that the volumetric flow required is ensured.

Adjustment of the maximum volumetric flow required (control range 0 to + Vg max) for counterclockwise driving direction

Screw off cover of the housing. Turn nuts (20) towards the tilting piece (1) until the lug of the lock plate can protrude from the bore of the stop disk (19). Adjust stop screw (18) in the direction desired. Place lock plate onto stop disk (19) with the lug engaging one of the bores. Tighten nut (20). Check volumetric flow. When the volumetric flow required is reached tighten the nut with the stop screw and secure it against slackening.

Caution! Quick actuation of the control piston (8) causes fluid to splash out of the drain bores of the forcing screw (16).

Adjustment of the minimum volumetric flow (control range 0 to + Vg max) for counterclockwise driving direction

Turn lock plate to unlock nuts (23), slacken them and turn nuts so that the servo-spool (5) can slide into the flange bushing until the volumetric flow required is achieved. Turn nuts with the lock plate until they come to rest against the flange bushing and lock them.

Check the volumetric flow again and readjust it, if necessary. Tighten the nuts and lock them against turning by bending a nose on each.

Minimum volumetric flow p_n 32 must be $\geq$ 10 % of the rated volumetric flow!

Minimum volumetric flow p_n 16 must be $\geq$ 5 % of the rated volumetric flow!

Adjustment in the range 0 to - Vg max

The maximum volumetric flow in the opposite direction of delivery may be obtained by setting the nut (23) on the servo-spool (5) accordingly.

The minimum volumetric flow is set by means of the stop screw (18).

3. Servo control units with magnetic unit C 21 and C 22

These control units consist of

C 21: Servo control unit with servo-spool C 20 and magnetic unit
2 magnets with zero-adjusting element

C 22: Servo control unit with servo-spool C 20 and magnetic unit
4 magnets with zero-adjusting element

After the actuation of a push-type solenoid the stroke of the magnetic core is transmitted to the control piston of the servo control unit C 20 via a pushpin to the adjusting screw (11), the control lever (4), shaft (3), rocking lever (6) and the thrust piece (20).

Construction and mode of operation are described in para 2.1.

The displacement required can be set by means of the adjusting screw (11). An attached pressure control device (zero-adjusting element) provides for the reduction of the volumetric flow of the radial piston pump to a minimum volumetric flow in dependence on the operating pressure and the helical compression spring (17) used. The adjustment of the individual volumetric flows with the adjusting screws (11) and the stop (10) have no influence on this.

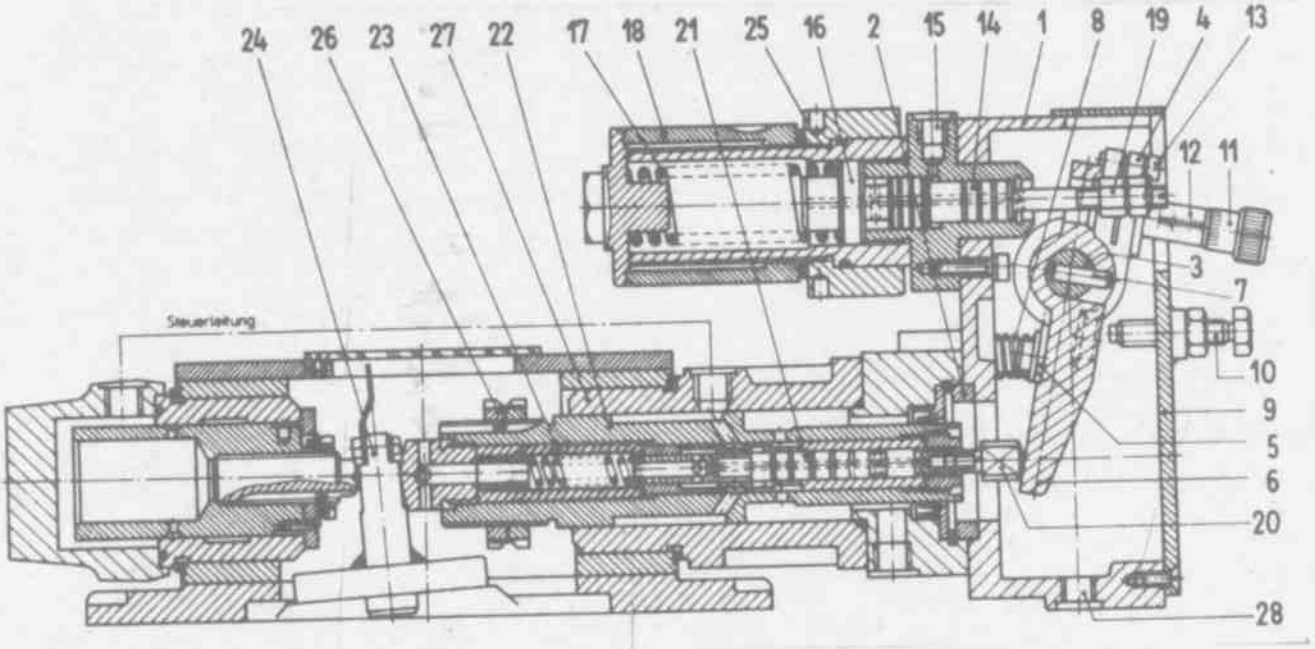


Figure 3 Servo control unit with magnetic unit C 21.11 (with rough indication)

1 Housing
2 Centring ring
3 Control shaft
4 Control lever
5 Stop lever
6 Swing lever
7 Pin
8 Helical compression spring
9 Cover
10 Stop screw
11 Adjusting screw
12 Vernier sleeve
13 Clamping screw
14 Control piston
15 Connection, operating pressure
16 Spring plate
17 Helical compression spring
18 Mounting sleeve
19 Stop
20 Thrust piece
21 Control piston
22 Servo-spool
23 Helical compression spring
24 Tilting piece
25 Packing sleeve
26 Nut
27 Flange bushing
28 Leakage oil bore

3.1. Construction and mode of operation

The housing (1) of the magnetic unit is attached to the face of the servo-spool of the servo control unit C 20 by means of four screws. Its position is determined by the centring ring (2). The control shaft (3) is rotatably supported in grooved ball bearings at the two end faces of the housing. The control lever (4) and the stop lever (5) are both attached to the shaft (3) so as to be free from play. On either side of the swing lever (6) there are adjustable torsion springs arranged on the shaft which press the lever against pin (7). The helical compression spring (8) pushes the stop lever (5) against the stop (10) when the magnets are dead. To increase the adjusting accuracy the adjusting screw (11) and vernier sleeve (12) have been provided with a scale similar to a precision micrometer screw. This permits an excellent reproducibility of the settings. The specific setting is safely clamped by tightening the clamping screw (13).

D.C. push-action control solenoids GS 1 (not shown in Figure 3) are used as actuating elements. Through the inlet (15) operating pressure is admitted to the control piston (14) of the zero-adjusting element which is also attached to the housing. This pressure forces the piston against the helical compression spring (17) via the spring plate (16). The stop (19) adjustably mounted to the threaded portion of the control piston moves the lever (6) against the torsion springs when the piston is pressurized, until minimum volumetric flow is reached at the stop (26).

No corrective motion (setting: basic volumetric flow Q_G)

In case of dead magnets and operating pressure below the starting of the swivelling-in of the zero-adjusting element the spring (8) pushes the stop lever (5) against the stop (10) (basic volumetric flow). The helical compression spring (23) of the sequence control moves the piston (21) via the thrust piece (20) against the lever (6) and, according to the known principle of the sequence control C 20, the basic volumetric flow results.

Corrective motion

Excitation of one of the magnets causes the corresponding pushpin to push against the adjusting screw (11). Consequently, the control lever (4) and thus the control shaft (3) with the pin (7) move through the same angle of rotation. The swing lever (6) is turned by the two torsion springs against the pin (7) and moves the piston

(21) via the thrust piece (20). In this way the sequence control C 20 regulates the volumetric flow. The volumetric flow desired is preset with the adjusting screw (11). The settings can be read off the vernier sleeve (12).

Via the connection (15) the operating pressure is admitted to the annular face of the control piston (14) of the zero-adjusting element. When the operating pressure is below the swivelling-in pressure, the spring (17) pushes the piston (14) with stop (19) via spring plate (16) into the extreme end position and, thus, the corresponding volumetric flow is effective.

When the operating pressure rises beyond the swivelling-in pressure up to the final swivelling-in pressure, the stop (19) is moved by the piston (14) and the spring plate (16) against the helical compression spring (17). This causes the swing lever (6) to move against the torsion springs without any motion of the shaft (3). With the result that piston (21) is relieved of pressure via the thrust piece (20) and the minimum volumetric flow set at stop (26) is initiated.

3.2. Technical data

Position of installation

Servo control units without indication:
Radial piston pump combinations may be used submerged. Leakage oil in the housing of the magnetic unit must be able to escape freely.

Servo control units with rough indication:

The leakage oil must be able to escape freely from these radial piston pump combinations with a steady gradient to the fluid container.

Fluid and viscosity - temperature - ranges

For this the operating instructions "Unit-Constructed Radial Piston Pumps TGL 10866 brochure 1 or brochure 2" are binding.

Adjustment beyond zero	not possible
Regulating time	from minimum to maximum adjustment approx. 200 ms. The regulating time depends on the nominal size of the radial piston pump and on the rate of the volumetric control flow.

Control pressure and stroke volume — as the basic control unit C 20 is used, the data given for the servo control unit C 20 apply here, too.

Control solenoids used

D.c. push-type control solenoids GS 1 Sb 220 V a.c. GR
Pushpin stroke: 8 mm Rated voltage: 220 V alternating voltage or
d.c. push-type control solenoid GS 1 Sb 24 V d.c.
Pushpin stroke: 8 mm Rated voltage: 24 V direct voltage

Start of swivelling-in of the zero-adjusting element

The operating pressure at which the loaded zero-adjusting element (control piston 14, Fig. 5) reduces the volumetric flow of the radial piston pump towards minimum volumetric flow, amounts to 13 MPa (130 kgf/cm^2).

By changing the preliminary tension of the spring (rotating the mounting sleeve (18)) the start of swivelling-in may be varied by ± 2 MPa (20 kgf/cm^2). As to other swivelling-in data, please, contact the manufacturer.

3.3. Trouble-shooting and fault clearance

Please observe the instructions of para 2.3.

Trouble	Possible cause	Remedy
Fluid splashes out of the housing (1).	Piston (14) has too much play.	Change the zero-adjusting element.
Adjusting screw (11) is difficult to turn.	Adjusting screw (11) with vernier sleeve (12) have seized in the thread.	Change items 11 and 12.
Zero-adjusting element does not function.	Helical compression spring (17) broken; stop nut (19) slackened; thrust piece (20) slackened	Replace helical compression spring Tighten firmly; Tighten firmly.
Servo control unit does not function.	Electromagnet dead.	Clear fault; replace magnet.
Fault location Screw off cover (21), press your hand uniformly on adjusting screw (11),	Pushpin of the magnetic unit moves heavily Magnet pressed too hard.	Restore ease of movement. Reduce preliminary tension of both torsion springs.

Trouble	Possible cause	Remedy
observe whether tilting piece tilts uniformly.	Piston (14) seized up in bearing bush.	Lap piston (14)
If so, look for the trouble in the magnetic unit;	Control shaft (3) moves heavily	Restore ease of movement.
If not, look for the trouble in the servo control unit C 20.	Despite of excitation of magnets no swivelling out of broken or missing pins (7).	Replace pins (7).

3.4. Adjustment of the volumetric flows

General

For the adjustment of the volumetric flows at the servo control unit C 20 the description of para 1.1.1. is binding. In the following, only instructions as to the adjustment by means of the magnetic unit will be given.

Adjustment of the maximum volumetric flow

It must be set to the rated volumetric flow plus 5 dm^3 for 12.5 MPa (125 kgf/cm^2) in the known manner at the servo-spool or the mating piston. Then secure with lock plate.

Movement of the tilting block:
Switch on the magnet. Screw in the associated adjusting screw until the stop disk bears against the bushing. Now check whether the adjusting screw can be screwed in further. If so, insert packing rings 12x15.5 TGL 0-7603-Cu in the vernier sleeve. The adjusting screw must not allow to be turned by more than one turn.
This adjustment must be carried out on all magnets.

Adjustment of the minimum volumetric flow (zero stroke)

Set it to 5 % of the rated volumetric flow for 16 MPa in the usual manner with the nut (26). Then secure it with the lock plate.

Adjustment of the minimum volumetric flow (low pressure, 5 MPa)

Set it to 10 % of the rated volumetric flow for 5 MPa with the stop (10) and then lock it.

Adjustment of the zero-adjusting element

Switch on the magnet, screw in the adjusting screw (11) until the maximum stop has been reached.
Set pressure to 6 MPa.

Turn stop nut (19) until it bears slightly against the swing lever (5) of the magnetic unit. Lock stop nut with the hexagon castel nut and secure it with a split pin. Turn mounting sleeve (18) in such a way that the piston (14) starts to lift the swing lever via the stop nut at a pressure of 13 $\pm$ 0.5 MPa (start of swivelling-in).

Increase pressure to 16 $\pm$ 0.5 MPa. Now the minimum stop must be reached.

Lock mounting sleeve against the packing sleeve. Switch on the magnet and tilt the tilting box so as to obtain maximum volumetric flow. Increase slowly. At the moment of swivelling-in by the zero-adjusting element the pressure acting on the magnet must not be too high. In case of excessive pressure the preliminary tension of both torsion springs must be reduced.

4. Servo control units with magnetic unit C 23

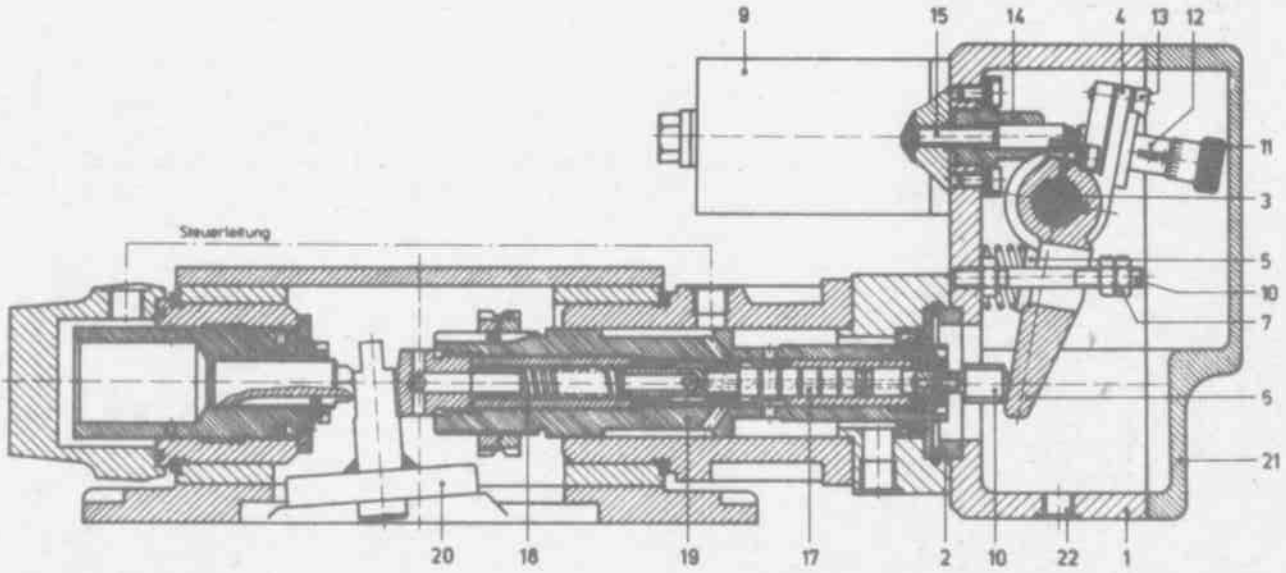


Figure 4 Servo control unit with magnetic unit C 23.11

1 Housing
2 Centring ring
3 Control shaft
4 Control lever
5 Stop lever
6 Actuating lever
7 Stop nut
8 Helical compression spring
9 Push-type control magnet
10 Pin
11 Adjusting screw
12 Vernier sleeve
13 Clamping screw
14 Bearing bush
15 Pushpin
16 Thrust piece
17 Control piston
18 Helical compression spring
19 Servo-spool
20 Tilting piece
21 Cover
22 Leakage oil connection

This control unit consists of

C 23: Servo control unit with servo-spool and magnetic unit
5 magnets without zero-adjusting element

Following the actuation of a push-type magnet the stroke of the magnetic core is transferred via a pushpin (15) to the adjusting screw (11), thence to control lever (4), shaft (3), lever (6) and the thrust piece (16) to the control piston (17) of the servo control unit C 20.

Construction and mode of operation are described in para 2.1. The piston displacement required can be preset by means of the adjusting screw (11).

4.1. Construction and mode of operation

The housing (1) of the magnetic unit is attached to the face of the servo-spool of the servo control unit C 20 by means of four screws. Its position is determined by the centring ring (2). The control shaft (3) is rotatably supported in grooved ball bearings in both end faces of the housing. The control lever (4), stop lever (5) and swing lever (6) are attached to the shaft (3) so as to be free from play. The helical compression spring (8) presses the stop lever (5) against the stop nuts (7) on the pin (10) when the magnets are dead. To increase the adjusting accuracy the adjusting screw (11) and the vernier sleeve (12) have been provided with a scale similar to a precision micrometer screw. This permits an excellent reproducibility of the settings. The specific adjustment is safely clamped by tightening the clamping screw (13). D.c. push-type control magnets GS 1 are used as actuating elements.

No corrective displacement (Setting: basic volumetric flow Q_G)

With the magnets dead, the spring (8) presses the levers on the shaft (3) against the stop nuts (5) (basic volumetric flow).

The helical compression spring (18) of the sequence control moves the piston (17) via the thrust piece (16) against the swing lever (6) and, according to the known principle of the sequence control C 20, the basic volumetric flow results.

Corrective displacement

Excitation of one of the magnets causes the corresponding pushpin to push against the adjusting screw (11). As a result the control lever (4) and the control shaft (3) with lever (6) swing out. The lever (6) moves the piston (21) via the thrust piece (16) and the sequence control C 20 initiates the volumetric flow desired. The specifically desired volumetric flow is preset by means of the

adjusting screw (11). The settings can be read off the vernier sleeve (12).

4.2. Technical data — see para 3.2.

4.3. Trouble-shooting and fault clearance — see para 3.3.

4.4. Adjustment of the volumetric flows — see para 3.4.

5. Spare parts

Wearing parts which function only in connection with other parts and which have low tolerances will be supplied only as spare sub-assemblies. In the period of guarantee interferences with the control unit are permissible only with the written consent of our after-sales service.

Claims, if any, are to be raised according to the contractual law on complaints. Commercially available standard parts should be bought from the relevant trade.

Spare parts orders should be directed to our sales department.

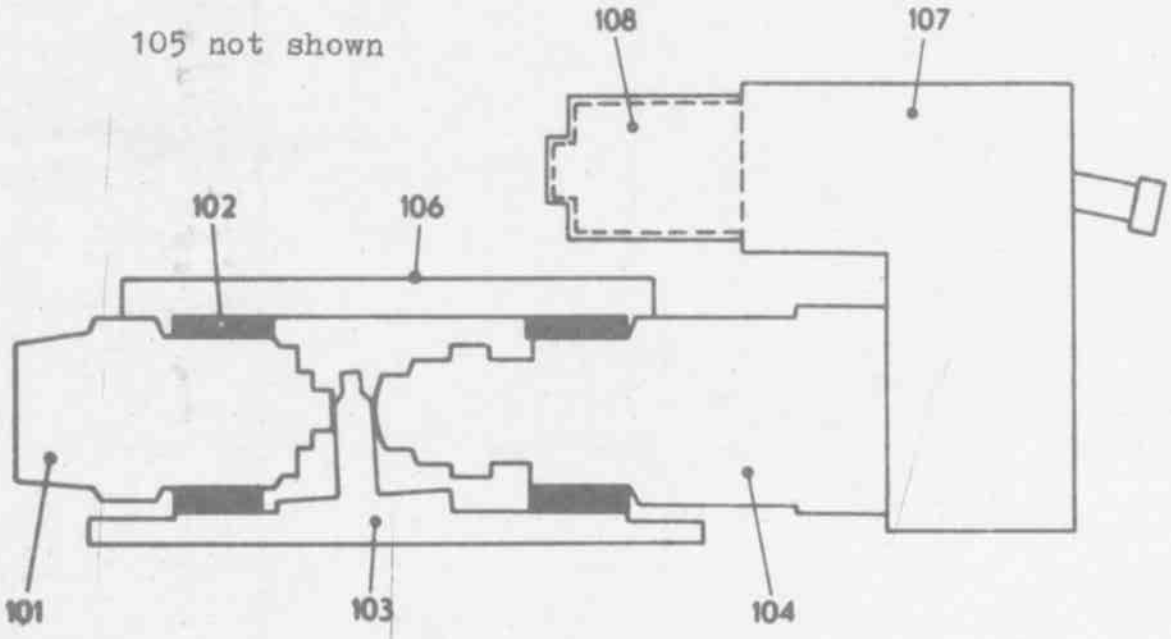
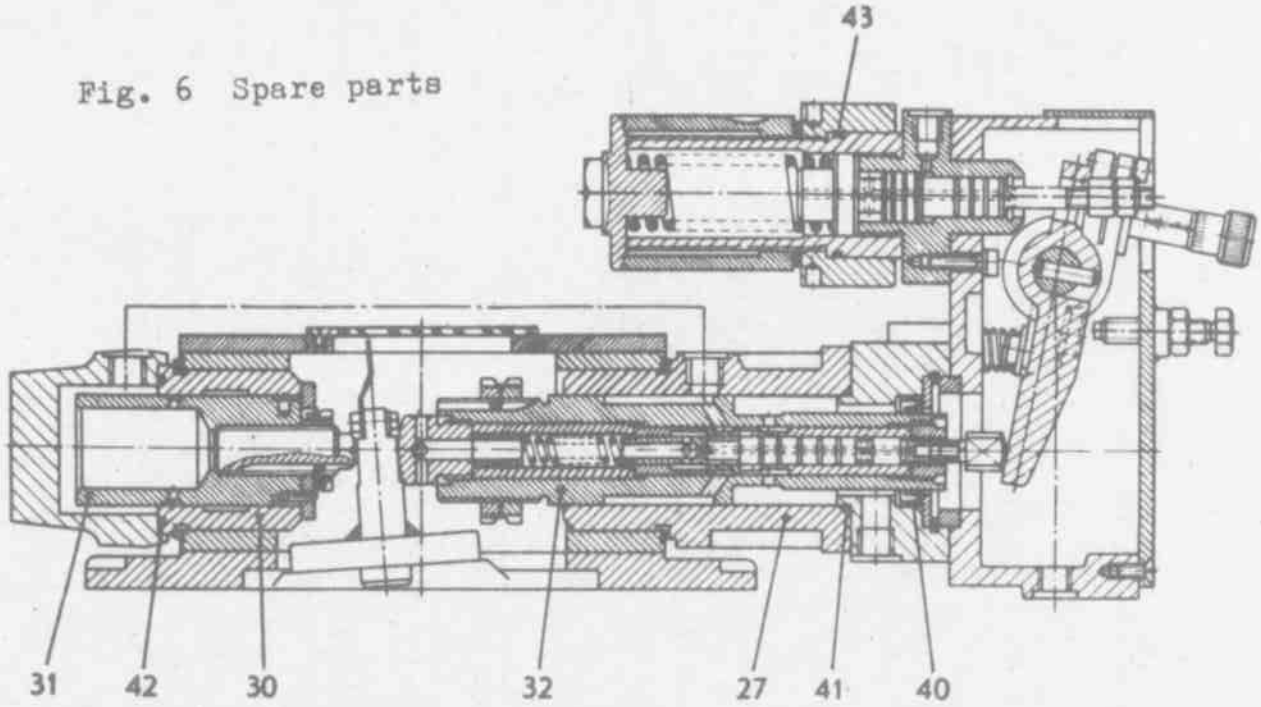


Fig. 5 Spare sub-assemblies

Pos. Nr. [1]	Benennung [2]	Bestellbezeichnung [3]	Benötigte Stückzahl für Nenngröße [5]												Stelleinheit [6]				See-wasser-beständige Ausführung [9]	Art [8]
			125/16	32/16	5/32	125/32	80/16	125/16	32/32	80/32	5-5/16	32-32/16	125-125/16	200-160/16	C 20	C 21	C 22	C 23		
101	Stellkolben komplett Hydr. Kolben [9]	31701 : 2093269	1	1	1	1					1	1			•	•	•	•	•	E
		31703 : 2093375					1	1	1	1			1	1	•				•	
		31703 : 2354388											1	1		•	•	•		
		31704 : 2098129					1	1	1	1						•	•	•		
102	Stellgehäuse komplett [10] ohne Anzeige [11]	31601 : 2123298	1	1	1	1									•	•	•	•		E
		31602 : 2123323	1	1	1	1									•				•	
		31603 : 2123345					1	1	1	1					•	•	•	•		
		31604 : 2123376					1	1	1	1					•				•	
		31668 : 2209713											1	1	•	•	•	•		
		31671 : 2309536											1	1	•				•	
	mit Grobanzeige [12] (G)	31605 : 2101602	1	1	1	1									•	•	•	•		E
		31606 : 2128425	1	1	1	1									•				•	
		31607 : 2101555					1	1	1	1					•	•	•	•		
		31608 : 2128436					1	1	1	1					•				•	
		31651 : 2123538									1	1			•	•	•	•		
		31652 : 2123571									1	1			•				•	
		31659 : 2265276											1	1	•	•	•	•		
		31670 : 2265267											1	1	•				•	
	für Fernanzeige [13] (F)	31609 : 2123447	1	1	1	1									•	•	•	•		E
		31610 : 2123491	1	1	1	1									•				•	
		31611 : 2123505					1	1	1	1					•	•	•	•		
		31612 : 2123527					1	1	1	1					•				•	
		31655 : 2123651									1	1			•	•	•	•		
		31656 : 2123682									1	1			•				•	
		31657 : 2123684											1	1	•	•	•	•		
		31658 : 2123709											1	1	•				•	
103	Anbauteile komplett [14]	31641 : 2102423	1		1										•	•	•	•	•	E
		31642 : 2101726		1		1									•	•	•	•	•	
		31643 : 2101737					1		1						•	•	•	•	•	
		31644 : 2103840						1		1					•	•	•	•	•	
		31681 : 2166681									1	1			•	•	•	•	•	
		31683 : 2809734											1	1	•	•	•	•	•	
104	Stellkolben komplett Folgekolben [15]	31738 : 2101770	1	1	1	1					1	1			•	•	•	•	•	E
		31739 : 2101830					1	1	1	1			1	1	•	•	•	•	•	
		31751 : 2168507											1	1		•	•	•		
105	Stellkolben komplett (Umlenkhebel) [16]	31740 : 2098380									1	1			•	•	•	•	•	E
		31741 : 2123265											1	1	•	•	•	•	•	
106	Steuerleitung komplett [17]	31835 : 2159715	1	1	1	1									•	•	•	•	•	E
		31836 : 2159726					1	1	1	1					•	•	•	•	•	
		31843 : 2123287									1	1	1	1	•	•	•	•	•	
107	Magneteinheit [18]	31912 : 2094161	1	1			1	1			1	1	1	1		•				E
		31913 : 2101283	1	1			1	1			1	1	1	1			•			
		31914 : 2101362	1	1	1	1	1	1	1	1	1	1	1	1				•		
108	Druckregeleinheit [19]	31912 : 2103299	1	1			1	1			1	1	1	1		•	•			E
27	Flanschbuchse [20]	31738 : 2101906	1	1	1	1					1	1			•	•	•	•		E
		31739 : 2101996					1	1	1	1			1	1	•	•	•	•		
30	Buchse [21]	31701 : 2093316	1	1	1	1					1	1			•	•	•	•		E
		31703 : 2093395					1	1	1	1			1	1	•	•	•	•		
		31704 : 2098151					1	1	1	1						•	•	•		
31	Kolben [22]	31701 : 2093307	1	1	1	1					1	1			•	•	•	•		E
		31703 : 2093384					1	1	1	1			1	1	•					
		31704 : 2098140					1	1	1	1						•	•	•		
		31718 : 2093602											1	1		•	•	•		
32	Kolben vollst. [23]	31738 : 2101781	1	1	1	1					1	1			•	•	•	•		E
		31739 : 2101941					1	1	1	1			1	1	•		•	•		
		31751 : 2168518											1	1		•	•	•		
40	Innenlippenring [24]	32 TGL 6357	1	1	1	1					1	1	1	1	•	•	•	•		E ▬
		45 TGL 6357					1	1	1	1			1	1	•	•	•	•		
41	Rundring [25]	45 x 3 TGL 6365	1	1	1	1					1	1			•	•	•	•		E ▬
		63 x 3 TGL 6365					1	1	1	1			1	1	•	•	•	•		
42	Rundring	56 x 2 TGL 6365	1	1	1	1					1	1			•	•	•	•		E ▬
		80 x 3 TGL 6365					1	1	1	1			1	1	•	•	•	•		
43	Rundring	50 x 3 TGL 6365	1	1			1	1			1	1	1	1		•	•			E ▬

Fig. 6 Spare parts



1 Item No.
2 Designation
3 Ref. No.
4 Quantity required for
5 nominal size
6 control unit
7 Seaworthy version
8 Type
9 Control piston, complete
hydraulic piston
10 Housing, complete
11 without indication
12 with rough indication (G)
13 for remote indication (F)
14 Attachments, complete
15 Control piston, complete
servo-spool
16 Control piston, complete
(reversing lever)
17 Control duct, complete
18 Magnetic unit
19 Pressure control device
20 Flange bushing
21 Bushing
22 Piston
23 Piston, complete
24 Flange seal
25 O-ring

Title of German edition
Betriebsanleitung mit Ersatzteilliste
Servo-Stelleinheiten TGL 10887/04 und TGL 10888/04
für Baukasten Radialkolbenpumpen

Ausgabe in englischer Sprache

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