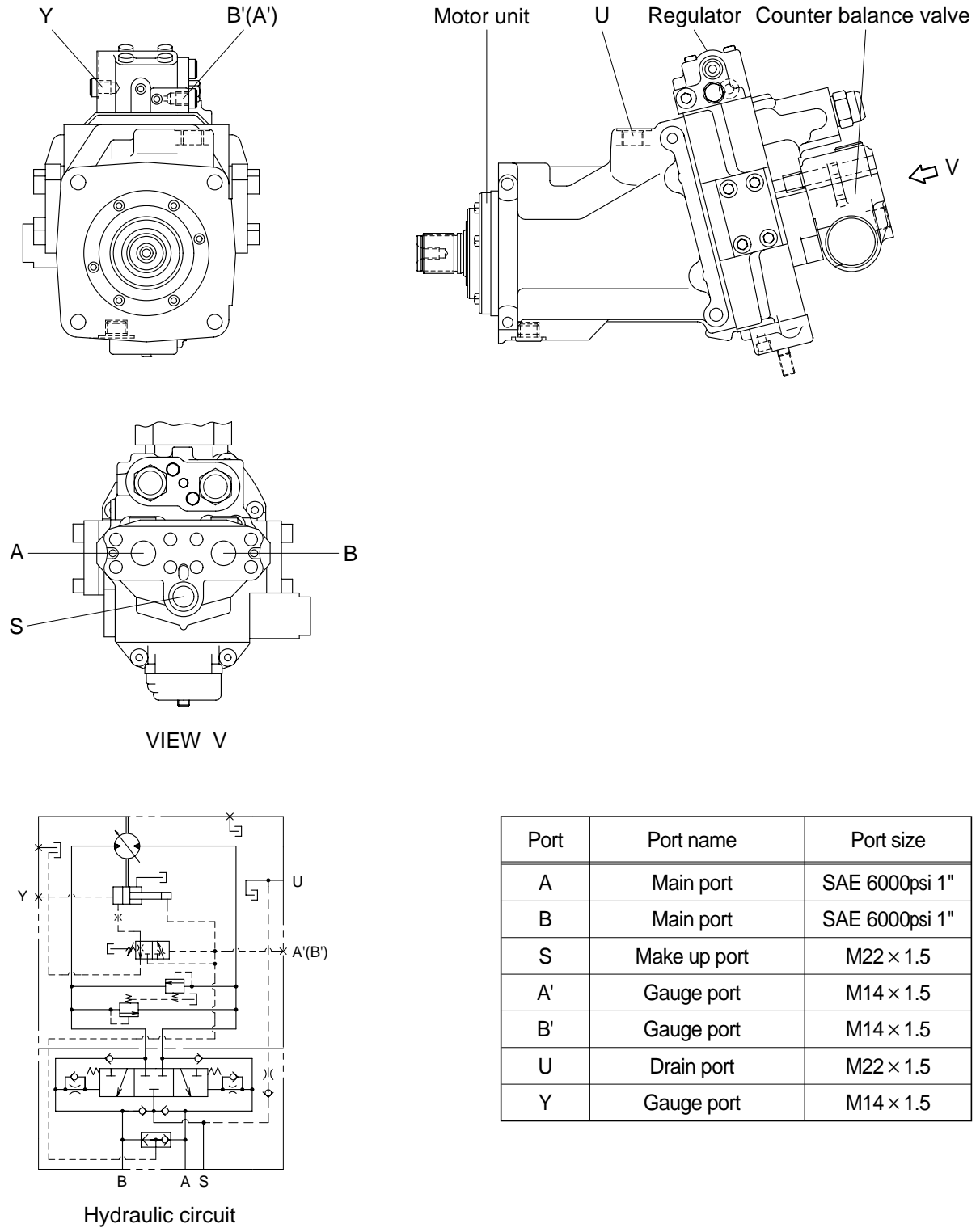


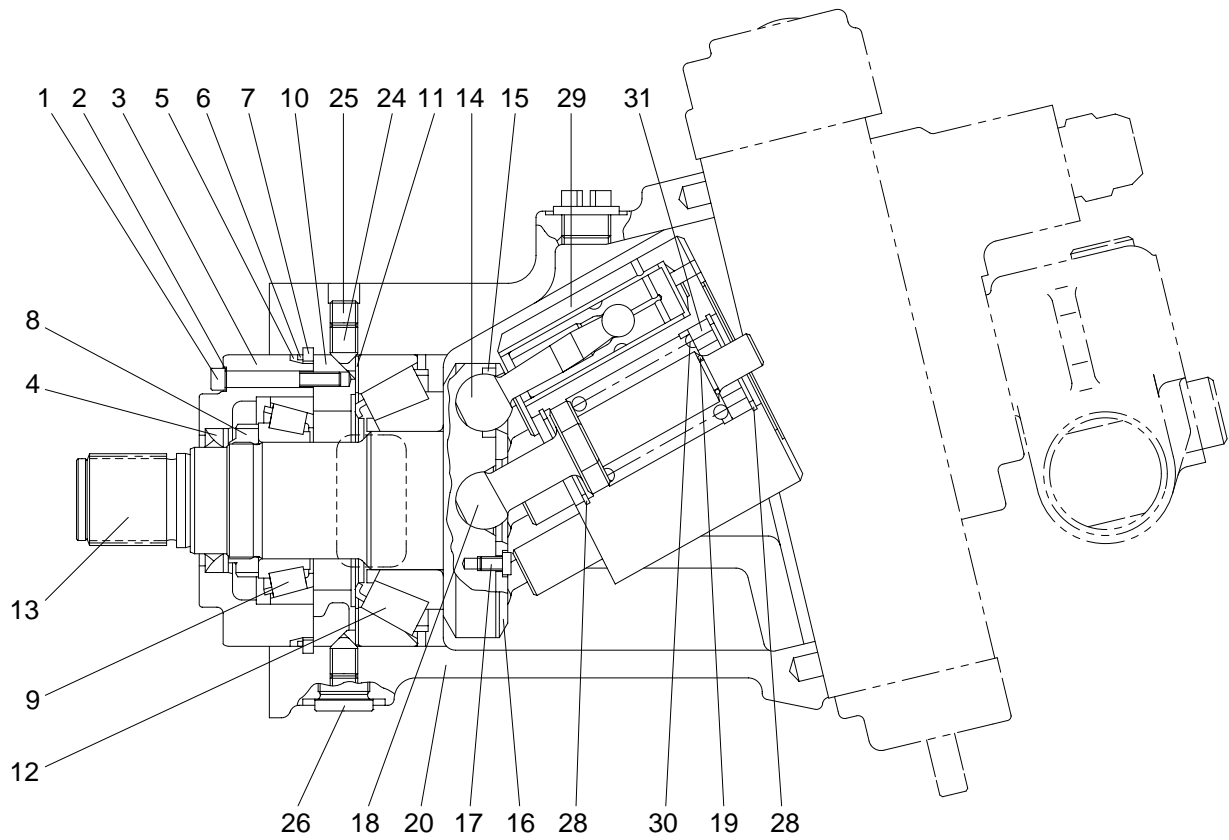
## GROUP 4 TRAVEL MOTOR

### 1. CONSTRUCTION

Travel motor consists motor unit, regulator and counter balance valve.

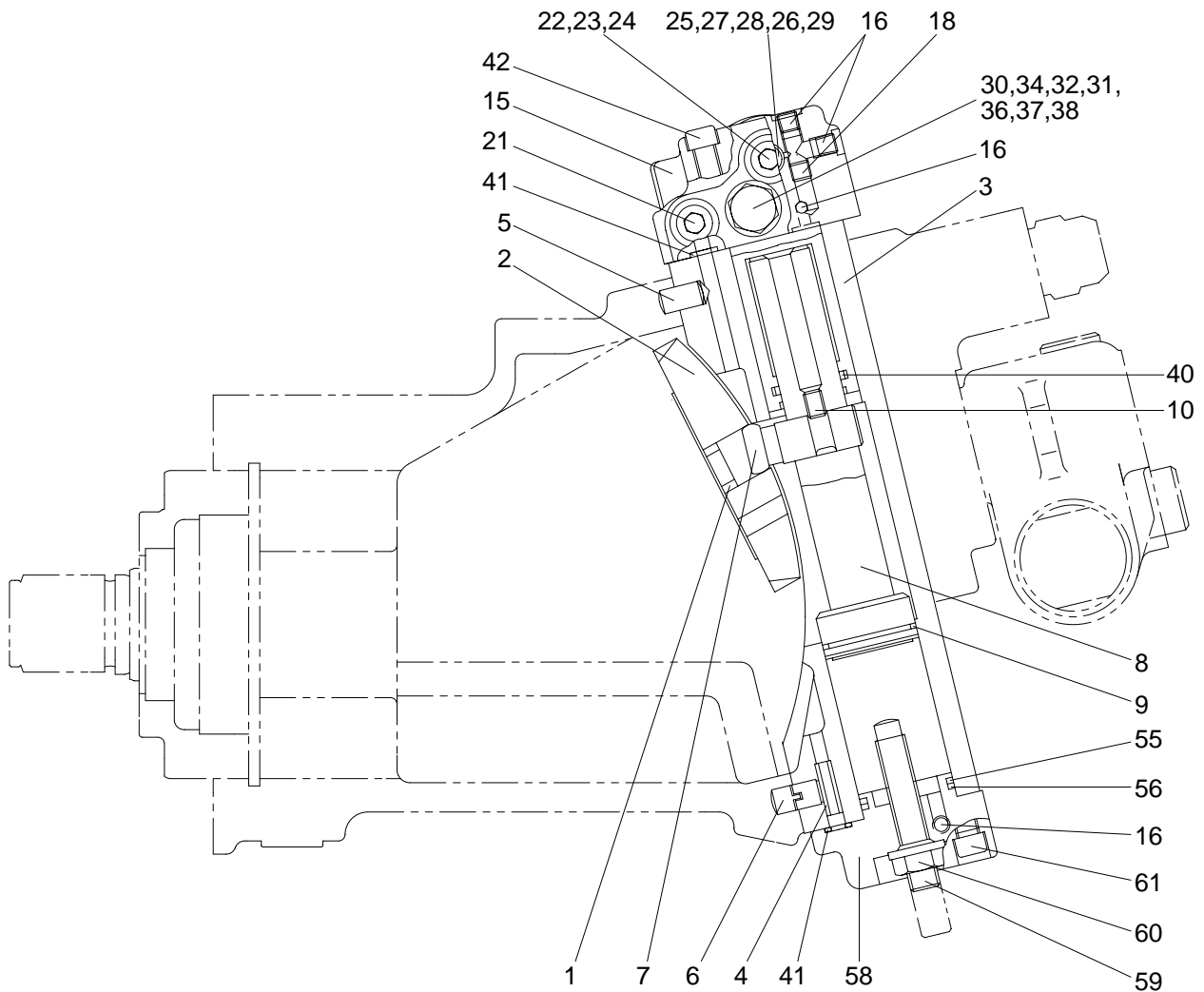


## 1) MOTOR UNIT



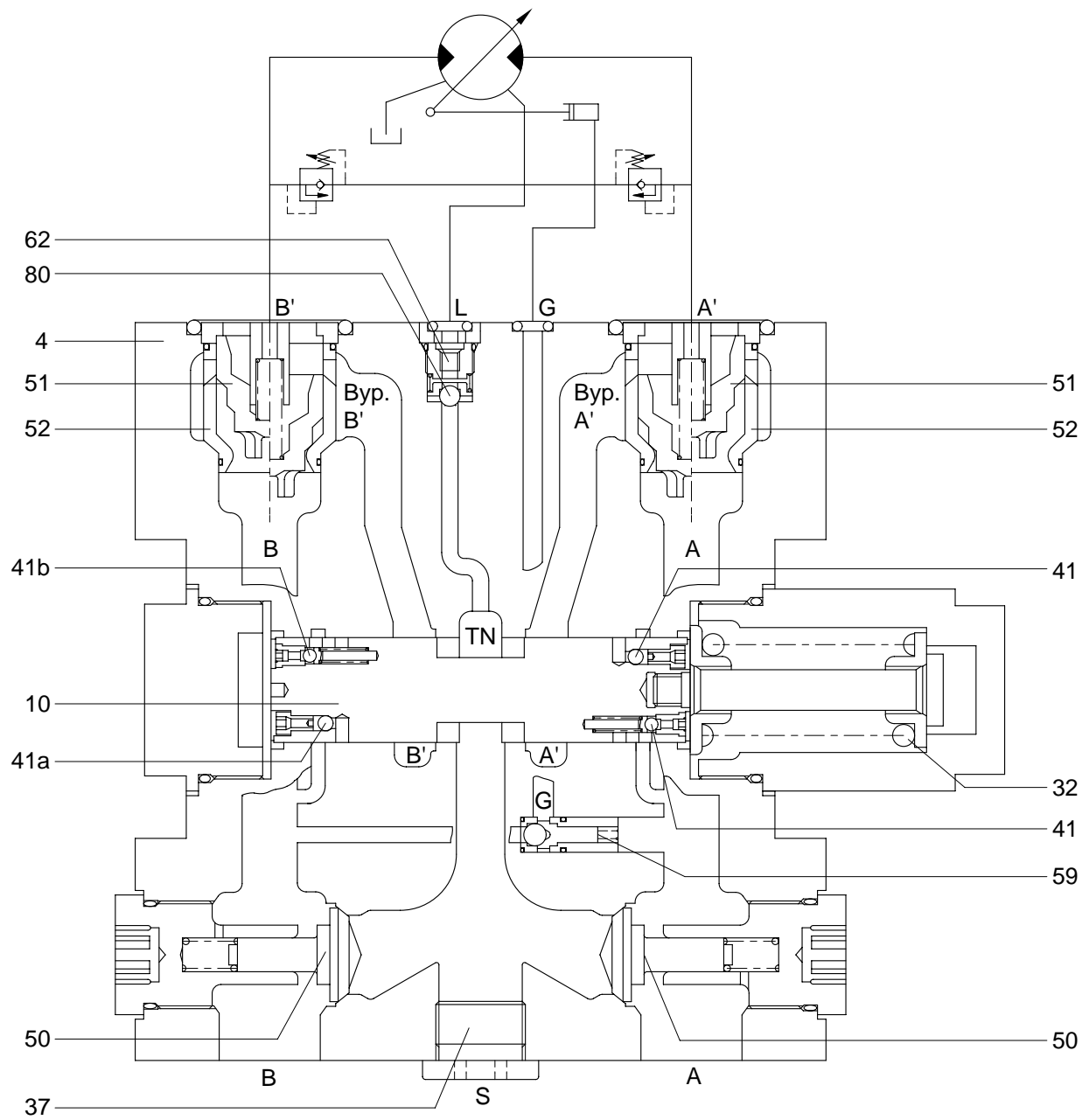
1	Socket head screw	10	Ring	19	Shim
2	Seal ring	11	Spacer	20	Housing
3	Flange	12	Taper roller bearing	24	Threaded pin
4	Seal ring	13	Drive shaft	25	Threaded pin
5	O-ring	14	Piston	26	Screw plug
6	Shim	15	Retainer ring	28	Retainer ring
7	Retainer ring	16	Thrust washer	29	Cylinder block
8	Nut	17	Socket head screw	30	Pressure spring
9	Taper roller bearing	18	Center pivot	31	Ring

## 2) REGULATOR



1	Bushing	21	Screw plug	36	O-ring
2	Port plate	22	Pilot	37	Support ring
3	Housing	23	Valve piston	38	Screw plug
4	Pipe	24	Screw plug	40	Seal ring
5	Cylinder pin	25	Shim	41	O-ring
6	Cylinder pin	26	Pressure spring	42	Socket head screw
7	Finger	27	Spring plate	55	O-ring
8	Piston	28	Shim	56	Support ring
9	Ring	29	Screw plug	58	Cover
10	Threaded pin	30	O-ring	59	Threaded pin
15	Housing	31	Valve seat	60	Nut
16	Screw plug	32	Valve sleeve	61	Socket head screw
18	Nozzle	34	Valve seat		

### 3) COUNTER BALANCE VALVE

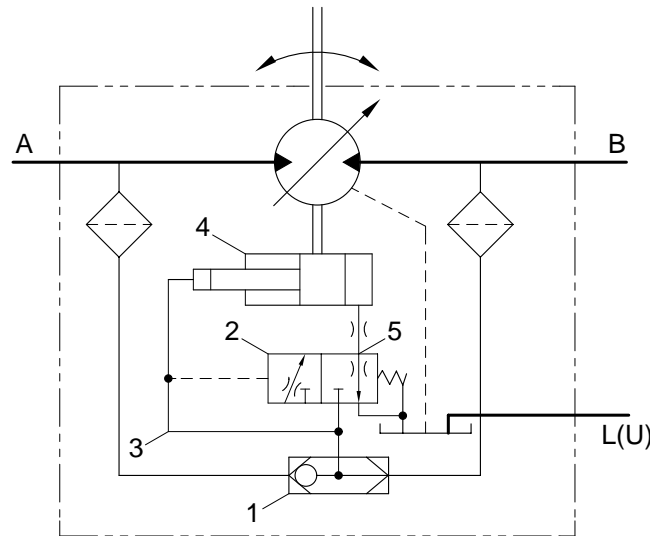


## 2. FUNCTION

### 1) HYDRAULIC MOTOR

#### (1) Regulating motor with high pressure sensing control

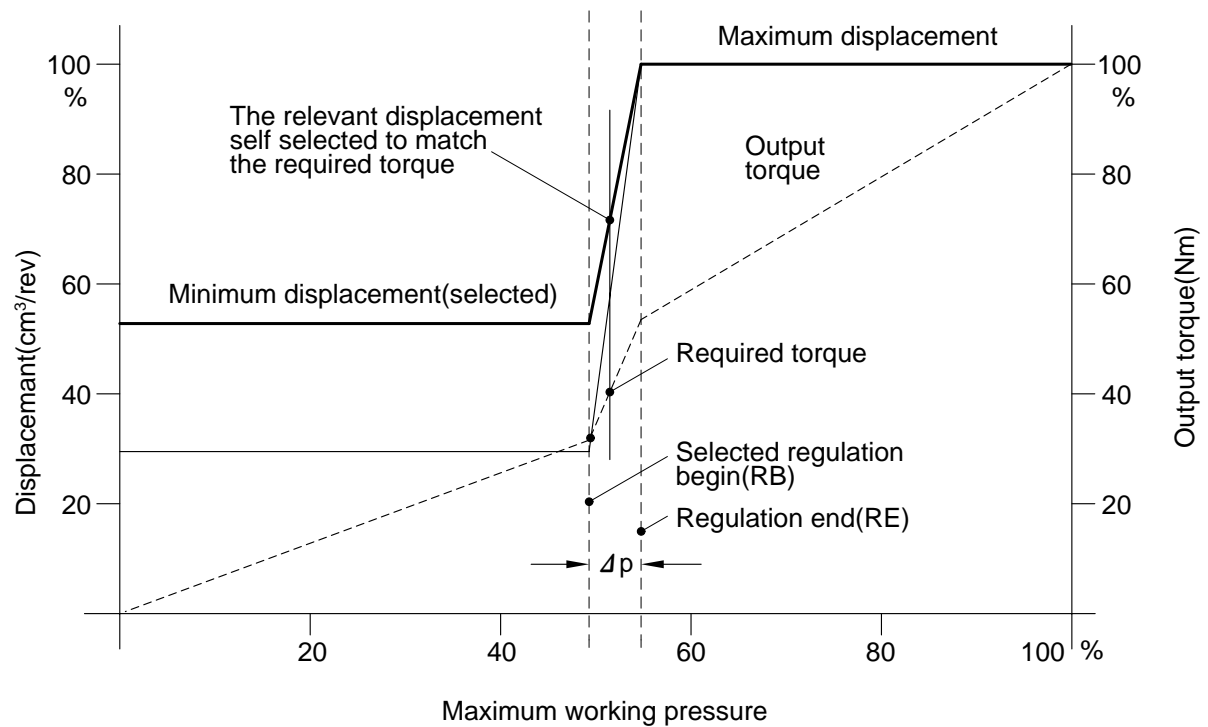
In this regulating system the motor is normally fixed in its minimum displacement position. Upon reaching a pre-selected pressure the motor switches steplessly towards its maximum displacement.



The shuttle valve(1) will always connect the pressure control device(2) with that high pressure port A or B carrying the higher pressure level(the shuttle valve feed line is equipped with a filter, in order to protect the entire regulating device against contamination). Therefore, there is always high pressure in front of the pressure regulator(2) and via channel(3) also on the small face of the control piston(4). The small area of the control piston being pressurized and the large area being unloaded via the pressure regulator the motor is always kept in its minimum displacement position.

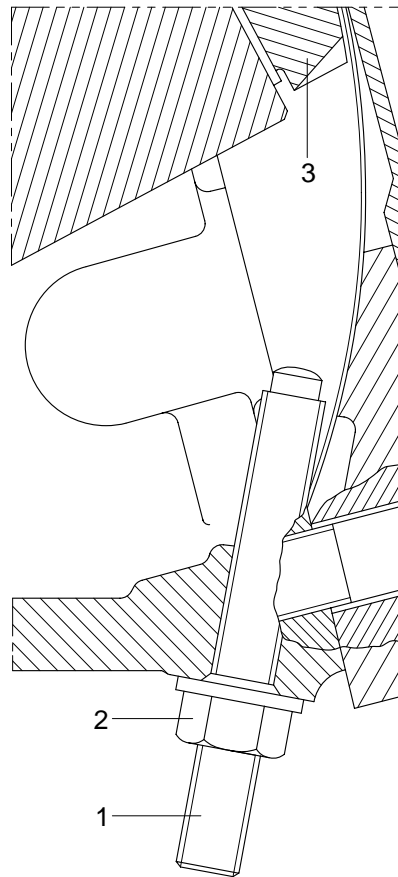
The pressure setting of the regulator defines the regulation begin, i.e. that pressure at which the motor will start to shift towards maximum displacement. As soon as the pressure controller(2) moves against the spring force, high pressure will be released upon the large area of the control piston through channel(5). Due to the pressure forces resulting from the area differential the motor is moved. The adaptation to the required torque is effected steplessly and the motor maintains positively any position between  $V_{\min}$  and  $V_{\max}$  depending on the high pressure.

## (2) Control characteristic of the regulating motor



The motor displacement is varied from  $V_{\min}$  to  $V_{\max}$  within the pressure range of  $P = P_{\text{RE}} - P_{\text{RB}}$  which is normally about 10 to 15 bar. despite this relatively narrow band the resolution is very good, because the torque is increased within this by about 2.8 times (depending on the minimum displacement setting).

### (3) Setting of minimum displacement



#### **Limitation by threaded stud**

There is a threaded stud(1) located at the  $V_{\min}$  side of the motor housing secured by the self sealing nut(2).

In the  $V_{\min}$  position the valve plate(3) of the complete rotating assembly is stopped by this stud.

For changing the minimum displacement the stud(1) has to be turned after loosening nut(2).

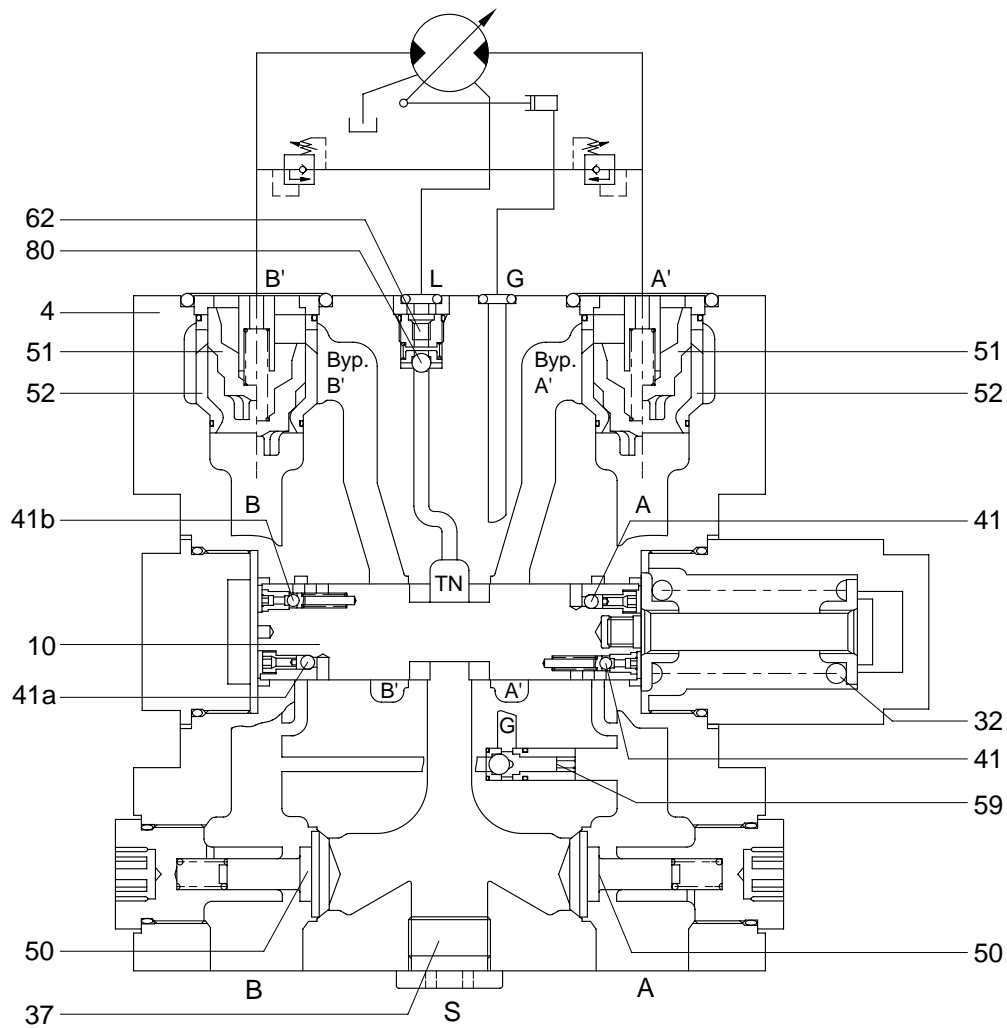
Screwing in =  $V_{\min}$  becomes larger

Screwing out =  $V_{\min}$  becomes smaller

Due to the length of the threaded stud the range of adjustment of the minimum displacement is limited(minimum swash angle 8 to 16°).

Bigger minimum swash angles hence larger minimum displacements are possible upon request to the factory.

## 2) COUNTER BALNCE VALVE



### (1) Double acting counter-balance valve

The double acting counter balance valve consists of a cast housing(4), control piston(10) with its check valve(41a) and the low pressure valves(41b) as well as its regulating spring(32). It also comprises the 3/2 logic devices(51) in their brushes(52). In addition there are the check valves (50) to separate working line A/B from TN channel, shuttle valve(59) to report load pressure at port G, the pressure make-up valve(80) with downline orifice(62) to limit flushing oil at port L.

The double acting counter balance valve is mounted onto the hydraulic motor.



## **(2) Traveling under load**

The counter balance valve being designed in a symmetric way only one direction of travel is described here.

The oil flow coming from the main control valve(MCV) and arriving at B moves to port B' via cone(51). Cone(51) is limited by a back stop and separates connection B/B' from bypass B'. Via check valve(41a) and make up valve(41b) the working pressure arrives at the front end of the control piston(10) and shifts the latter to the right towards spring(32). Bypass A' to channel TN is thus opened(beginning of opening at approx. 8bar-full diameter at approx. 45bar).

Simultaneously travel pressure is built up via shuttle valve(59) at port G to control the regulating motor.

Draining oil in this case moves to channel TN via port bypass A' and can flow direct to opened working port A of MCV via check valve(50) on the right.

The oil motor is flushed via make up valve(80) and the subsequent orifice(62) if pressure at port TN exceeds 5bar.

## **(3) Functioning of brake**

If the oil entering at B is throttled or if the machine is stopped by a slope, pressure at B collapses and the brake valve closes connection bypass A' to TN. Oil still flowing at first during opening(of valve) is fed via check valve(50) at port B if pressure at A is higher than that at port B. As the distance from channel TN via the check valve to port B is very short and as there may be negative pressure at B When coming to a halt or when braking oil moves from TN to B. The distance from TN via check valve(50) to A and to rotary oil distributor to the upper carriage being longer a considerably higher dynamic pressure is built up. The check valve(50) to A remains closed.

## **(4) Reversing while slowing down the machine**

The control piston is fully opened at full speed and at a travel pressure exceeding 40bar and therefore has to move from open to closed position when travel speed is reduced. The closing speed depends on the machine concerned and is adjusted by means of a cushioning.

Reversing while the piston moves towards closing position leads to the situation that the main directional valve shifts the oil flow from B to port A. Pressure is built-up at port A, cone(51) is moved towards pressure at port A' and closes connection A' to channel bypass A' when pressure at port A' is exceeded. This means that the driver of the machine can initiate reversing which overweighs when pressure at port A exceeds the oil pressure at A' still draining to bypass A'.

This set-up enables the construction of very smooth brake valves(long closing time for braking piston) and at the same time guarantees piloted reversing of the machine. In this case control piston(10) has locked mid- position to TN. Drifting rates of the machine correspond to only minor leak oil here.

Via port(37) oil can be added to avoid cavitation if the solution described above proves to be insufficient.