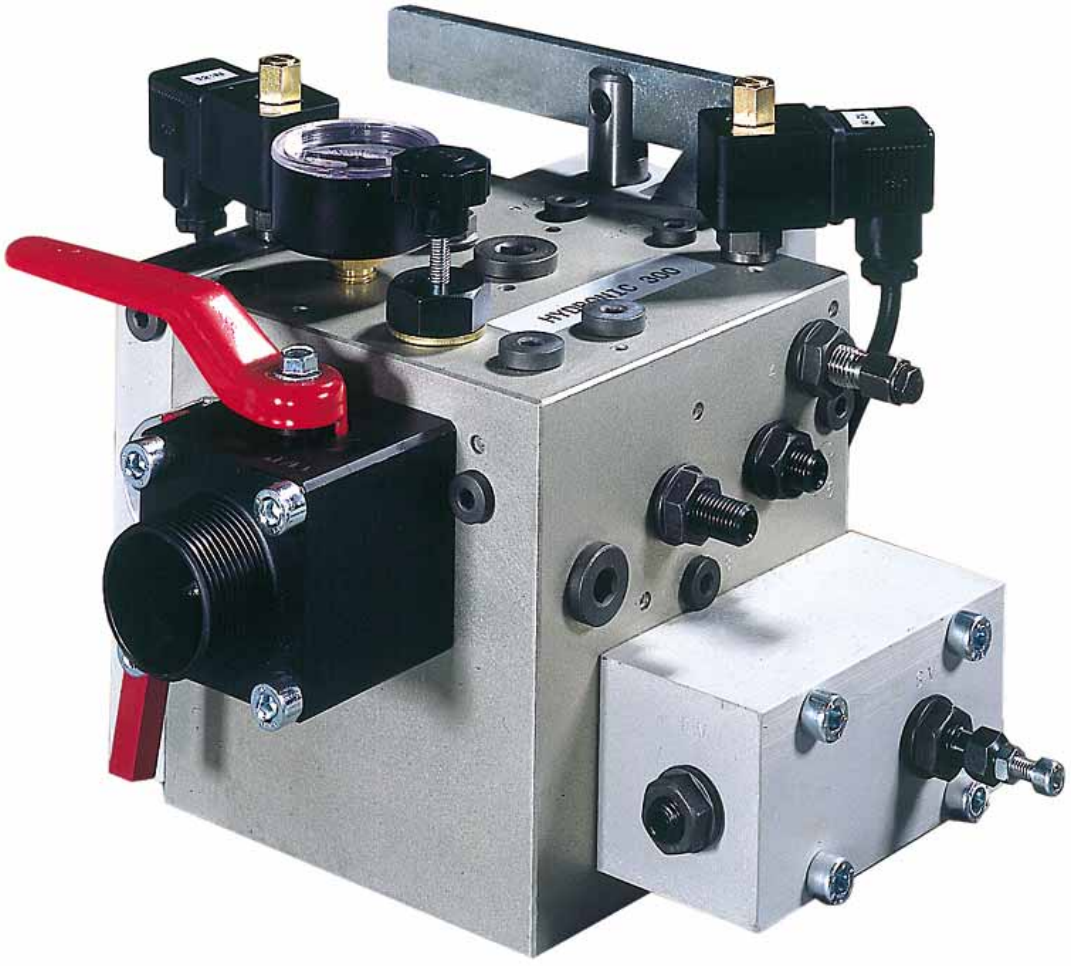
HYDRONIC LIFT

# Short Guide for H300



# Index

# 1 FUNCTION DESCRIPTION

## 1.1 UP TRAVEL

Start

Pump motor and pilot valve 12:H are activated.
Oil flow from the pump pushes the start valve **SV** open and goes back to the tank. The motor reaches the nominal speed "compressing" the oil to by pass pressure (**SV** is wide open).
After a short time delay, which depends on **J12**, **HDV** closes.
This delay enables the star/delta motor starting and eliminates the need of a specific pilot valve. Pilot valve **12:H** is activated and the main speed valve **MSV** starts to open.
The start valve **SV** closes with constant speed determinated by the spring and the jet **J1** increasing the pressure inside the chamber in front of **CV1**.

Acceleration

When it is higher than the load pressure, the pressure pushes **CV1** and the compensator valve **PCV**, to the open position. The elevator begins to accelerate due to oil flow through the check valve, the main speed valve and **PCV** to the cylinder line.

Nominal speed

When **SV** is completely closed, the whole flow from the pump goes to the cylinder and the elevator drives up at the nominal speed.
The still activated **12:H** pilot valve keeps **MSV** wide open.

Deceleration

When the elevator arrives at the deceleration vane, the pilot valve **12:H** drops, **SV** gradually closes, thanks to **J1**, **DV1, J9**, **J4** while deceleration is actuated by the gradual closing of **MSV** valve.

Levelling speed

After **MSV** has closed completely, a little portion of the flow reaches the jack through levelling valve LSV while the bigger part will come back to the tank through **SV**, and the car will climb at levelling speed.

Stop

When the elevator car arrives at the floor level vane, the motor is switched off.
Inertia of the motor and the flywheel makes the elevator stop smoothly.
While the pump retards, **SV**, **CV1** and **PCV** close to the position they had before start up.
the route through **CV3** and **J10** is provided for speeding up the closing of **PCV** after the elevator has stopped.

## 1.2 DOWN TRAVEL

Start

The pilot valves, **12:H** e 1**2:N** are activated, this causes the opening of the down travel valve **DTV**, **MSV** and **PCV**.

Acceleration

**MSV**, slowed by jets **J4** and **J5**, opens gradually until it's wide open and the car accelerates until it reaches the max speed.

Nominal speed

MSV is wide open, **PCV** regulates the oil flow and therefore the car speed, thanks to the pressure balance created by **J6**, J7, DV2 (last one is adjustable)

Deceleration

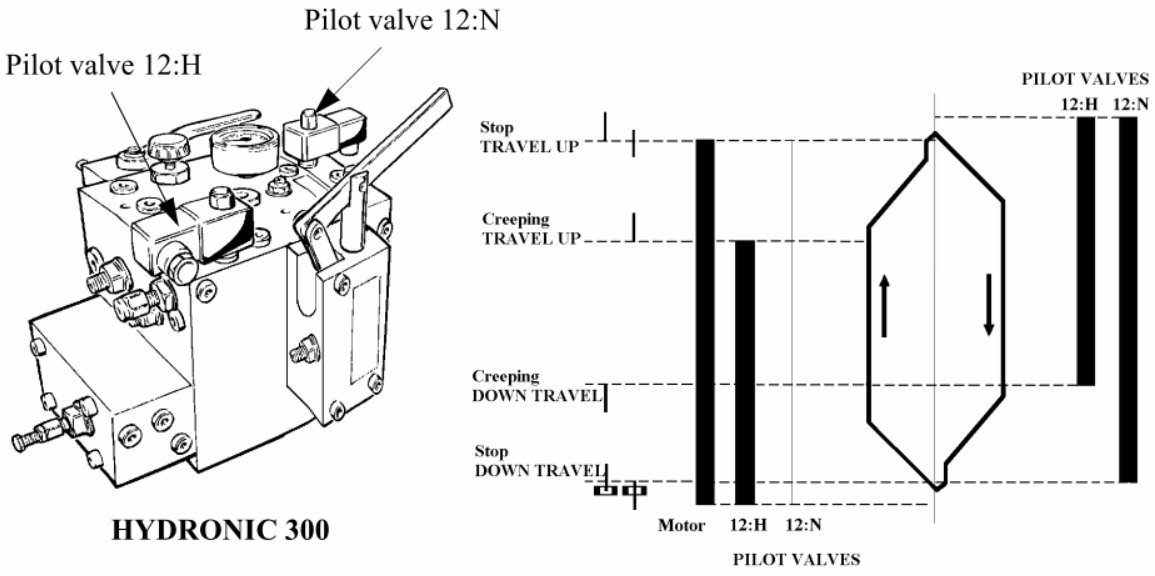
When the car reaches the slowing vane, **12:H** is deactivated, **MSV** start closing, slowed by **J4**, and the car decelerates.
Again **PCV** keeps the pressure drop over **MSV** constant and the elevator decelerates to the levelling speed as **MSV** closes.

Levelling speed

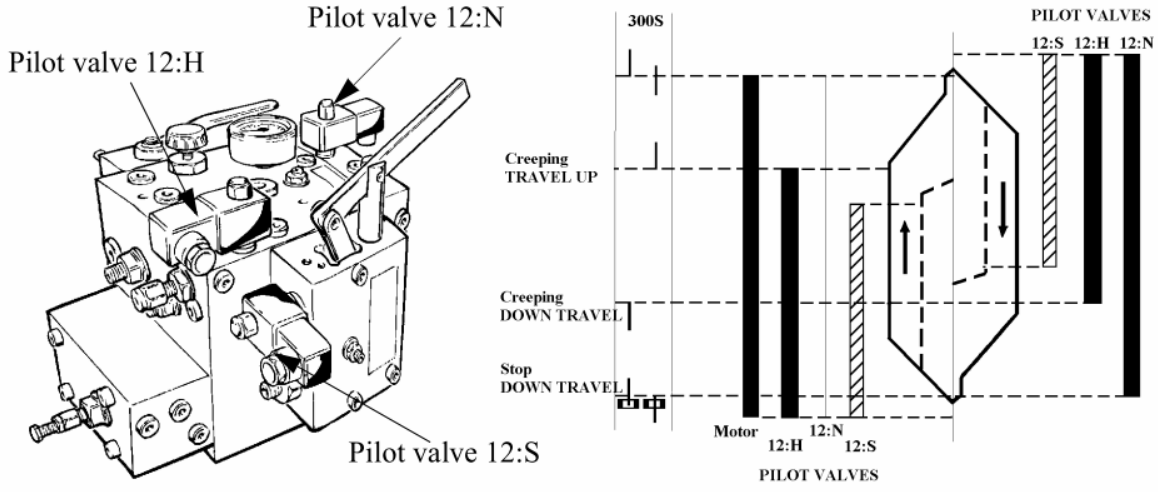
**MSV** is fully closed, oil flows just through **LSV**, and the car goes down slowly. **PCV** regulates oil flow according to car load.

Stop

Finally **12:N** is de-energized. the down travel valve **DTV** start closing and the elevator stops smoothly. The pressure compensator valve **PCV** closes too and the elevator is ready for the next travel.




**HYDRONIC 300**



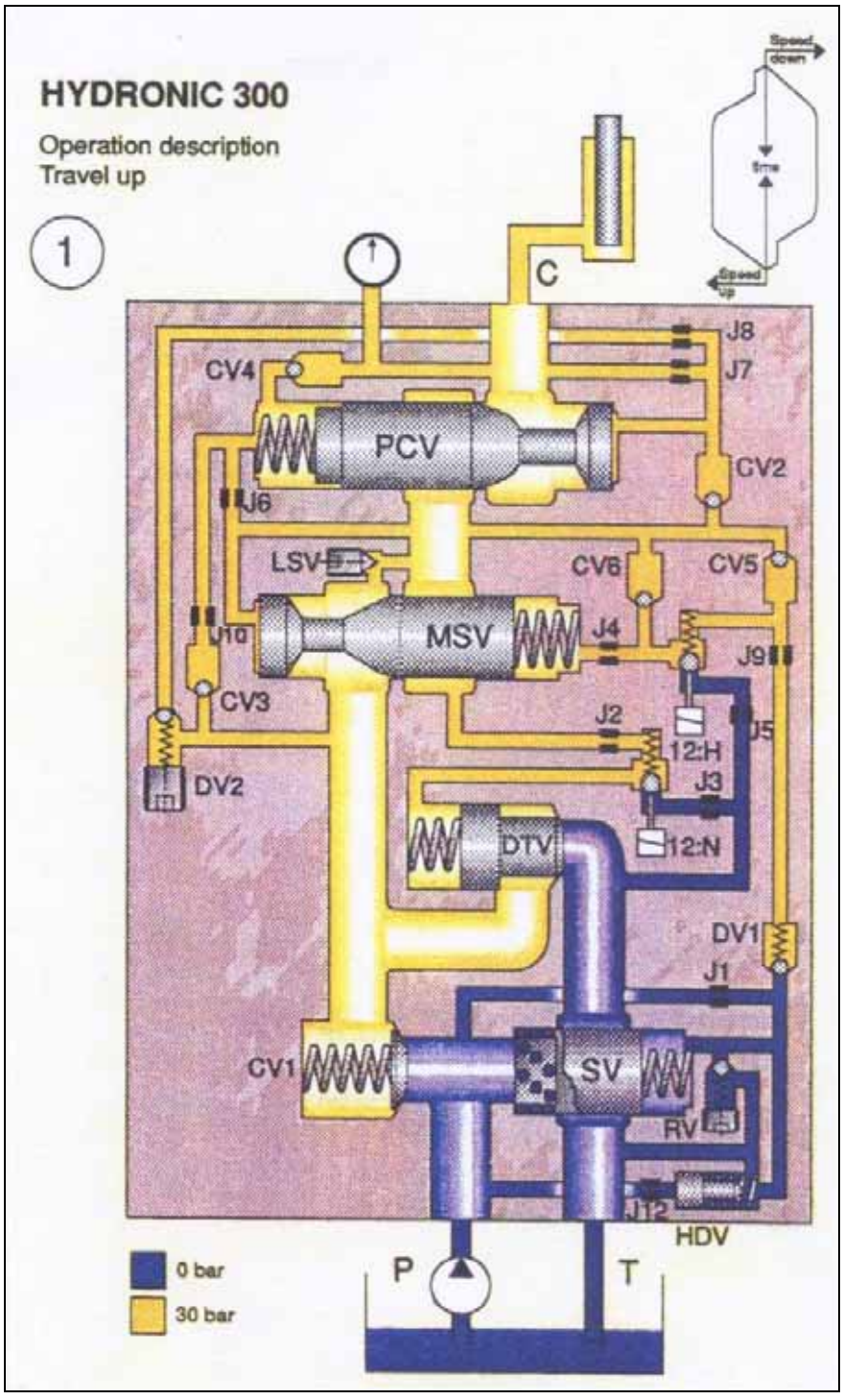

**HYDRONIC 300S**

**Pilot valve 12:s for service drive is compulsory for elevators with speed over 0,63 m/s**

**When using service drive. The pilot valve 12:H is not energized**

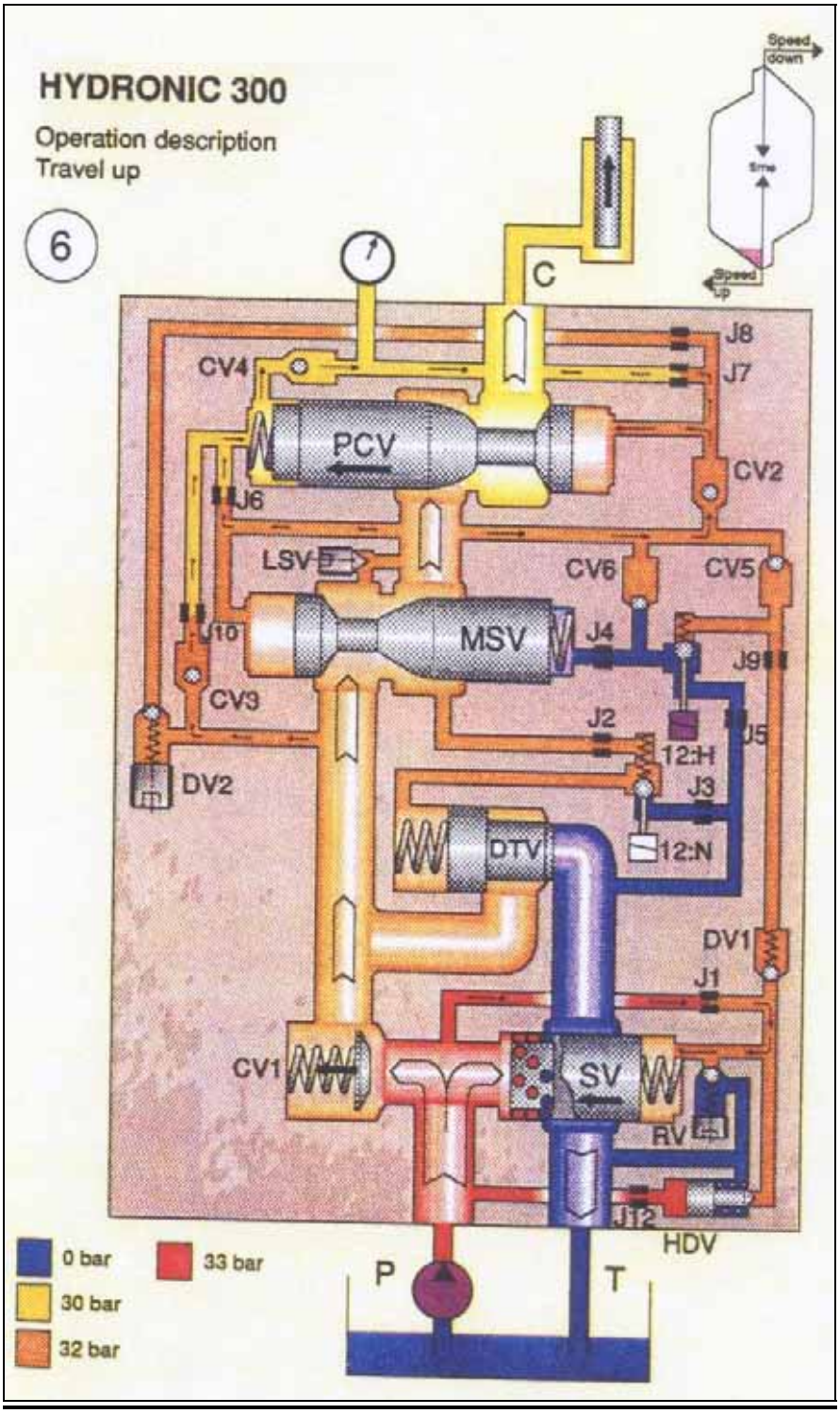
# 2 FUNCTION DIAGRAMS

**Stop at floor**



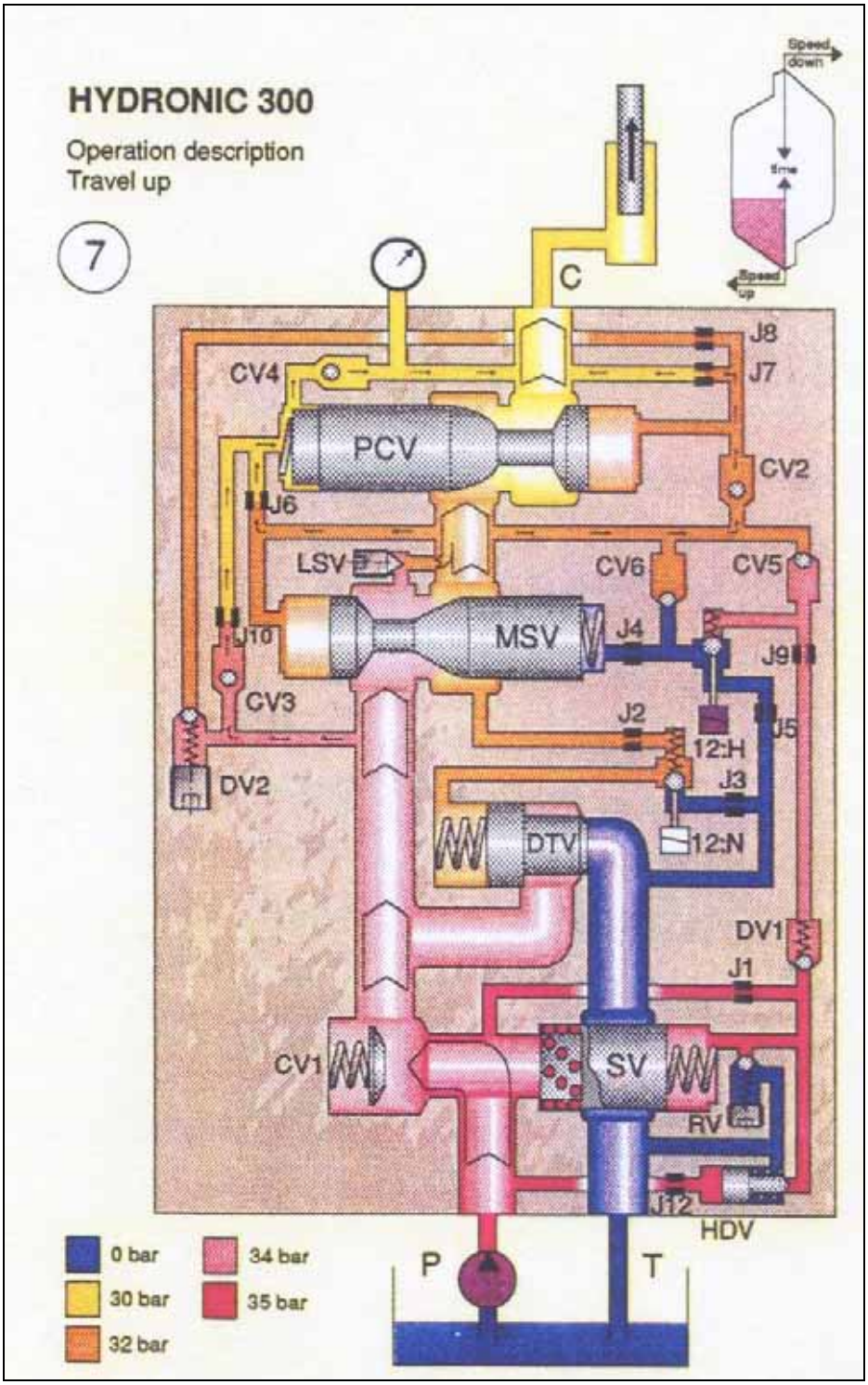
HYDRONIC LIFT

## Acceleration phase in up-direction



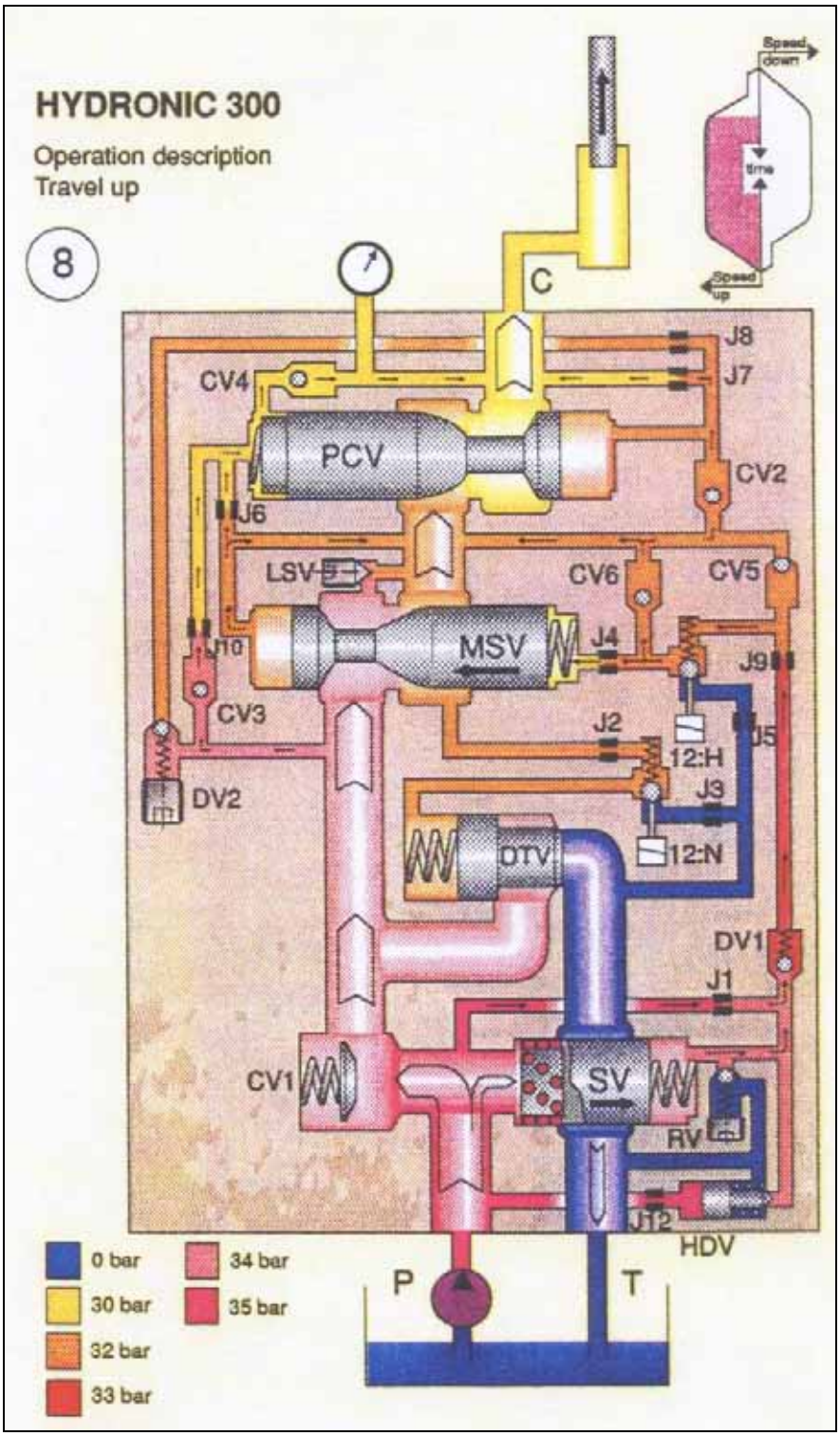
HYDRONIC LIFT

## Main speed phase in up direction



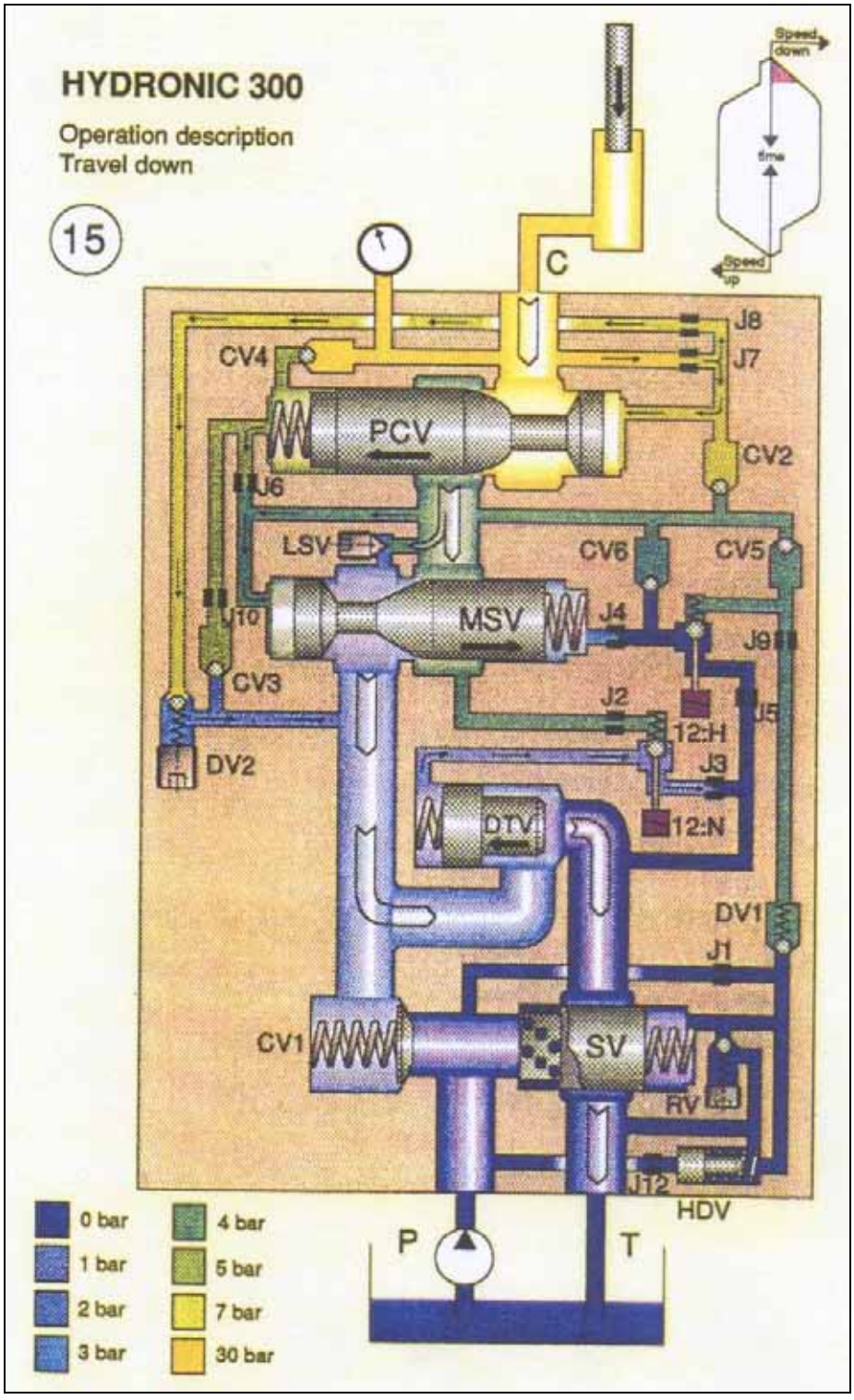
HYDRONIC LIFT

## Deceleration phase in up-direction



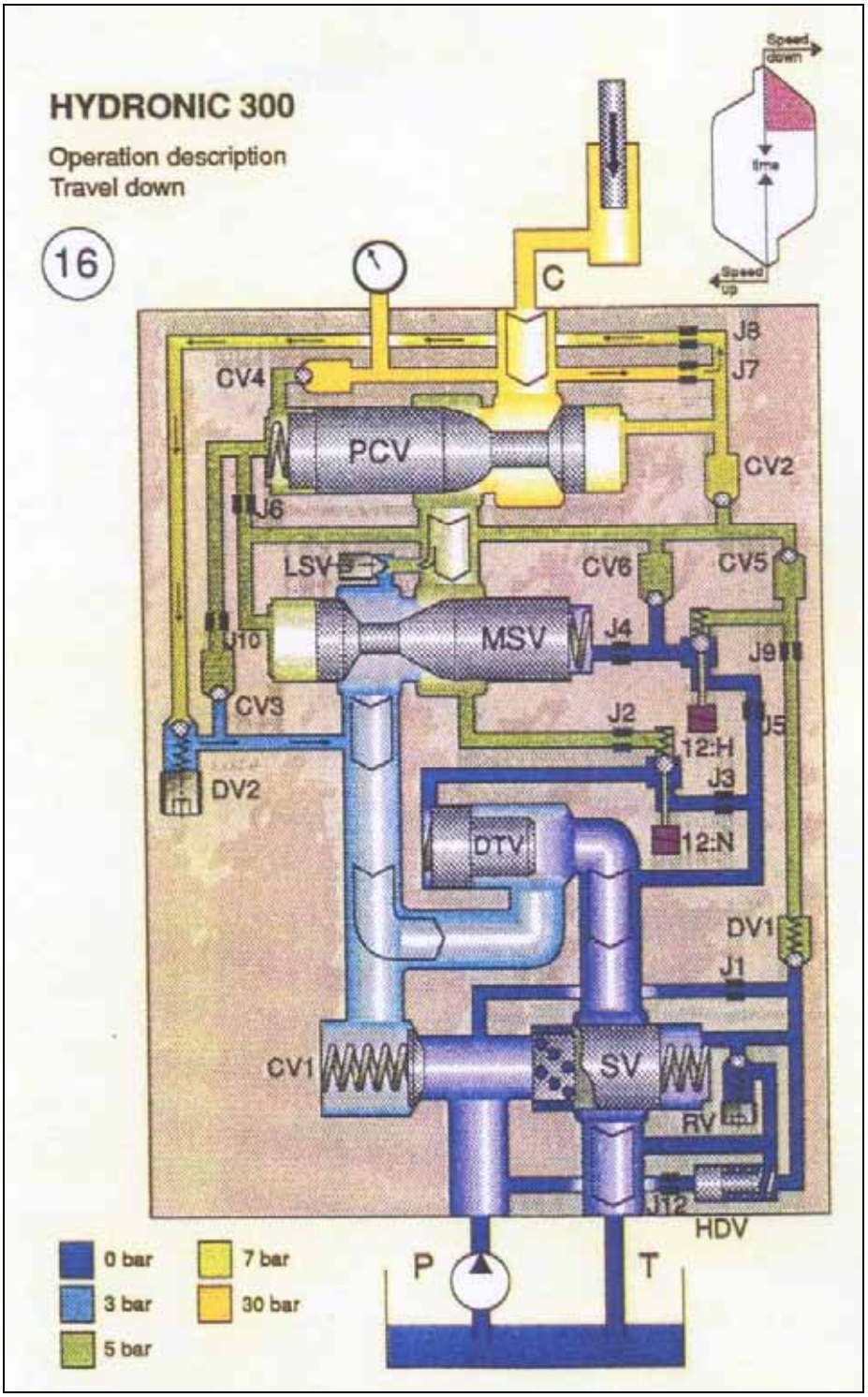
HYDRONIC LIFT

## Acceleration Phase in down-direction



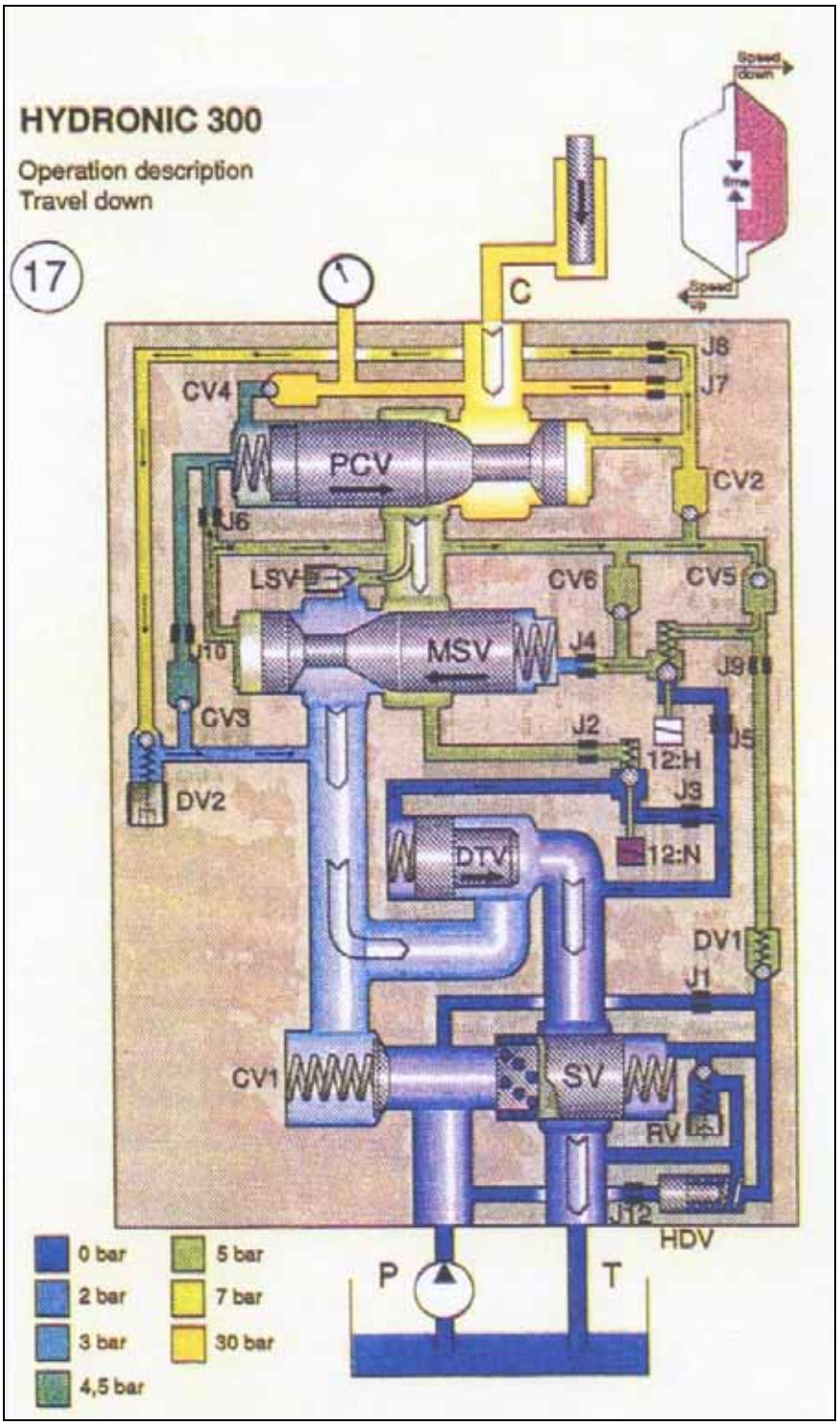
HYDRONIC LIFT

## Main speed phase in down direction



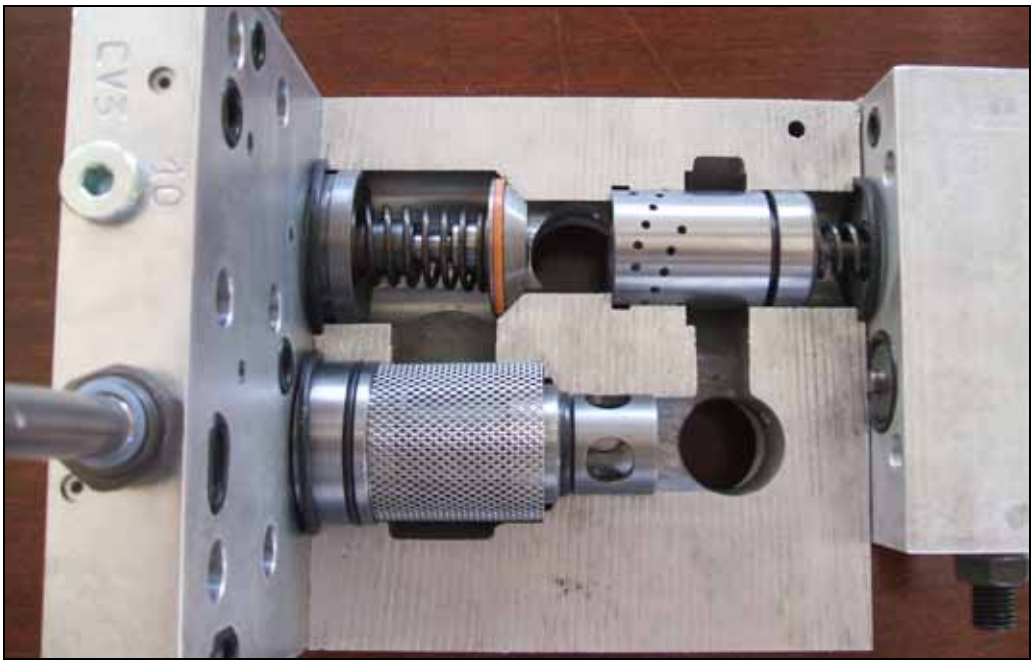
HYDRONIC LIFT

## Deceleration phase in down direction

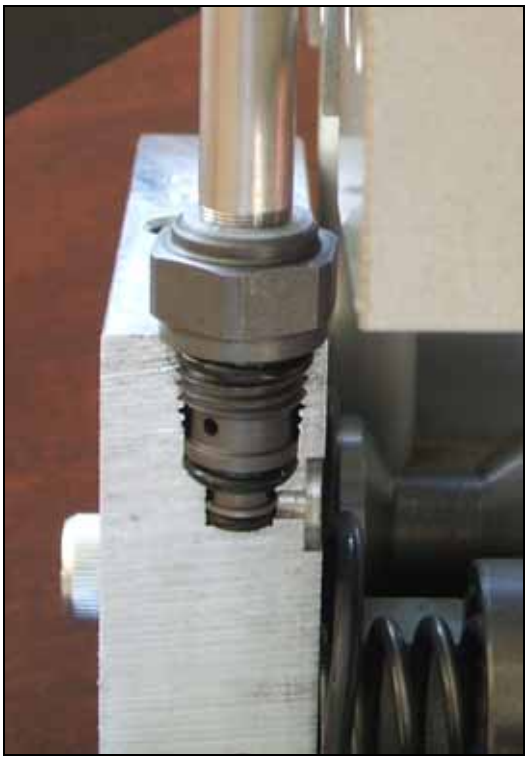


# 3 MAIN COMPONENTS

**PCV & MSV**



**DTV CV1 SV**

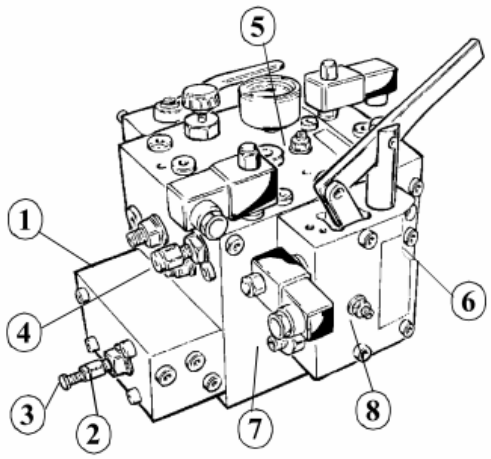


## SOLENOID VALVE

## MANUAL LOWERING VALVE

# 4 ADJUSTMENT

| | Elevator movement | Change | Procedure | Remarks |
|---|---|---|---|---|
| UP | Acceleration | Slower | Screw 2 | |
| | | Faster | Screw 2 | |
| | Elevator speed | | | Not adjustable |
| | Deceleration up and down | Softer | Screw 4 | 1/6 turn at time |
| | Levelling speed | Increased | Screw 5 | Common for up and down. Normally c:a 0,05 m/sec |
| | | Decreased | Screw 5 | |
| | Stop | Levelling | Adjusted with shaft vane | Vane ~ 30 mm from floor level |
| DOWN | Acceleration | | | Not adjustable |
| | Elevator speed | Increased | Screw 6 | Normally equal with speed in up direction |
| | | Decreased | Screw 6 | 1/6 turn at time |
| | Deceleration up and down | Softer | Screw 4 | |
| | Levelling speed | Increased | Screw 5 | Common for up and down. Normally c:a 0,05 m/sec |
| | | Decreased | Screw 5 | |
| | Stop | Levelling | Adjusted with shaft vane | Vane ~ 30 mm from floor level |
| Over pressure | | Higher pressure | Screw 1 | Adjusted to 140% max. static pressure |
| | | Lower pressure | Screw 1 | |




1. Adjustment screw for over pressure
2. Adjustment screw for acceleration up
3. Adjustment screw for by-pass pressure
4. Adjustment screw for deceleration up and down (for HYDRONIC 300 as an option)
5. Adjustment screw for levelling speed up and down
6. Adjustment screw for elevator speed down
7. Adjustment screw for hand pump pressure
8. Adjustment for service speed (only for HYDRONIC 300S)

# 5 LOCATION AND REPAIR OF INTERNAL OIL LEAKAGE

If the lift car sinks inspite of the fact that there is no visible oil leakage, the leakage is somewhere inside the valve body. Closing of the shut off valve also helps indicate the existence of an internal leakage, because the manometer reading immediately starts to decrease.

**NOTE!** The car sinks also when the oil cools down. This sinking of the car has nothing to do with oil leakage. When the oil cools down 40°C the car may sink 40...100 mm at the lower most landing and up to 200...400 mm at the upper most landing.

The location of an internal leakage is a bit complicated, because there are several points to be checked in the valve:

1. Hand pump HP (if existing)
2. Pressure difference valve DV1
3. Manual lowering valve ML
4. Pilot valves 12:H, 12:N, 12:S
5. Check valve CV1 and down travel valve DTV

It is better to start the location and repair of a leakage first with easier points. This can be done in the order of the list above.

**NOTE! Before working on the valve, switch of the main power.**

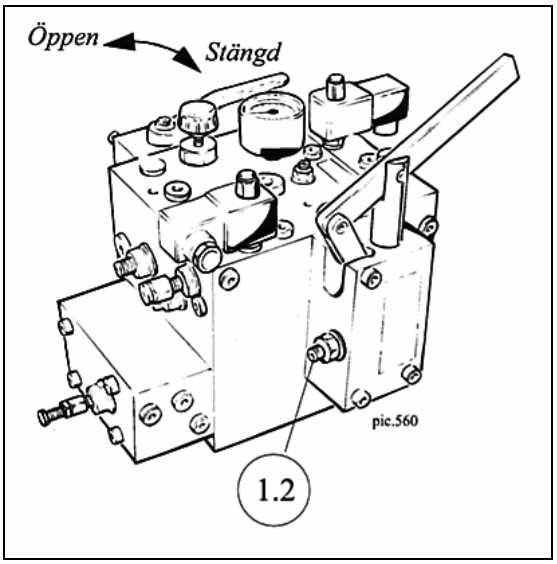
## 5.1 CHECK UP OF THE HAND PUMP AND REPAIR OF THE LEAKAGE

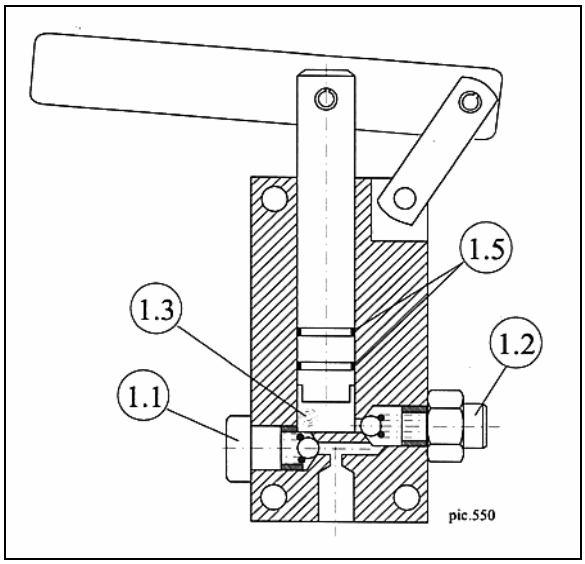
- Check that there is static pressure in the valve.
- Open the tank cover and take up the free end of the hand pump suction pipe. If a leak flow comes from the pipe, the leakage in the hand pump is either in:

  a. the pressure and suction port check valves
  b. the pressure port check valve and in the pressure relief valve
  c. or in the service speed pilot valve 12:S (only 300S and 300E)

If only the suction port check valve is leaking (or the relief valve) the hand pump arm can be pushed with little force. The leakage in the pressure port check valve alone makes the pump arm come up by itself.

Tools:
- Socket head wrench 6 and 8 mm (allen key)
- Spanner 27 mm
- Mandrel 8 mm
- Hammer



### 5.1.1 SUCTION PORT CHECK VALVE

- Close the shut-off valve
- Open the suction port check valve. Remove the spring and the ball and clean the ball seat.
- Install the ball and form the ball seat by hitting the ball slightly using the mandrel and the hammer.
- Install the valve and check the tightness again.

### 5.1.2 HAND PUMP RELIEF VALVE

- Close the shut-off valve and test the hand pump over pressure.
- Let off the pressure, open the relief valve and form the ball seat by hitting the ball slightly using the mandrel and the hammer.
- Install the relief valve and set the over pressure. Check the tightness.

### 5.1.3 PRESSURE PORT CHECK VALVE

**The repair of this check valve is a work shop operation. Leakage in the pressure port check valve must be repaired without any delay because this check valve prevents the hand pump relief valve from opening with over load!**

### 5.1.4 PILOT VALVE 12:S (see section 4)

### 5.1.5 HAND PUMP PISTON ROD SEAL (EXTERNAL LEAKAGE)

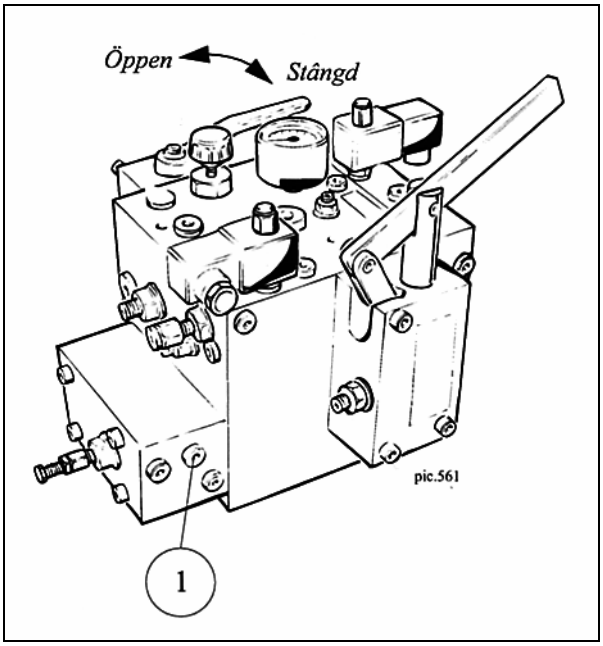
- Close the shut-off valve and discharge the pressure.
- Remove the screw that acts as a pin joint in the linkage and lift off the piston from the pump.
- Fit new o-rings on the piston (2 pieces 16x2 NBR 70 GR).
- Install the hand pump and check the tightness.

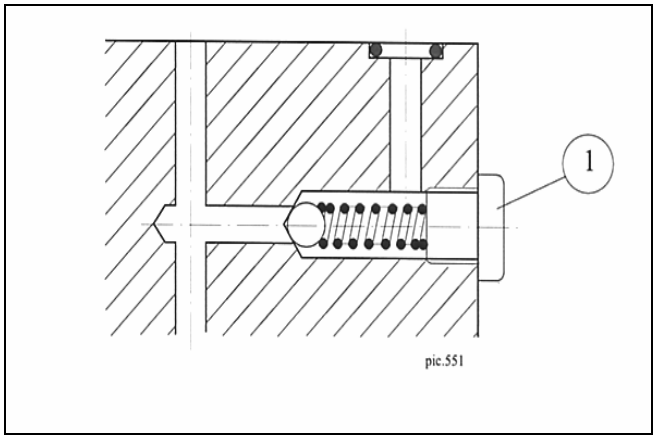
## 5.2 PRESSURE DIFFERENCE VALVE DV1

- Close the shut-off valve and discharge the pressure.
- Open the plug (1).
- Remove the spring and the ball and check them. Clean the ball seat carefully.
- Position the ball back and form the ball seat by hitting the ball slightly using the mandrel and the hammer.
- Install the spring and the plug
- Check that DV1 does not leak any more.

Tools:

- Socket head wrench 5 mm (allen key)
- Mandrel D 8 mm
- Hammer



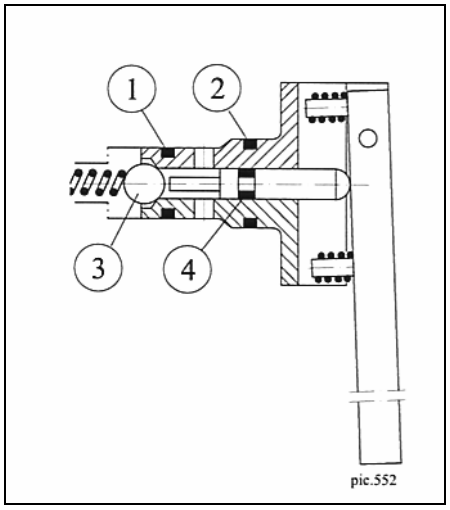
## 5.3 MANUAL LOWERING VALVE

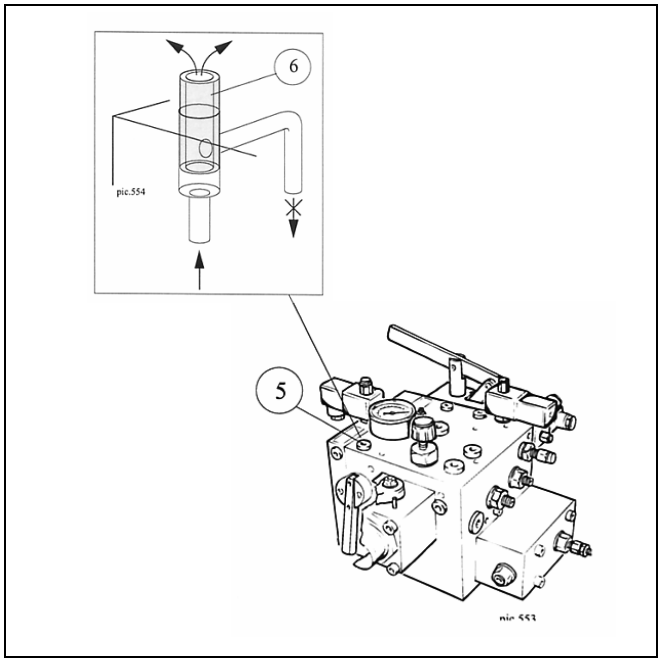
1. O-ring 1,6 x 11,1
2. O-ring 1,6 x 14,1
3. Ball D 8 mm
4. O-ring 2,9 x 1,78

- Check that there is static pressure in the valve.
- Open the plug (5) of the PV valve and remove the spring and the ball.
- If oil is flowing from the bottom of the hole then there is a leakage over the ball (3) or the O-ring (1). A short plastic pipe D9 or a piece of paper formed into a cylinder (6) helps to verify the leakage by covering the bore to tank.
- In the case of leakage discharge the pressure.
- Remove the manual lowering valve.
- Check the O-ring (1) and replace it with a new one, if necessary. If there was external leakage, then also change the O-rings (2) and (4) .
- Clean the ball and the seat.
- Replace the ball back on its seat and form the seat by hitting the ball slightly using the mandrel and hammer. NOTE! Make sure the lever is pulled back and clear of the pin when reseating the ball. Otherwise the pin can be bent causing it to jam when the valve is operated.

Tools:

- Socket head wrench 5 mm (allen key)
- Mandrel D8 mm
- Hammer



## 5.4 PILOT VALVES 12:H, 12:N AND 12:S

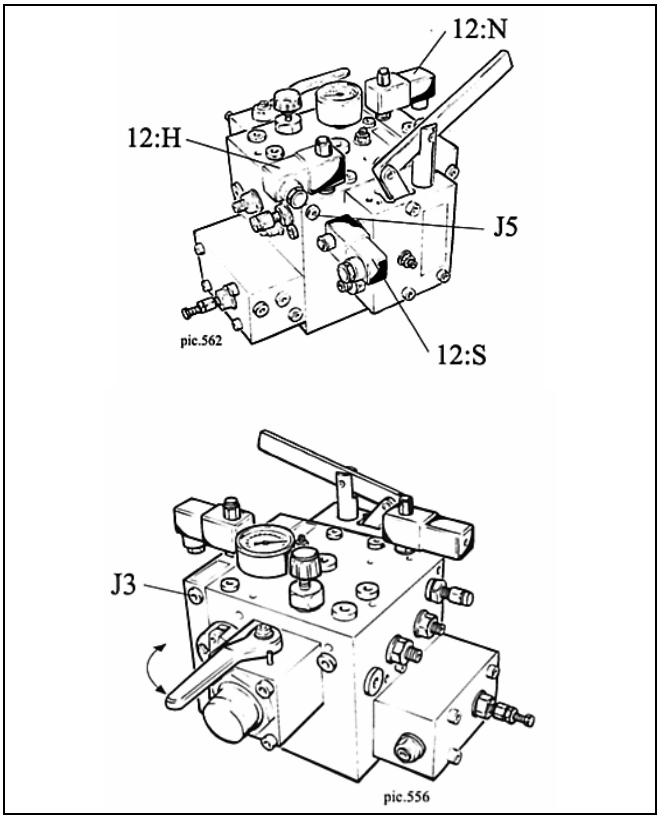
- Leakage in a pilot valve can be verified by replacing the pilot valve with a new one. Leakage in the pilot valve 12:H can also be seen by opening the plug of jet 5, and letting the leak oil out. The plug of jet 3 lets out the leak flow from the pilot valve 12:N. If 12:S leaks the oil flows to the suction pipe of the hand pump.
- To repair a leakage first close the shut-off valve and remove the coil.
- Unscrew the pilot valve and check the O-rings (the middle one carries the static pressure).
- Replace the faulty O-rings and install the pilot valve.
- If the pilot valve still leaks, replace it with a new one.

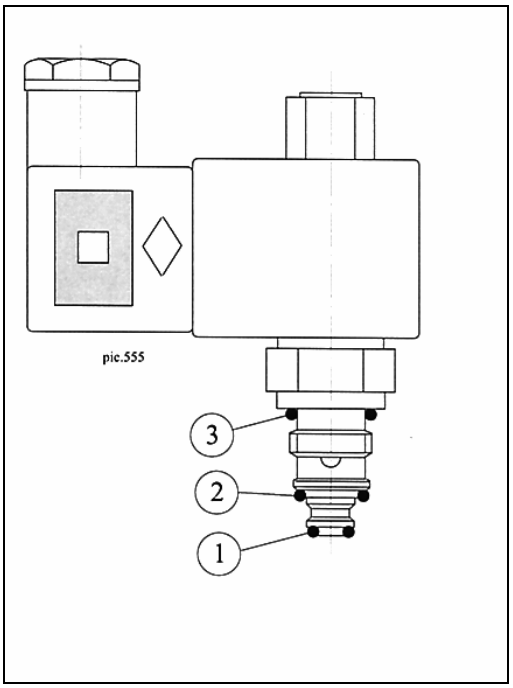
O-rings:

1. 4,47 x 1,78
2. 9,25 x 1,78
3. 10,82 x 1,78

Tools:

- Spanner 19 mm



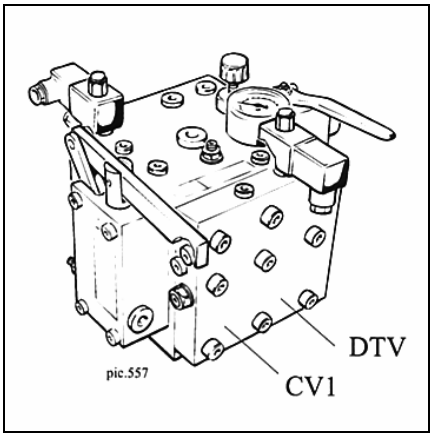
## 5.5 REPAIR OF CHECK VALVE (CV1) AND DOWN TRAVEL VALVE (DTV)

Tools:

- Socket head wrench 8 mm (allen key)
- A small screw driver
- Cutting pliers

### 5.5.1 REMOVAL OF THE COVER

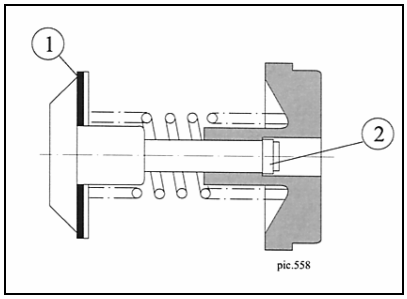
- Discharge the pressure from the hydraulic system.
- Remove the nine fixing screws of the cover (the middle one last).
- Check that all the O-rings were in the right places.




### 5.5.2 CHECK VALVE CV1

2 Washer seal 114356 H01
2. Locking ring

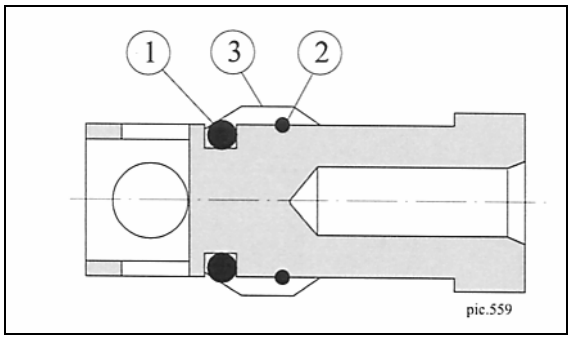
- Pull out the check valve
- Compress the spring and remove the locking ring (2).
- Change the washer seal (1).



5.5.3 DOWN TRAVEL VALVE DTV

2 O-ring 5 x 16
2. Locking wire (1 mm)
3. Bushing

- Pull out the down travel valve spool.
- Take off the locking wire (2).
- Remove the bushing (3) so that the O-ring (1) becomes visible.
- Change the O-ring (1).
- Set the bushing back in positionand lock it with 1 mm thick wire.



pic.559

5.5.4 ASSEMBLY OF THE VALVES AND THE COVER

- Install the check valve CV1 and the down travel valve DTV back into the valve body.
- Press the cover against the valve body so that the MSV-spool goes in and turn the middle screw in by hand. At the same time check that the O-rings stay in the right place.
- Replace the remaining screws. Tighten the screws by starting with the middle one.
- Drive the lift and check that there are no more leaks.

# 6 TROUBLE SHOOTING

| Fault | Description of fault | Remedy | Remarks |
|---|---|---|---|
| 1. | **No up travel** | | |
| | 1.1 Motor pump not running | Check controller, safety circuit etc | |
| | 1.2 Hose split or disconnected between pump and valve block | Tighten joint or replace hose | |
| | 1.3 Car overloaded | Reduce to contract load | |
| | 1.4 Relief valve leaking | Reset relief valve | May need re-adjustement |
| | 1.5 Trottle J1 e J12 blocked | Dismantle and clean | |
| | 1.6 Filter F1 blocked | Remove and clean | |

| Fault | Description of fault | Remedy | Remarks |
|---|---|---|---|
| 2 | **<u>No down travel</u>** | | |
| | 2.1 12:N valve not energised | Check controller | |
| | 2.2 12:N valve faulty | Replace | Check O-Ring during valve replacement |
| | 2.3 Trottle J3 blocked | Dismantle and clean | |
| | 2.4 Safety gear or rupture valve operated | Trace fault, rectify and reset by pumping up | |

| Fault | Description of fault | Remedy | Remarks |
|---|---|---|---|
| 3 | **Car overshoots in up direction** | | |
| | 3.1 Slowing vane/switch incorrectly positioned | Reposition giving longer slowing | This will heat oil faster so check following points also |
| | 3.2 Slow speed too high | Re-adjust LSV | Care is needed not overtighten lock nut (common direction adjustm.) |
| | 3.3 Floor level vanes positioned incorrectly | Check position and overlap | Set overlap approximately 10 mm |
| | 3.4 Oil too cold | Add heater to oil or machine room | |
| | 3.5 12:H valve not de-energised or faulty | Replace/check controller | |
| | 3.6 Deceleration too smooth | Re-adjust TCJ if present, dismantle and clean trottle J4 | For TCJ 1/6$^{th}$ of a turn at a time Anti clockwise |

| Fault | Description of fault | Remedy | Remarks |
|---|---|---|---|
| 4 | **<u>Car overshoot in down direction</u>** | | |
| | 4.1 Slowing vane/switch incorrectly positioned | See 3.1 | |
| | 4.2 Slowing speed too high | See 3.2 | |
| | 4.3 Floor level vanes positioned incorrectly | See 3.3 | |
| | 4.4 Oil temperature too cold | See 3.4 | |
| | 4.5 Trottle J2 blocked | Dismantle and clean | |
| | 4.6 Down speed too high | Adjust DV2 (no. 5 adjuster) | Turn anti-clockwise |
| | 4.7 12:H valve not de-energised or faulty | Replace/check controller | |
| | 4.8 Deceleration too smooth | See 3.7 | |

| Fault | Description of fault | Remedy | Remarks |
|---|---|---|---|
| 5 | **Car overspeeds in down direct.** | | |
| | 5.1 Incorrect adjustment of DV2 (no. 5 adjuster) or faulty | Turn DV2 out anti-clockwise to reduce speed/dismantle and clean | |
| 6 | **Car will not relevel up** | | |
| | 6.1 Vanes incorrectly set | See 3.3 | |
| | 6.2 Pump runs but car does not move | See 1.1 | |
| | 6.3 Check revelling circuit | | |

| Fault | Description of fault | Remedy | Remarks |
|---|---|---|---|
| 7 | **Car will not relevel down** | | |
| | 7.1 Vanes incorrectly set | See 3.3 | |
| | 7.2 valve 12:N not energised or faulty | Replace/check controller | |
| | 7.3 check relevelling circuit | | |
| 8 | **Jerky start in up direction** | | |
| | 8.1 HDV valve stuck in | | |
| | 8.2 By pass pressure too high | Screw out centre screw of acceleration adjuster | Turn anti-clockwise until smooth start achieved |
| | 8.3 Start valve sticking | Dismantle and clean | Check spool and bore for damage |
| | 8.4 Motor | Check start-delta circuit | |

| Fault | Description of fault | Remedy | Remarks |
|---|---|---|---|
| 9 | **<u>Car leaves floor then stops in down direction</u>**<br><br>9.1 Operation of safety gear or rupture valve<br>9.2 Faulty 12:N valve<br>9.3 Break in safety circuit | <br><br>See 2.4<br><br>Replace or check controller<br>Trace fault. Slack rope/min pressure switch etc. | |

| Fault | Description of fault | Remedy | Remarks |
|---|---|---|---|
| 10 | **Car runs at reduced speed upwards** | | |
| | 10.1 CV5 leaking | Remove clean and reseat | |
| | 10.2 Relief valve opening | Check adjustment/dismantle and check functionality | |
| | 10.3 CV6 leaking | Remove clean and reseat | |
| | 10.4 CV4 jammed | Dismount and check functionality | |
| 11 | **Car runs reduced speed downwards** | | |
| | 11.1 CV4 leaking | Reseat , check valve | |
| | 11.2 CV2 leaking | Reseat , check valve | |
| | 11.3 DV2 jammed opened | Dismantle and check functionality | |
| | 11.4 Trottle J7 blocked | Dismantle and clean | |

| Fault | Description of fault | Remedy | Remarks |
|---|---|---|---|
| 12 | **Car runs always at levelling speed upwards** | | |
| | 12.1 Trottle J1 blocked | Dismantle and clean | |
| | 12.2 Trottle J5 blocked | Dismantle and clean | |
| | 12.3 12:H valve faulty | Replace/check controller | |
| | 12.4 Trottle J12 blocked | Dismantle and clean | |
| 13 | **Car runs always at levelling speed downwards** | | |
| | 13.1 12:H valve faulty | Repalce/check controller | |
| | 13.2 Trottle J5 blocked | Dismantle and clean | |

| Fault | Description of fault | Remedy | Remarks |
|---|---|---|---|
| 14 | **Car does not reduce speed from nominal to levelling speed upwards** | | |
| | 14.1 12:H valve not de-energised | Check controller/replace | |
| | 14.2 Trottle J9 blocked | Dismantle and clean | |
| | 14.3 Trottle J1 blocked | Dismantle and clean | |
| | 14.4 DV1 jawned | Dismantle and check functionality | |

| Fault | Description of fault | Remedy | Remarks |
|---|---|---|---|
| 15 | **Car does not reduce speed from nominal speed to levelling speed downwards** | | |
| | 15.1 12:H valve not de-energised | Check controller/replace | |
| | 15.2 CV3 leaking | Reseat, check valve | |
| | 15.3 CV6 leaking | Reseat check valve | |
| | 15.4 CV5 jammed | Dismantle and check functionality | |

| Fault | Description of fault | Remedy | Remarks |
|---|---|---|---|
| 16 | **<u>Car slowly sinks away</u>** | | |
| | 16.1 Sinking away of the car with shut off valve closed | | |
| | 16.1.1 Leakage in pipeline between valve and cylinder | Check for leakage at joints | |
| | 16.1.2 Leakage at cylinder seals | Check leakage return tube to monitor amount of leakage and if necessary replace seals | |
| | 16.2 Sinking away of gauge pressure with shut off valve closed | See from page 1 to 7 | |
| | 16.3 Sinking away due to cooling off of oil in the cylinder and pipeline | Reduce overlap of levelling vanes to keep more accurate floor level if required | <u>NOTE</u>: Oil volume reduces by 0,7% with 10°C drop in temperature |

| Fault | Description of fault | Remedy | Remarks |
|---|---|---|---|
| 17 | **Oil gets very hot** | Check slowing distances are not excessive. Increase ventilation/add additional cooling.<br>Check for correct up speed ie, correct operation of valve | Thermistors in motor windings trip 100° C<br>Thermistor in oil trips at 70°C<br>Contact technical department do advice on additional cooling |
| | 17.1 Lift travelling up at reduced speed | Readjust/check valve operation | See 10. |
| 18 | **Car sinks with increase of load** | This is normal due to oil compression and any rope stretch may be excessive if air is trapped in system. Bleed system and positioning floor level vanes to give adequate relevelling accuracy | |

| Fault | Description of fault | Remedy | Remarks |
|---|---|---|---|
| 19 | **Vibration/stick-slip when approaching upper floors** | a/ Increase levelling speed<br>b/ Reduce levelling distance<br>c/ Add special oil additive | Turn LSV adjuster anti-clockwise<br>Carry out when oil is cold |
| 20 | **Car will not manually lower** | | |
| | 20.1 Faulty manual lowering valve | Remove and check | Look at pressure gauge for clues |
| | 20.2 Rupture valve or safety gear operated<br>20.3 Car stuck in guides | Check for reason and reset | Check for slack ropes – Manual lower pressure valve may be operating |