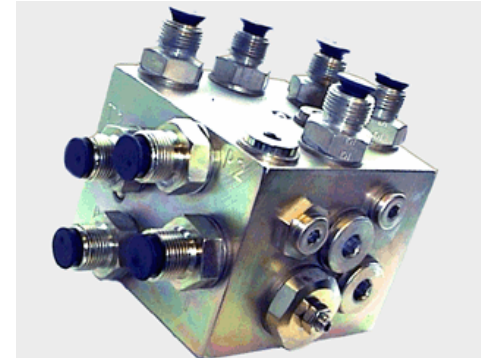


Mounted Reversible Plough Hydraulic Valve Training Course

BA Plough & Equipment
H. Krogedal April 2014

Hydraulic Valves



Why four different valves on mounted reversible ploughs?

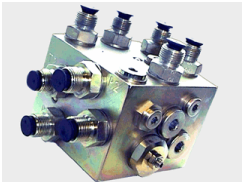
- **Valve type KK012740 - Automatic Switch-Over Valve**
- By means of this valve mounted reversible ploughs can be turned over through a double acting cylinder. By that means the valve switches the turnover cylinder in the dead centre. The valve is being used in the same version on ploughs turning the bodies *over* respectively *under* the main frame.
-
- **Automatic alignment with valve KK012740**
- In order to reduce the turnover forces on heavy ploughs, the turnbuckle for frame angle adjustment may be replaced by a cylinder, aligning the entire weight of the plough closer to the rotation line. Hereby both cylinders entered into cooperation of the turnover system are connected in parallel, which results in a smooth turnover, as the separate movements partly occur simultaneously.
- Note: This simple and reliable interconnection, which is made outside the valve at the oil ports 'A' & 'B', is applicable only on ploughs turning the bodies *under* the main frame and with fixed working width.
-
-
- **Valve type KK012741 - Memory Valve**
- This exclusive 'Kverneland Memory System' provides the equivalent movements concerning alignment and turnover as described under **Automatic alignment** above, but permits additionally ploughs with adjustable working width to be adjusted during ploughing from a second directional valve on the tractor.
-
- The main components of the Memory System consist of a twin piston cylinder called 'Memory cylinder', connected to a set of check valves integrated in the memory valve, ensuring the working width being fixed during ploughing. The adjustment of the working width is carried out by increasing or decreasing the oil amount between the two pistons. Thus the actual working width set prior to alignment/turnover, is 'memorized' through this looked up oil, acting as a buffer causing the realignment movement to stop at the initial position. Thereof the designation 'Memory System'.
- **Valve type KK012742 - Sequence Valve**
- Sequence valves have to be used on ploughs with turning bodies *over* the main frame requiring alignment. The discrete movements are running in the following sequence:
 - 1) Alignment starts and completes
 - 2) Turnover starts and fulfils the 1. cycle
 - 3) Automatic switch-over takes place in the dead point, inverting the turnover cylinder
 - 4) Turnover movement finishes the 2. cycle
 - 5) Realignment takes place and is completed as the alignment cylinder stroke stops against the adjustable hexagon stopper, which is adjusted to correspond with the setting of the interbody clearance on ploughs with fixed working width
-
-
- **Valve type KK012743 - Sequence-Memory Valve**
- The basic functions of this valve are exactly like those of the sequence valve. Additionally, the same check valves as described under the Memory valve are built in, thus enabling remote control of the working width in the same manner as known by the Kverneland Memory System.

Change-Over Valves in use today



KK012740 - Change-over valve only

Ploughs: LM/EM + LS/ES 4f + LO/EO (ploughs without a frame alignment cylinder - except LO/EO)



KK012741 - Change-over valve & memory system

Ploughs: old LB/EG (ploughs turning bodies under the main frame during reversal)



KK012742 - Change-over valve & sequence operation

Ploughs: LS/ES 5f + LD/ED (ploughs with a frame alignment cylinder)



KK012743 - Change-over valve, memory & sequence operation

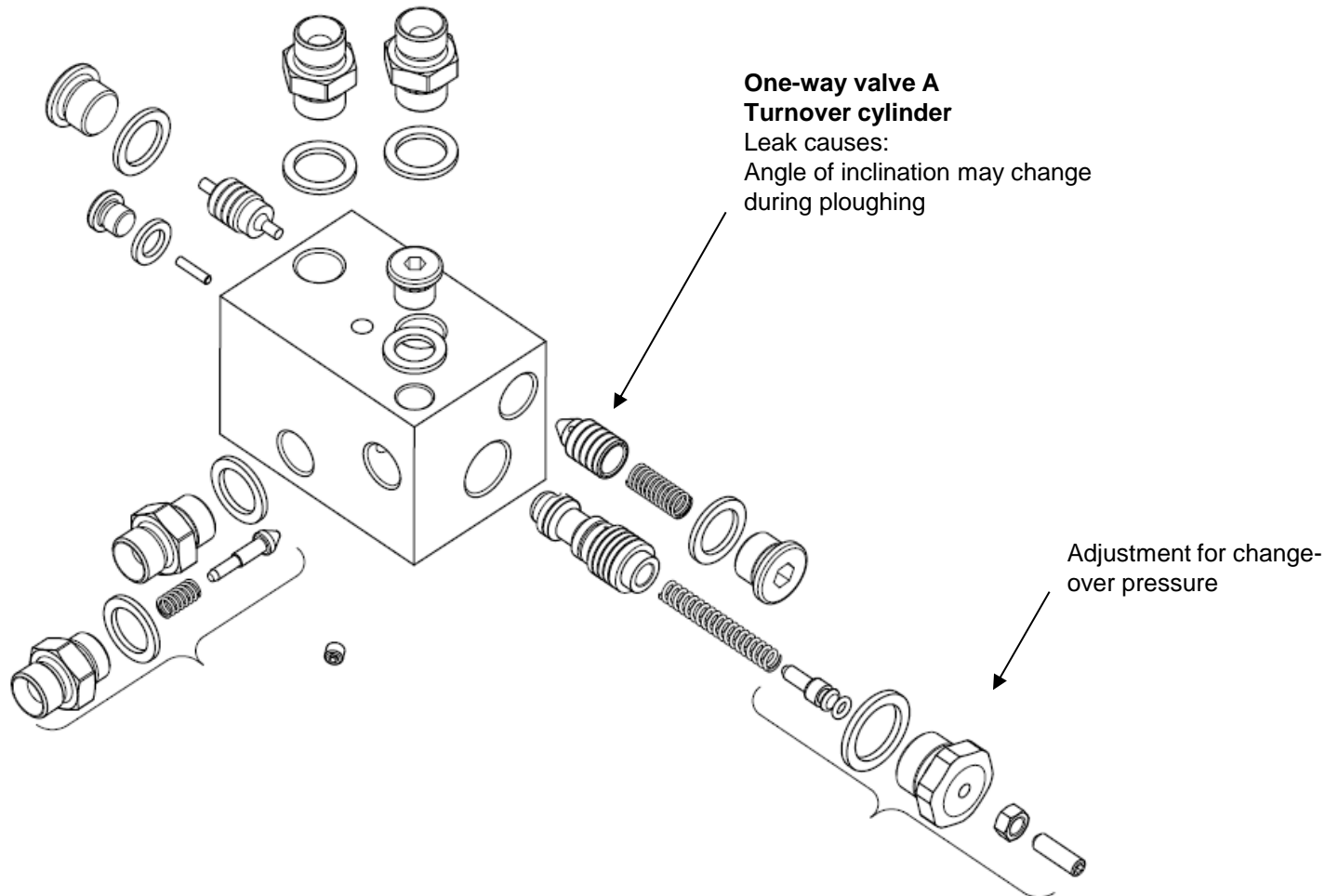
Ploughs: LB/EG (ploughs with memory/alignment cylinder)

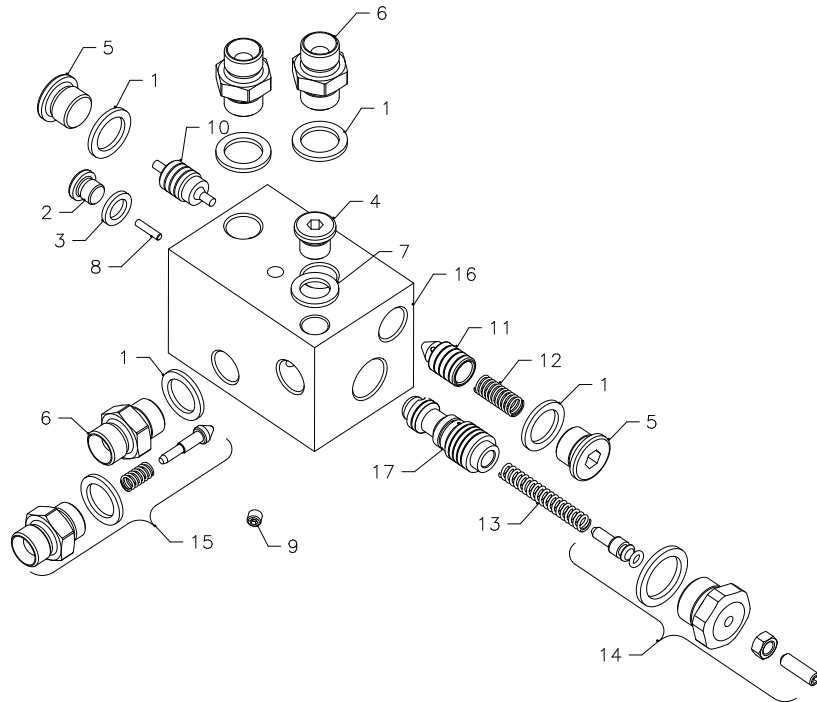
KK012740 - Change-over valve

Ploughs applicable : LM/EM + LS/ES 4f + LO/EO + 150 B/S (ploughs without a frame alignment cylinder)



KK012740 - Change-over valve





Kverneland part no. KK012740 Turnover valve

- **1. KK011585** **Bonded seal**
- 2. KK012063 Plug G1/8
- **3. KK012064** **Bonded seal G1/8**
- 4. KK012095 Plug G1/4
- 5. KK012122 Plug G3/8
- 6. KK012261 Nipple G3/8
- **7. KK012269** **Bonded seal G1/4**
- 8. KK352760 Needle pin D3X13,8
- 9. KK353319 Restictor M6X6 with D 0,6 orifice
- 10. KK353394 Pilot plunger
- 11. KK353395 Check valve
- 12. KK353396 Spring 1x8x26,1
- 13. KK353476 Spring 1,25xDM6,3x60
- 14. KK353613 Switch-over pressure adjustment
- **15. KK354650** **Back pressure valve**
- 16. - Switch-over block (not available sep.)
- 17. - Switch-over spool (not available sep.)

Main valve components



← Change-over spool on all valves

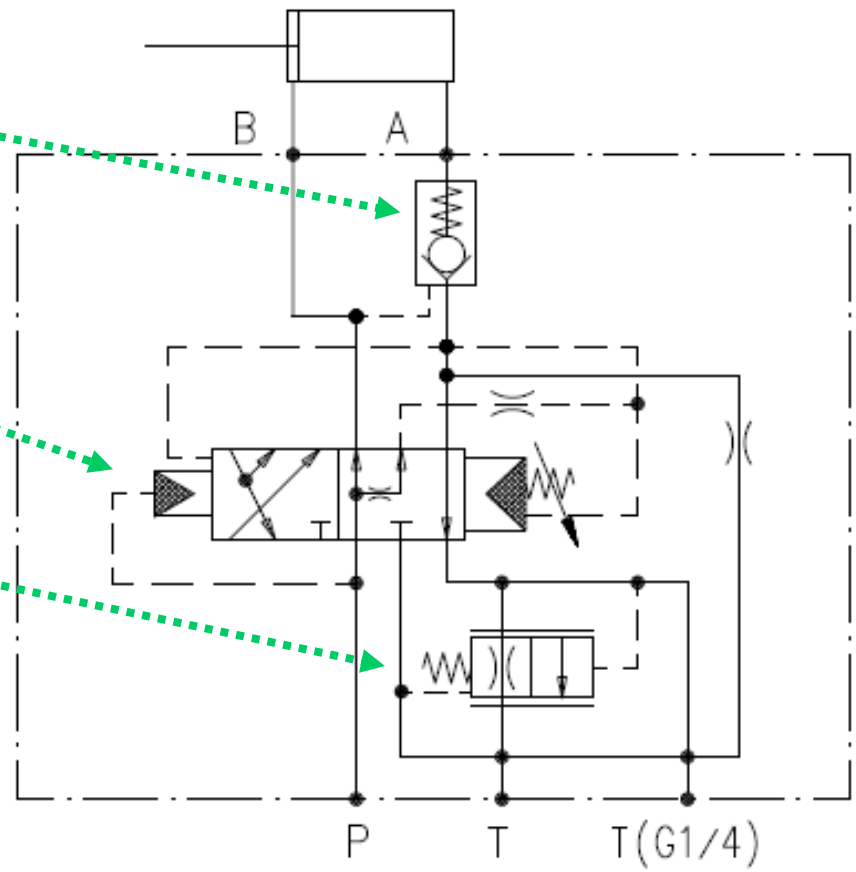
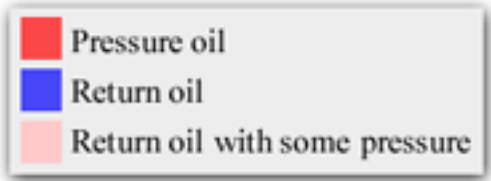
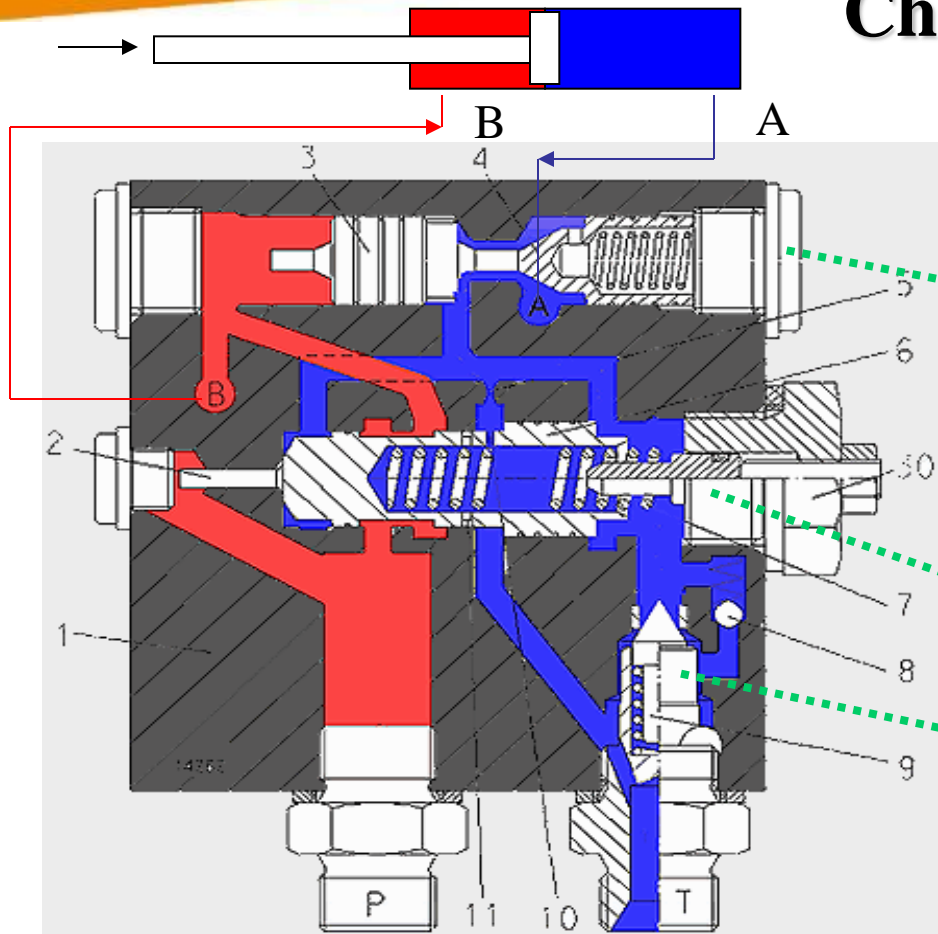


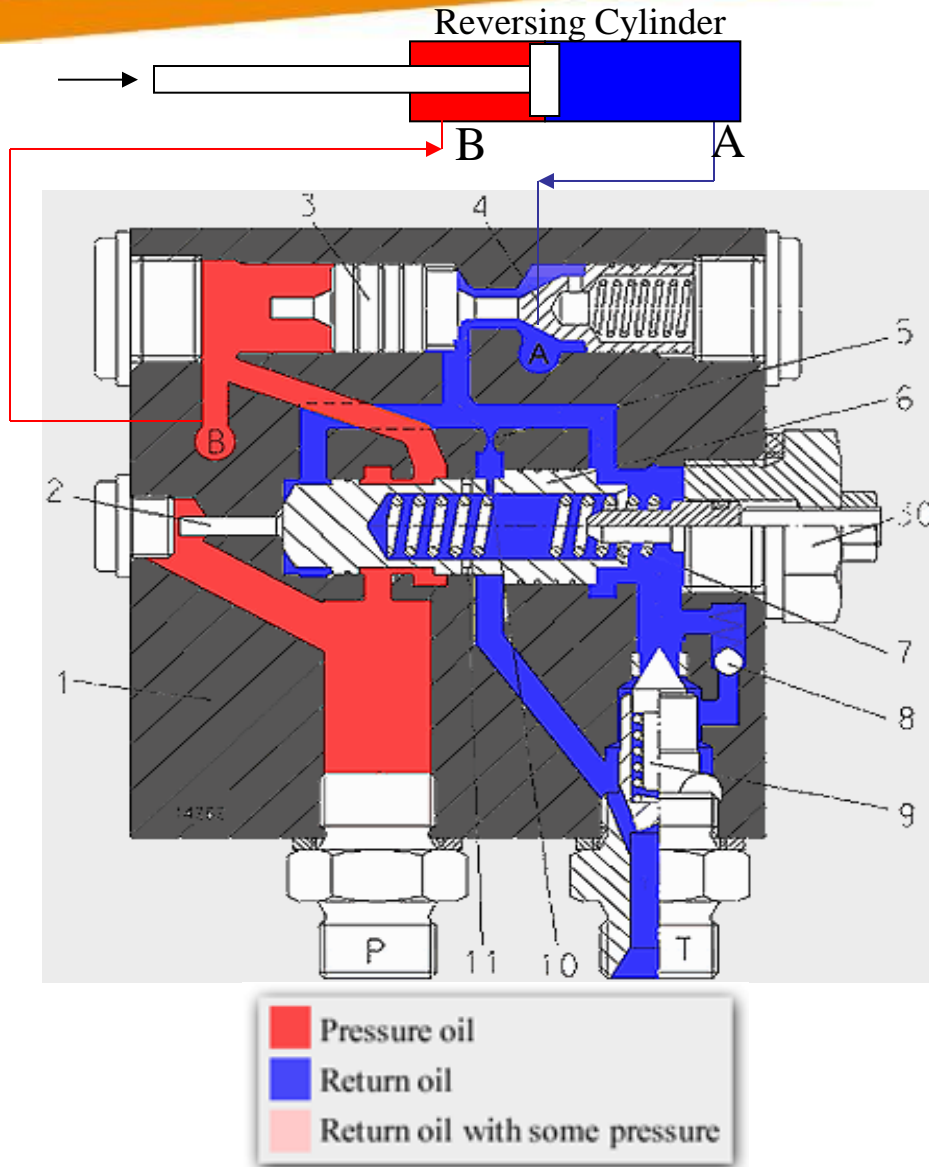
← Check valve on all valves



← 'T' port on all valves (return oil)

Change-Over valve KK012740





First Turning Phase KK012740

The diagram shows the valve where port P is supplied with oil.

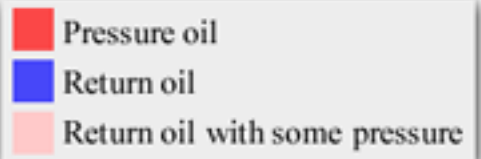
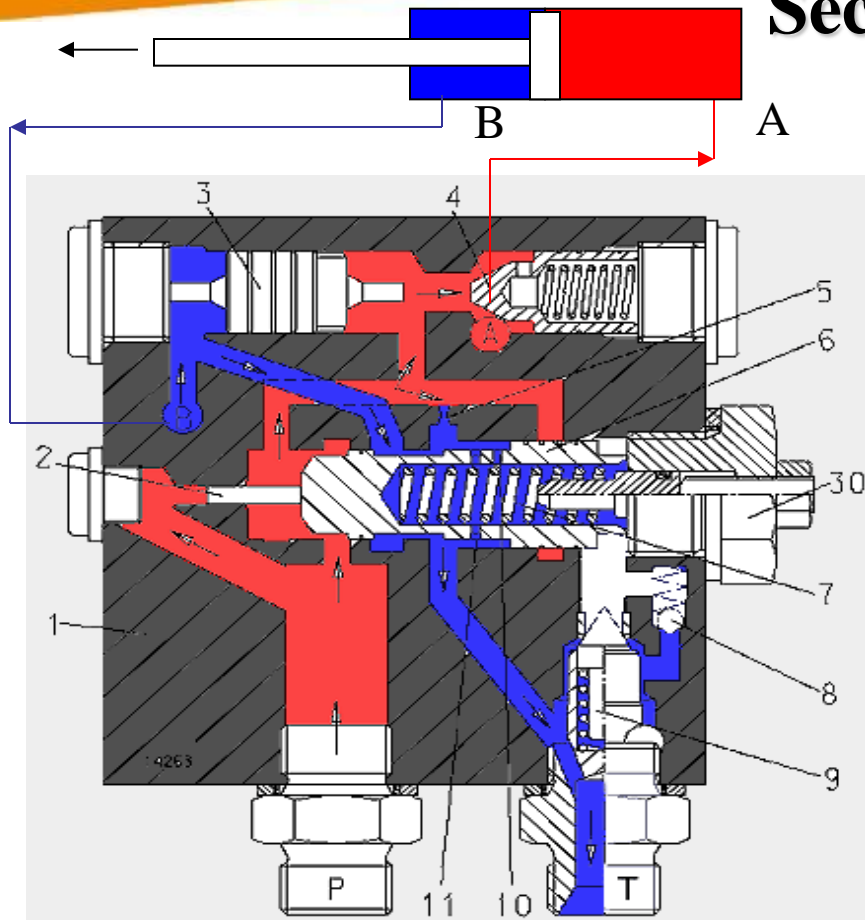
The oil flows behind the pilot piston (2), around the spool (6) to the rear of piston (3), which lifts lock valve (4) and then flows to the reversing cylinder from port B.

Return oil from the cylinder flows to port A, around the lock valve (4), behind the spool (6) and through the back pressure valve (9) to the tank via port T.

Due to the back pressure in valve (9) and a greater area of the spool (6), the return oil together with the spring (7) will create an additional force.

This prevents the pilot piston (2) from switching the spool (6) in the first turning phase

Second Turning Phase KK012740



The diagram shows the valve where the spool (6) is now switched over.

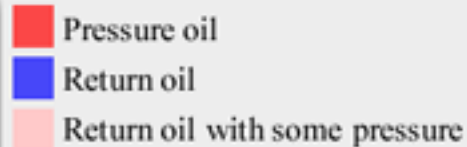
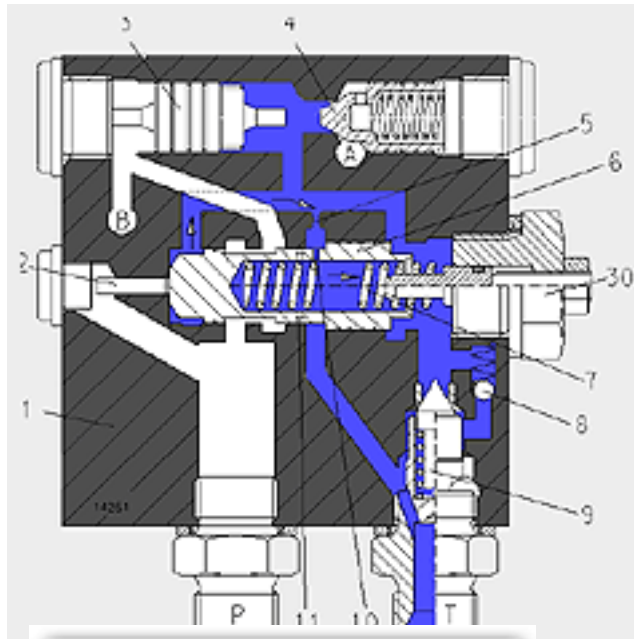
The switching takes place as soon as the piston rod in the reversing cylinder has reached its end position in the first turning phase - (half turn position).

The oil flow then stops and the extra force created by the return oil on the spring side of the spool (6) disappears due to the connection to the tank via orifice (10) causing the pressure to drop.

The pilot piston (2) then pushes the spool (6) across (change-over pressure set at 105bar). The oil behind the spool (6) is first exhausted to tank through orifices (5) and (10), then (11) to achieve the maximum switching speed.

The oil now flows in front of the spool (6), around the lock valve (4) and to the cylinder via port A. Return oil from the cylinder flows to port B, around the spool (6), and straight to tank via port T.

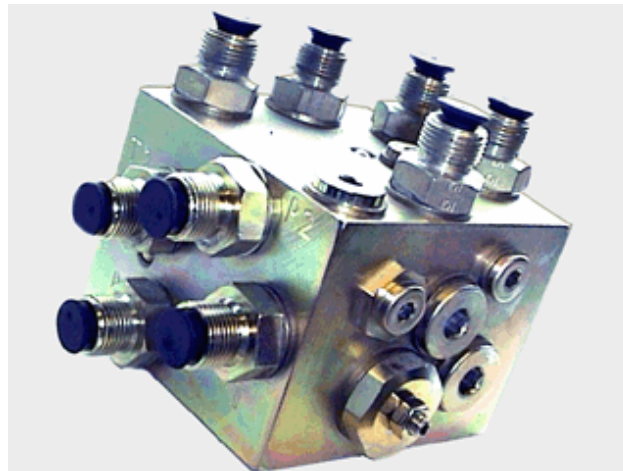
End Of Turning Phase KK012740



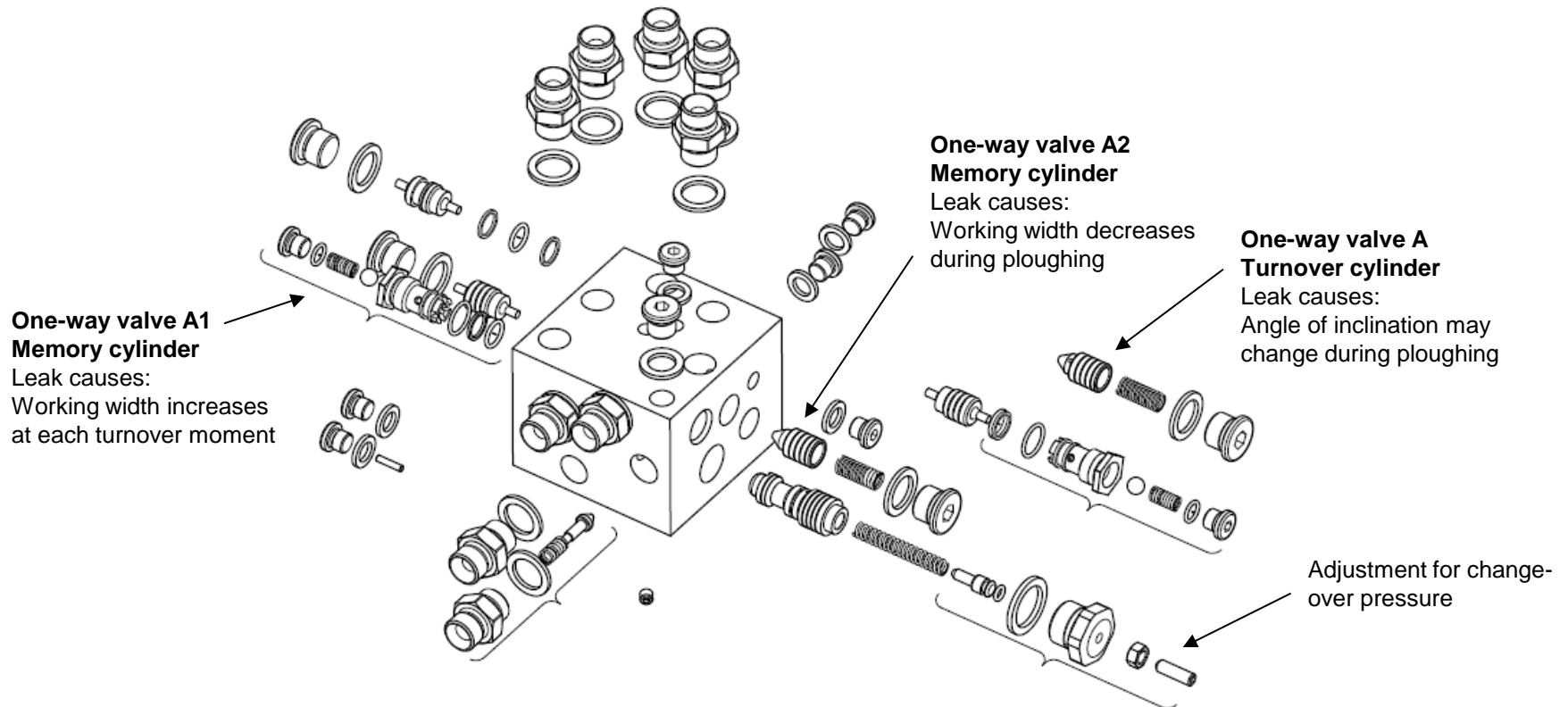
- The diagram shows the valve ready for a new turning phase.
- At the end of the plough reversal, the valve drains itself within a maximum of 5 seconds when the oil supply stops. The pressure spring (7) pushes the spool (6) back to its start position, moving the oil ahead of the spool through the orifices (10) and (11), then to port T.

KK012741 - Change-over valve & memory system

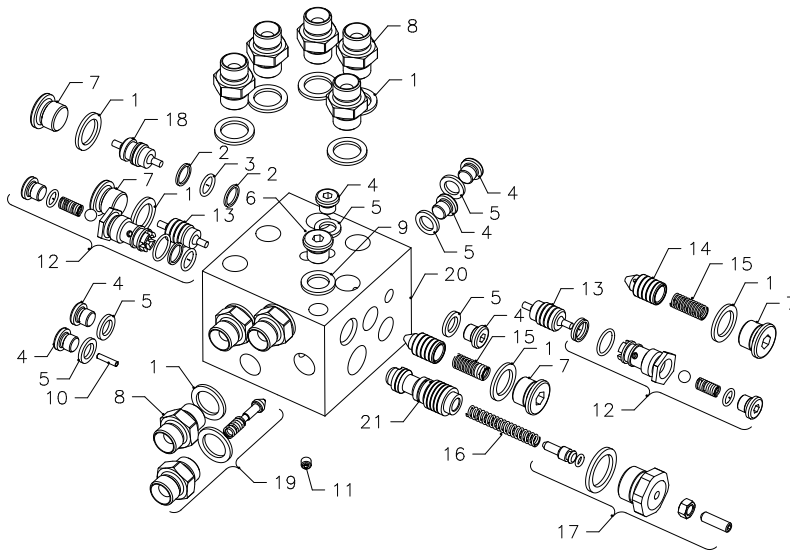
**Ploughs applicable
old LB/EG-240 ploughs turning with bodies
under the main frame during reversal**



KK012741 - Change-over valve & memory system

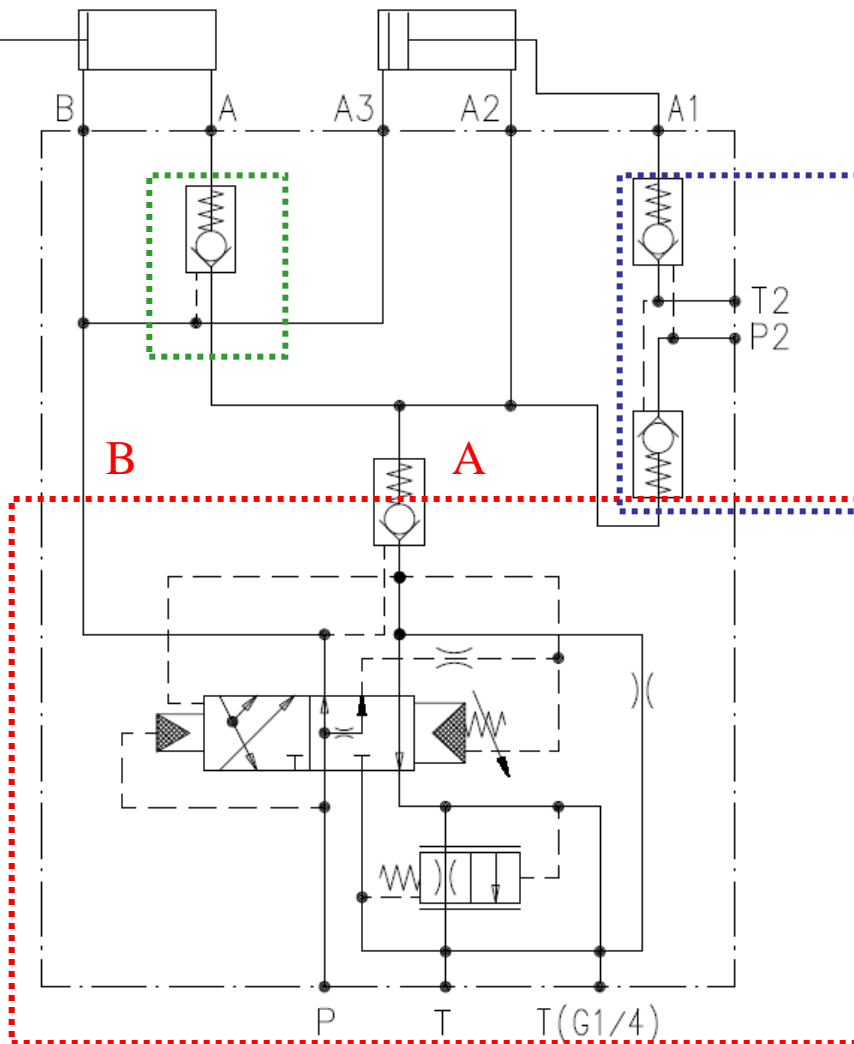


Kverneland part no. KK012741 Memory valve



- **1. KK011585** **Bonded seal**
- 2. KK011775 Back-up ring 8-013-N300-90
- 3. KK011776 'O' ring 10,82x1,78 – 70 shore
- 4. KK012063 Plug G3/8
- **5. KK012064** **Bonded seal G1/8**
- 6. KK012095 Plug G1/4
- 7. KK012122 Plug G3/8
- 8. KK012261 Nipple G3/8
- **9. KK012269** **Bonded seal G1/4**
- 10. KK352760 Needle pin D3x13,8
- 11. KK353319 Restrictor M6x6 with D 0,6 orifice
- **12. KK353390** **Lock valve cartridge**
- 13. KK353394 Pilot plunger
- 14. KK353395 Check valve
- 15. KK353396 Spring 1x8x26,1
- 16. KK353476 Spring 1,25xDM6,3x60
- 17. KK353613 Switch-over pressure adjustment
- 18. KK353623 Pilot piston
- **19. KK354650** **Back pressure valve**
- 20. - Memory block (not available separately)
- 21. - Switch-over spool (not available separately)

Valve Principle KK012741



The memory valve consists of a change-over section and a memory section built together in one block.

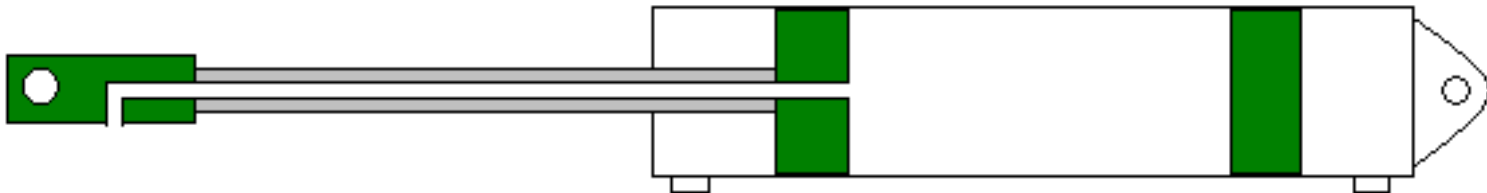
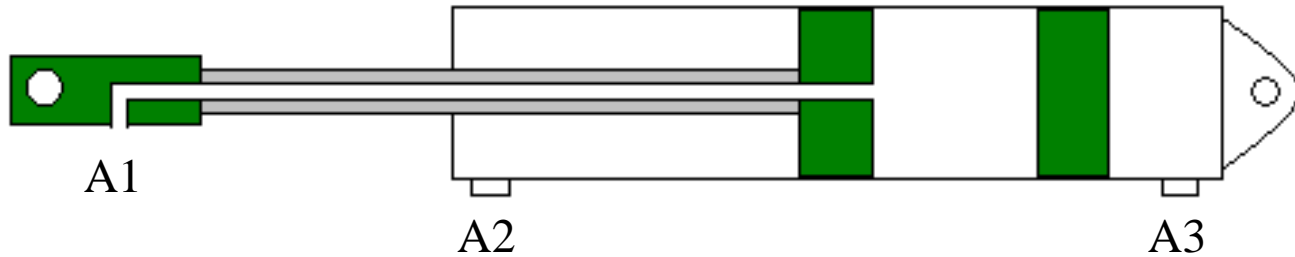
The change-over section is identical to that of valve Part No. 012740

The memory section consists of a two-way lock valve controlled by an extra oil supply from the tractor P2 & T2. In addition, the memory section is fitted with a one-way lock valve to avoid cylinder creep from port A.

When the plough is used in conjunction with a soil packer, the cylinder is connected to G1/4 T port.

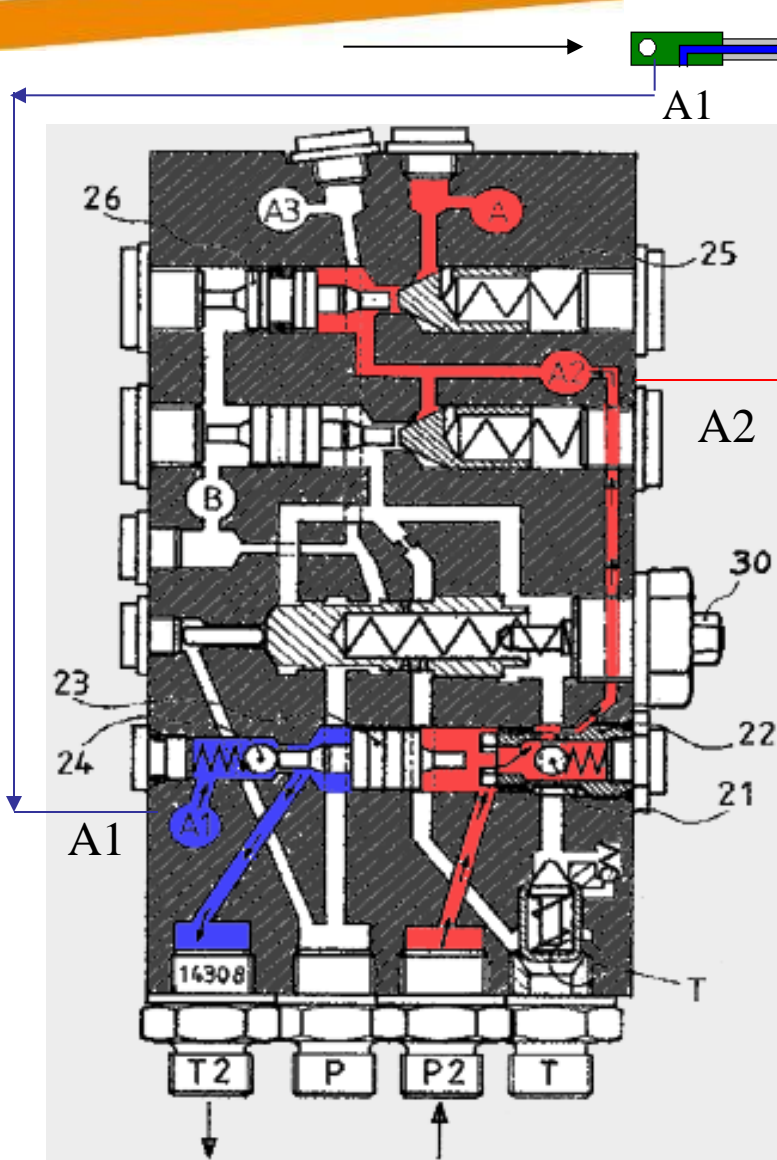
Memory Cylinder Function (LB/EG vari-width ploughs)

12" ← Furrow width → 20"



View Cylinder

Valve KK012741



Furrow width is increased

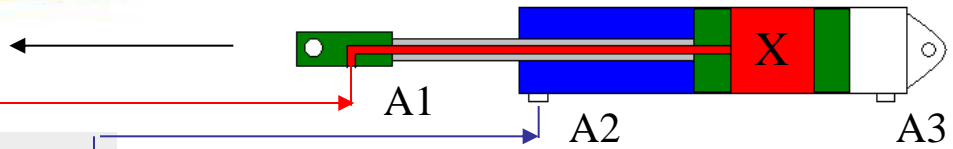
Ports P & T – reversing & change-over section.

Ports P2 & T2 - furrow width and memory section.

The diagram shows the memory section where port P2 is supplied with oil. The oil flows behind the pilot piston (23) which lifts the ball (24), around the ball (21), through the valve housing (22) and to the rod side of the memory cylinder via port A2.

Return oil from the memory cylinder flows through the piston rod to port A1, around the ball (24) and to the tank via port T2.

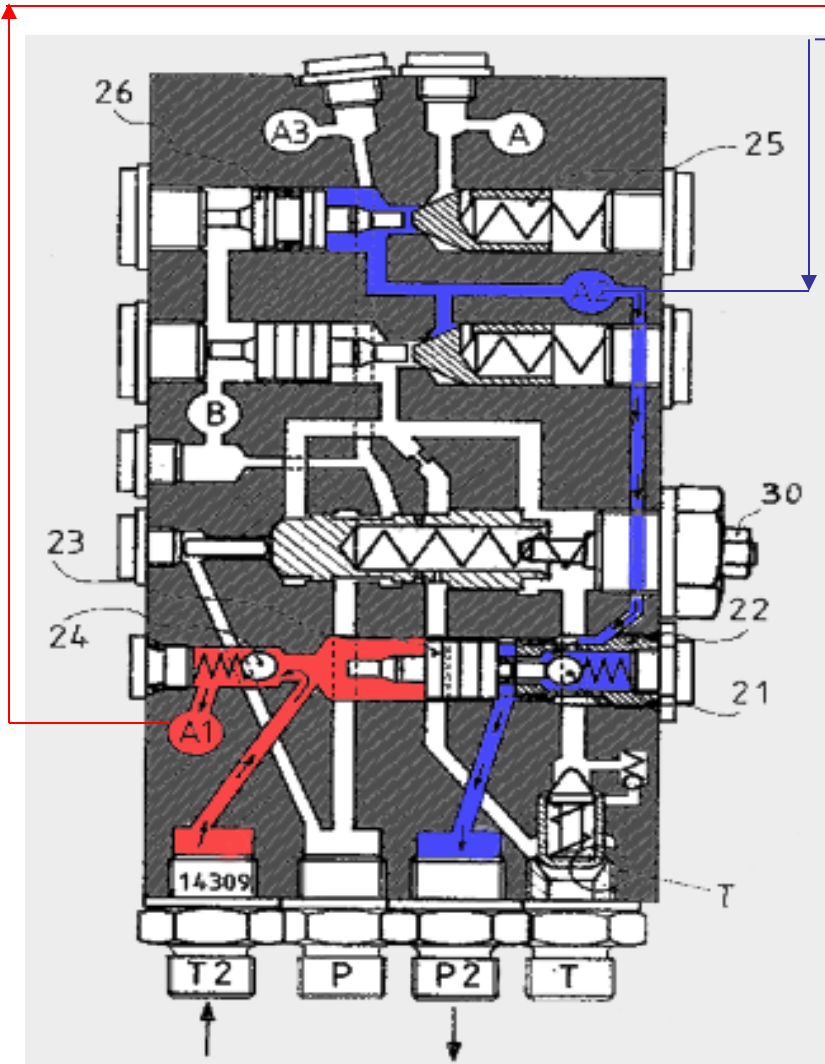
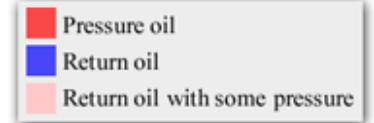
As oil is exhausted from chamber 'X', the effective piston size has reduced. The stroke length of the memory cylinder therefore is now increased and widens the furrow width of the plough.



Furrow width is reduced - 012741

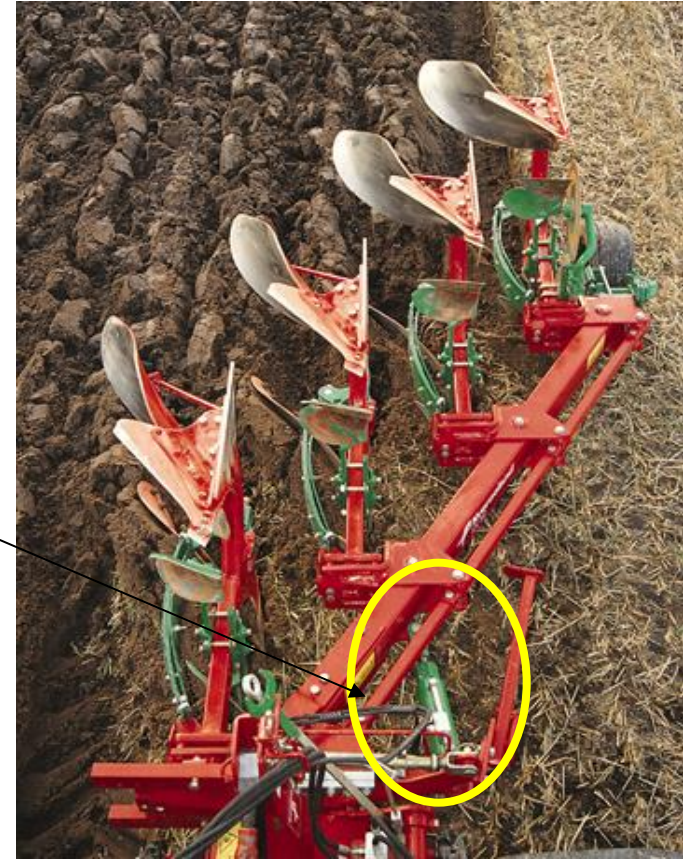
The diagram shows the memory section where port T2 is supplied with oil. The oil flows behind the pilot piston (23) which lifts the ball (21), around the ball (24) and through the piston rod to the memory cylinder from A1. Return oil from the rod side of the cylinder flows to port A2, through the valve housing (22), around the ball (21) and to the tank via port P2.

The furrow width is now reduced as oil enters chamber 'X' and the effective piston size has increased. The stroke length of the memory cylinder therefore is now reduced and narrows the furrow width.



KK012742 - Change-over valve & sequence operation

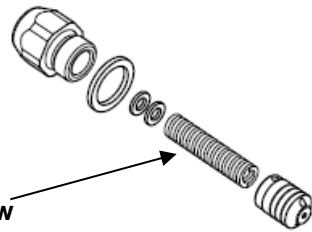
Ploughs applicable:
Models LS/ES 5f & LD/ED
(all non vari-width ploughs with
a frame alignment cylinder)



KK012742 - Change-over valve & sequence operation

Sequence spring yellow

Secures against premature realigning during the 2. turnover cycle. On tractors with low oil pressure, removal of shim may be necessary if realigning doesn't take place



One-way valve A & A2

Turnover & aligning cylinder

Leak causes:

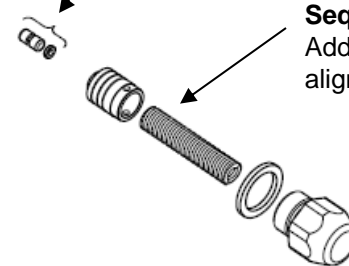
Angle of inclination may change & working width decreases during ploughing



Plunger piston D=6 mm with green O-ring

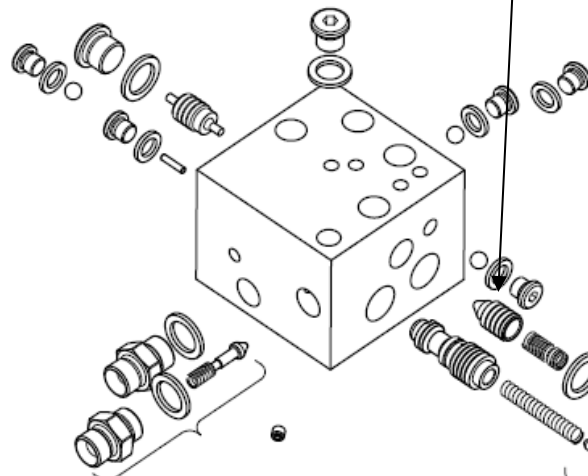
Leak causes:

Angle of inclination may change & working width decreases during ploughing

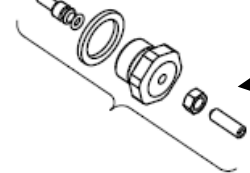


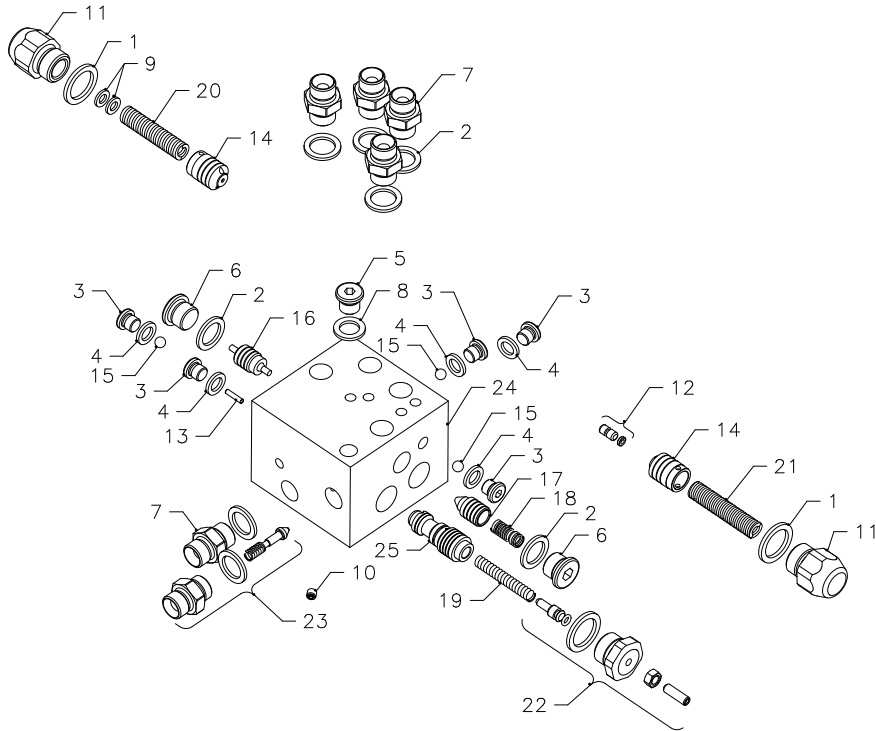
Sequence spring blue

Add shim if turning starts before aligning



Adjustment for change-over pressure

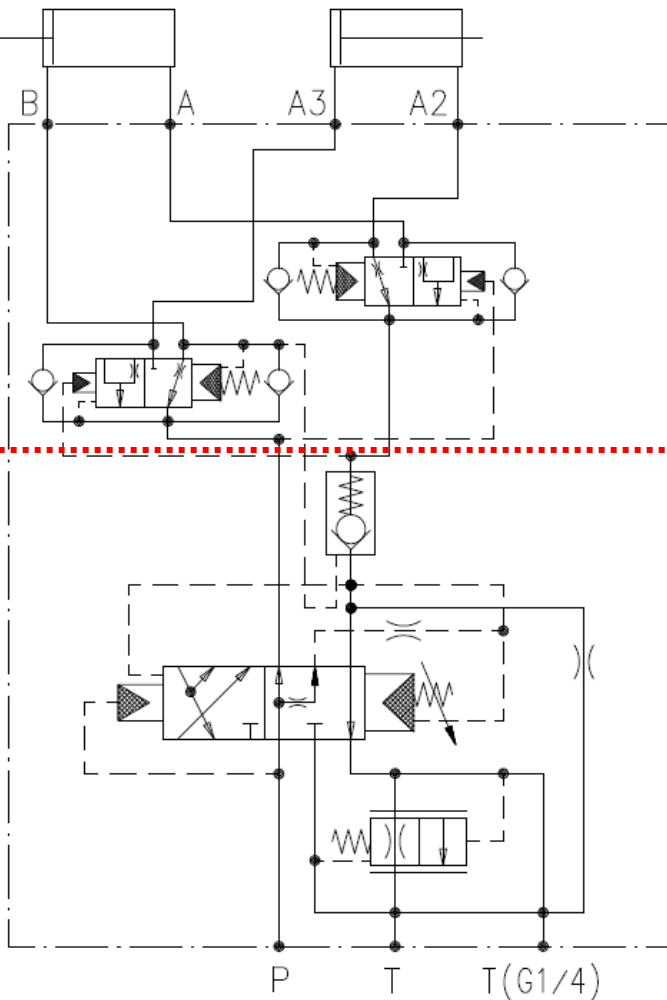




Kverneland part no. KK012742 Sequence valve

- **1. KK011565** Bonded seal G1/2
- **2. KK011585** Bonded seal G3/8
- 3. KK012063 Plug G1/8
- **4. KK012064** Bonded seal G1/8
- 5. KK012095 Plug G1/4
- 6. KK012122 Plug G3/8
- 7. KK012261 Nipple G3/8
- **8. KK012269** Bonded seal G1/4
- 9. KK012988 Shim 6,4x12x1,6
- 10. KK013551 Restrictor M6x6 with D 0,8 orifice
- 11. KK013777 Dome nut
- **12. KK352758** Plunger D6 cpl. (with green 'O' – ring)
- 13. KK352760 Needle pin D3x13,8
- 14. KK352776 Sequence plunger
- **15. KK353324** Ball D8
- 16. KK353394 Pilot plunger
- 17. KK353395 Check valve
- 18. KK353396 Spring 1x8x26,1
- 19. KK353476 Spring 1,25xDM6,3x60
- 20. KK353611 Spring yellow-12,5x64
- 21. KK353612 Spring blue-12,5x76
- 22. KK353613 Switch-over pressure adjustment
- **23. KK354650** Back pressure valve
- 24. - Sequence block (not available separately)
- 25. - Switch-over spool (not available separately)

Valve Principle KK012742



The sequence valve consists of a change-over section and a sequence section built together in one block.

The change-over part is identical to that of valve part No.012740.

The sequence section is a combined pressure and flow valve and for the plough to reverse, the valve goes through 4 stages of operation.

1st = plough frame alignment - frame swings in

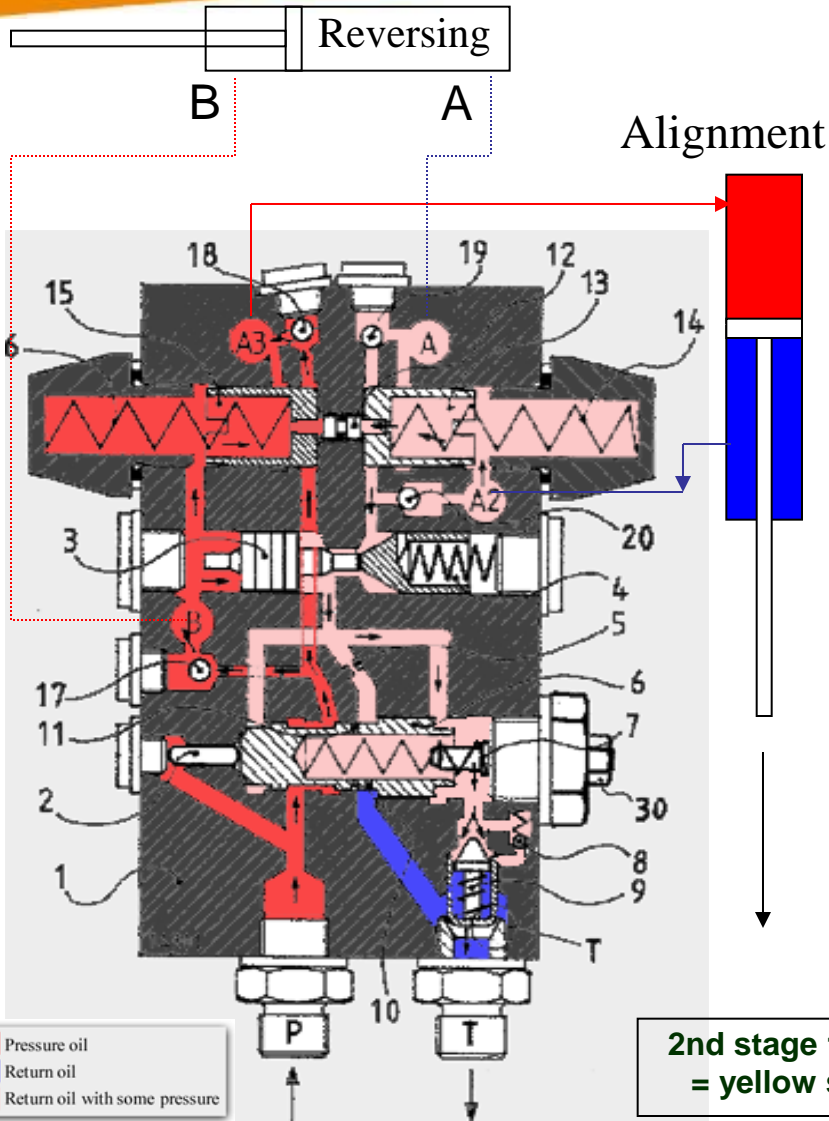
2nd = plough reverses half way to TDC

3rd = change-over and plough completes reversal

4th = plough frame alignment - frame swings out

Plough Alignment 012742 - 1st stage

The diagram shows the valve where port P is supplied with oil. The oil flows behind the pilot piston (2), around the change-over spool (6), through the non-return valve (17), behind the pilot piston (3) which lifts the plunger (4), behind the pilot piston (12), through the non-return valve (18), to the alignment cylinder via port A3 and to the reversing cylinder via port B. Return oil from the alignment cylinder flows to port A2, through the orifice in the sequence spool (13), around the plunger (4), behind the change-over spool (6), through the back-pressure valve (9) and to tank via port T. Because the return oil from A2 creates an extra force together with the force from the blue spring (14) (used to be red), the small pilot piston (12), is prevented from switching the sequence spool (13), so that the oil from the reversing cylinder is blocked. Likewise, the return oil creates a back pressure to secure the change-over spool (6) against switching as described in the function description for valve 012740.

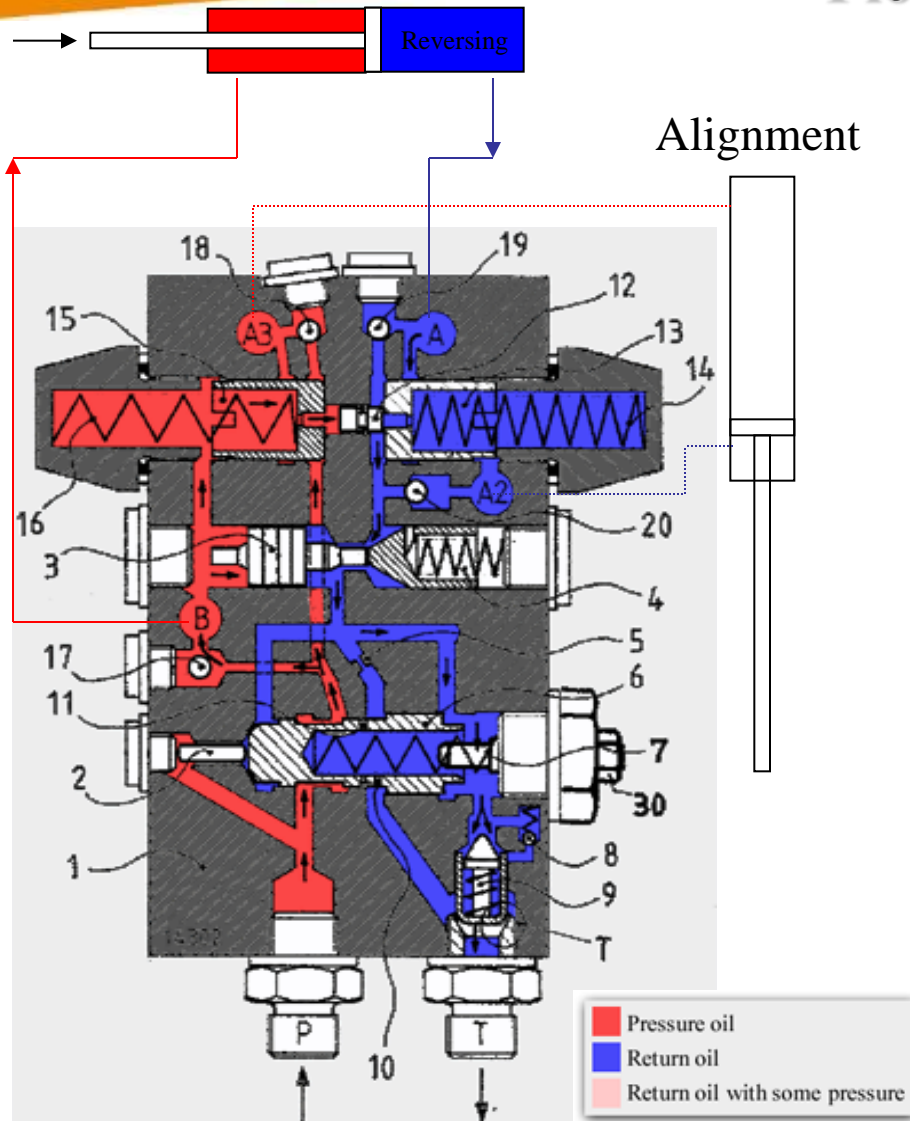


2nd stage 140 bar
= yellow spring



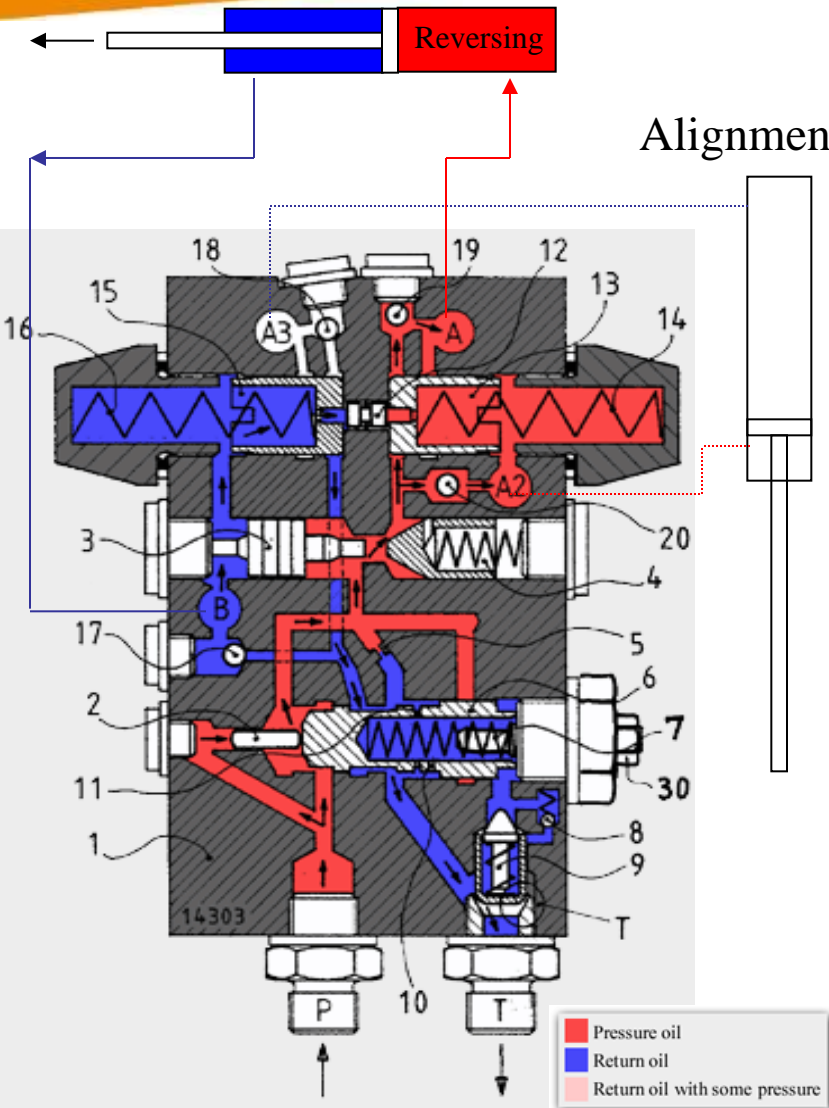
1st stage 90 bar
= blue spring (was red)

Plough Turnover 012742 - 2nd stage



The diagram shows the valve where the sequence spool (13) is switched over. The switching takes place as soon as the alignment cylinder movement is finished. The oil flow then stops and the extra force on the spring side of the sequence spool (13), disappears. The oil pressure from (15) pushes the pilot piston (12) which then pushes the sequence spool (13) and opens the return oil from the reversing cylinder. Return oil from the reversing cylinder now flows to port A, around the sequence spool (13), around the plunger (4) behind the change-over spool (6), through the back-pressure valve (9) and to the tank via port T. The change-over spool (6) is secured against switching as described for valve 012740

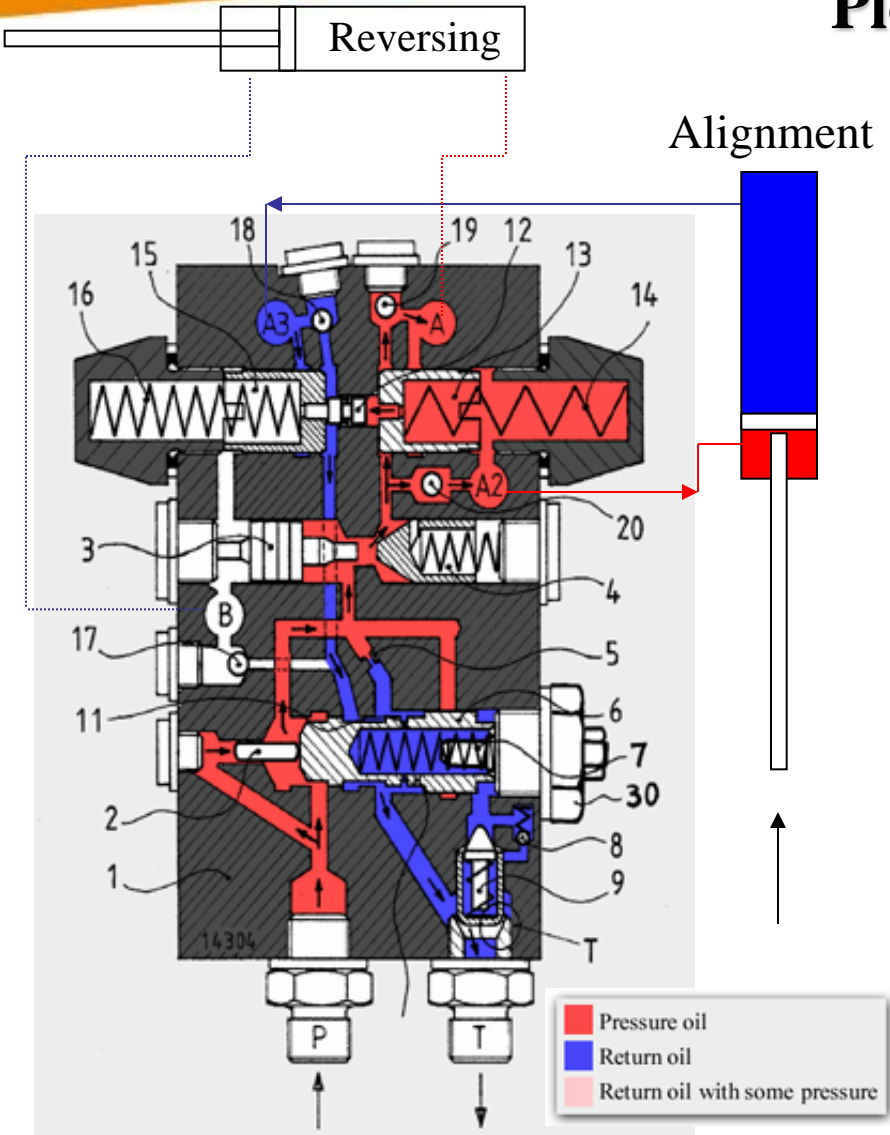
Plough Turnover 012742 - 3rd stage



The diagram shows the valve where the change over spool (6) is switched over as described in the function for valve 012740.

The oil flows ahead of the change-over spool (6), around the plunger (4), around the sequence spool (13) and behind the pilot piston (12), through the non-return valves (19) and (20), to the reversing cylinder port A and to the alignment cylinder via port A2. Return oil from the reversing cylinder flows to port B, through the orifice in the sequence spool (15), around the change-over spool (6) and straight to tank via port T. Due to the pressure drop through the orifice in the sequence spool (15), the return oil will create an extra force on the yellow spring side in addition to the force from the spring (16). This secures the pilot piston (12) from switching the sequence spool (15) so that return oil from the alignment cylinder A3 is closed.

Plough Alignment 012742 - 4th stage



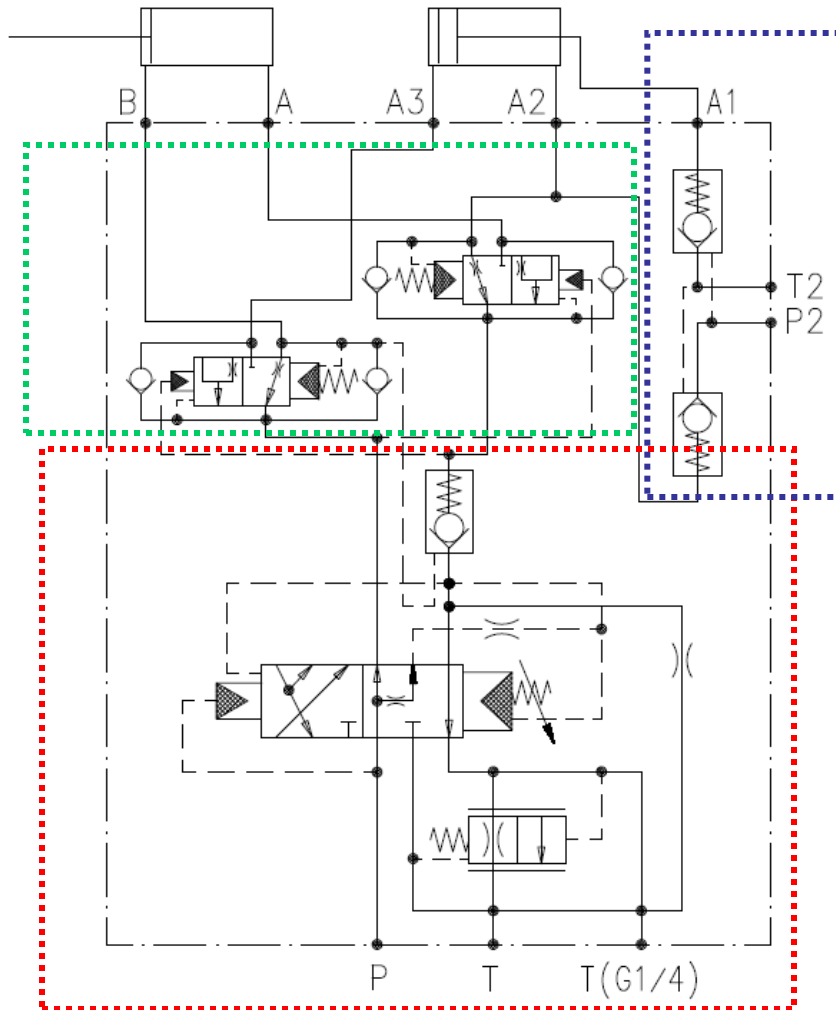
The diagram shows the valve where the sequence spool (15) is switched over. The sequence change-over takes place as soon as the third reversing phase has finished. The oil flow then stops and the extra force on the spring side of the sequence spool (15) disappears. The pilot piston (12) pushes the sequence spool (15) over to allow return oil to exhaust from the alignment cylinder. Return oil from the alignment cylinder now flows to port A3, around the sequence spool (15), around the change-over spool (6) and straight to the tank via port T.

KK012743 - Change-over valve, memory & sequence operation

**Ploughs used: LB/EG (ploughs with
memory/alignment cylinder)**



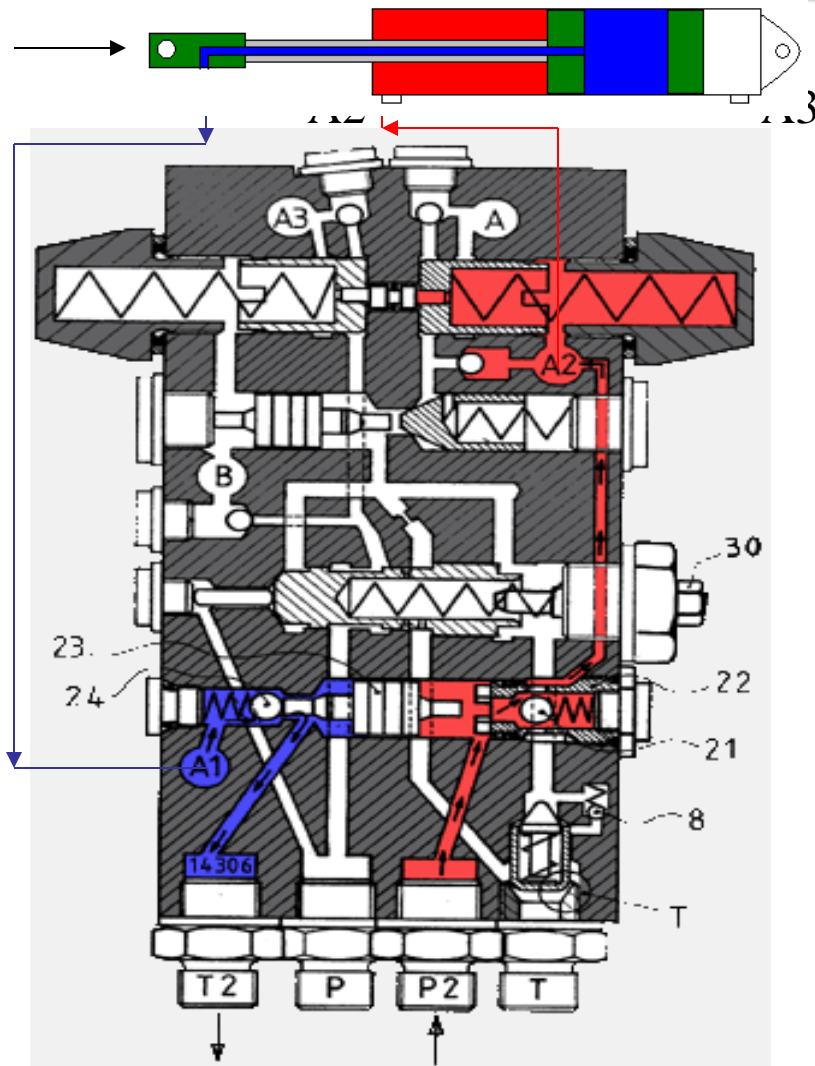
Valve Principle 012743



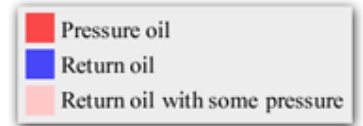
The sequence-memory valve consists of a **change-over section**, a **sequence section** and a **memory section** built together in one block.

The change-over section and sequence section are identical to the sequence valve Part No. 012742. The memory section consists of a two-way oil lock valve controlled by an extra spool section from the tractor P2 and T2.

The furrow width of the plough is being increased - 012743

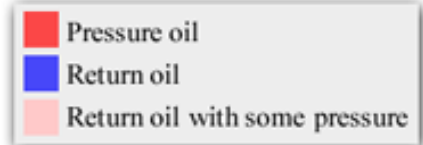
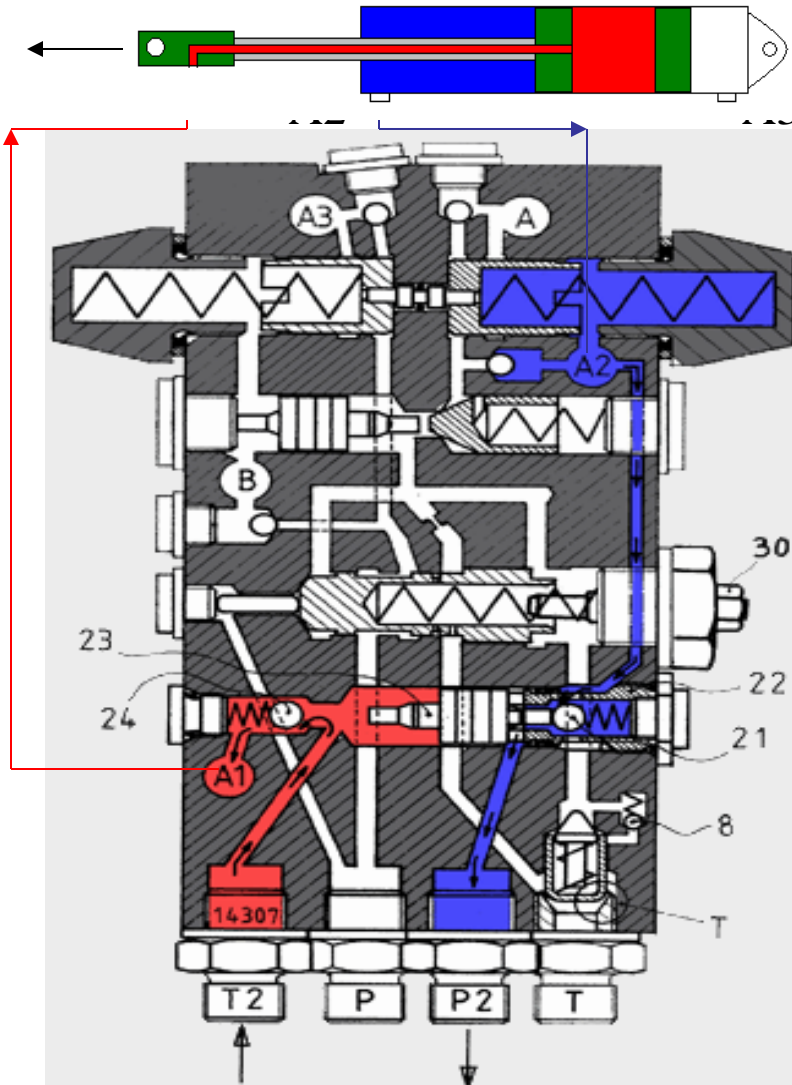


The diagram shows the memory section where port P2 is supplied with oil. The oil flows behind the pilot piston (23) which lifts the ball (24), around the ball (21), through the valve housing (22) and to the rod side of the memory cylinder via port A2. Return oil from the memory cylinder flows through the piston rod to port A1, around the ball (24), and to the tank via port T2. The furrow width is now being increased.



The furrow width of the plough is being reduced - 012743

The diagram shows the memory section where port T2 is supplied with oil. The oil flows behind the pilot (23) which lifts the ball (21), around the ball (24) and through the piston rod to the memory cylinder via port A1. Return oil from the rod side of the cylinder flows to port A2, through the valve housing (22), around the ball (21) and to tank via port P2. The furrow width is now being reduced.



Valve components



← Change-over spool on all valves



← Check valve on all valves



← Tee port on all valves (return oil)



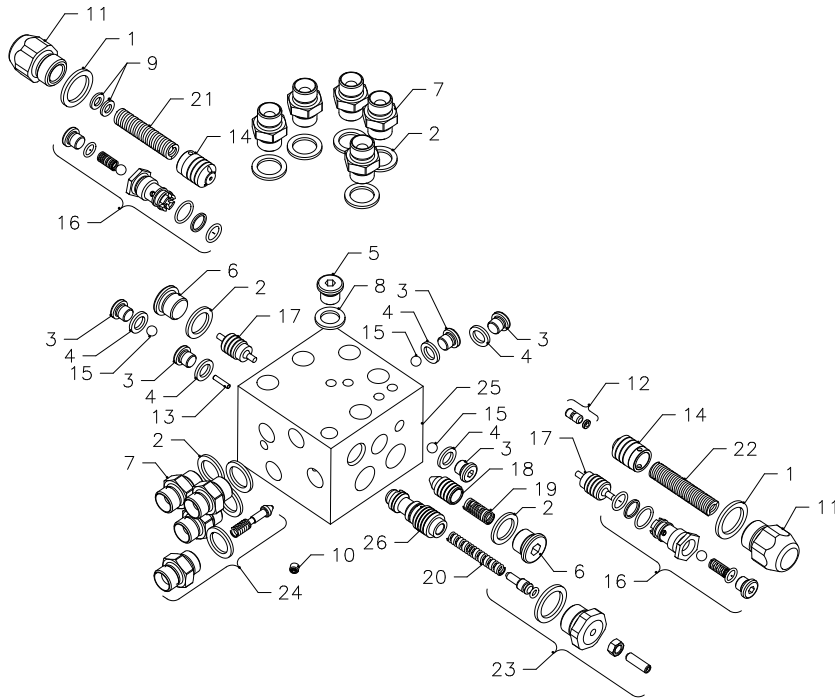
← Sequence valve fitted on 012742 & 43



← Check valve fitted on current 012741 & 43



← Check valve fitted on early 012741 & 43

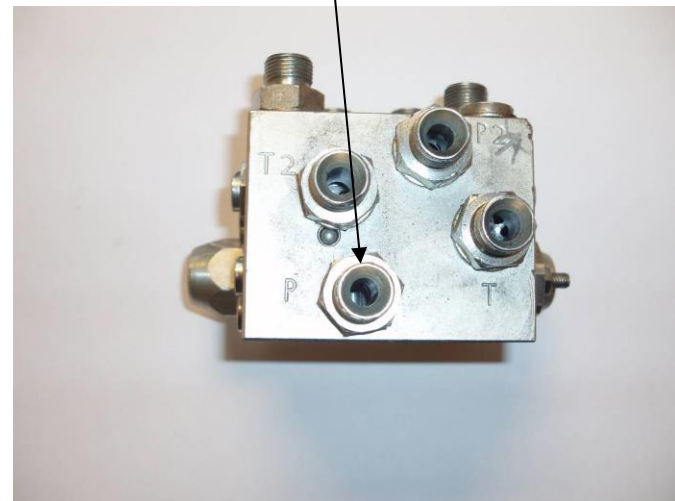
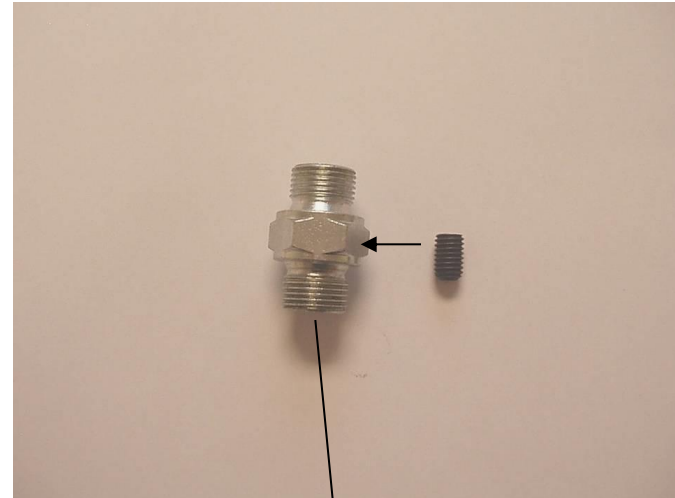


Kverneland part no KK012743 Sequence/memory valve

- 1. **KK011565** Bonded seal G1/2
- 2. **KK011585** Bonded seal G3/8
- 3. **KK012063** Plug G1/8
- 4. **KK012064** Bonded seal G1/8
- 5. **KK012095** Plug G1/4
- 6. **KK012122** Plug G3/8
- 7. **KK012261** Nipple G3/8
- 8. **KK012269** Bonded seal G1/4
- 9. **KK012988** Shim 6,4x12x1,6
- 10. **KK013551** Restrictor M6x6 with D 0,8 orifice
- 11. **KK013777** Dome nut
- 12. **KK352758** Plunger D6 cpl. (with green 'O' – ring)
- 13. **KK352760** Needle pin D3x13,8
- 14. **KK352776** Sequence plunger
- 15. **KK353324** Ball D8
- 16. **KK353390** Lock valve cartridge
- 17. **KK353394** Pilot plunger
- 18. **KK353395** Check valve
- 19. **KK353396** Spring 1x8x26,1
- 20. **KK353476** Spring 1,25xDM6,3x60
- 21. **KK353611** Spring yellow-12,5x64
- 22. **KK353612** Spring blue-12,5x76
- 23. **KK353613** Switch-over pressure adjustment
- 24. **KK354650** Back pressure valve
- 25. - Sequence-memory block (not available separately)
- 26. - Switch-over spool (not available separately)

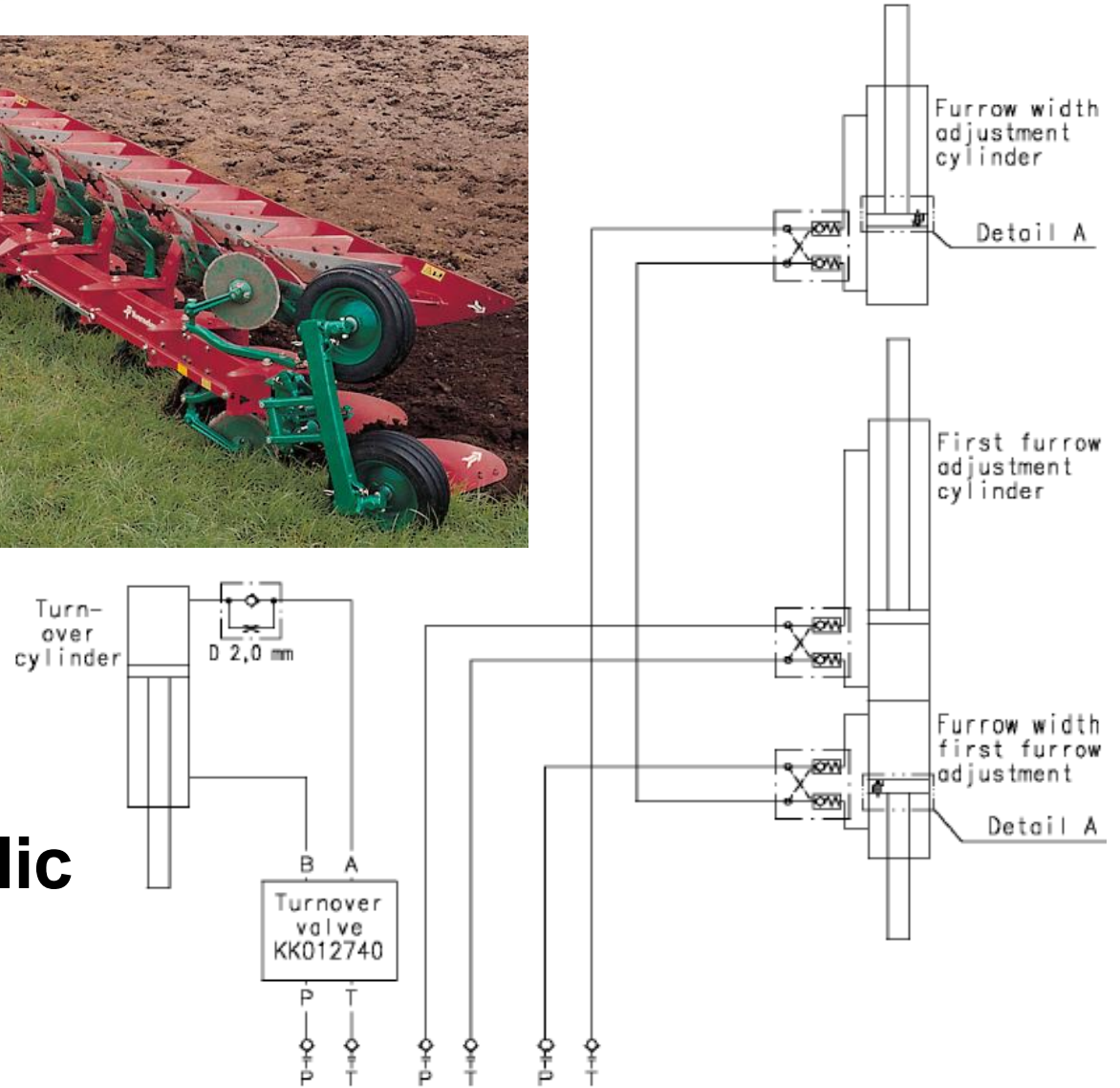
Restrictor for turning valves

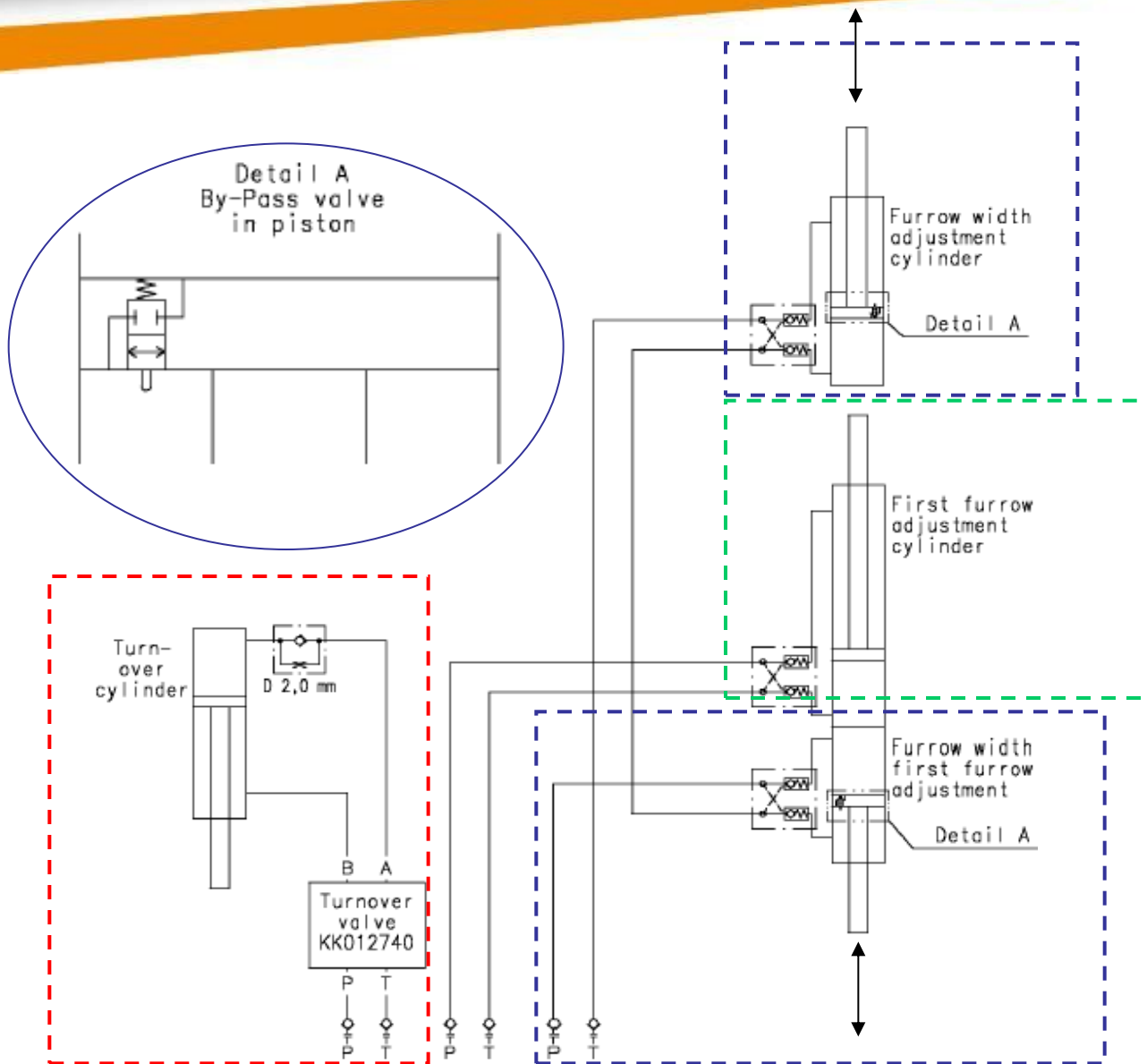
- Recommended oil flow from tractor to the hydraulic system on the plough is approx 35 l/min
- On some tractors it can be difficult to adjust the oil flow to an exact quantity that will ensure perfect turnover function.
- In these cases a 2 mm restrictor in the P-port will reduce the oil flow sufficient to secure turnover function.
- The part is available from Spare Part. KK012343 will be complete with restrictor.





EO/LO Hydraulic Layout





EO/LO Hydraulics



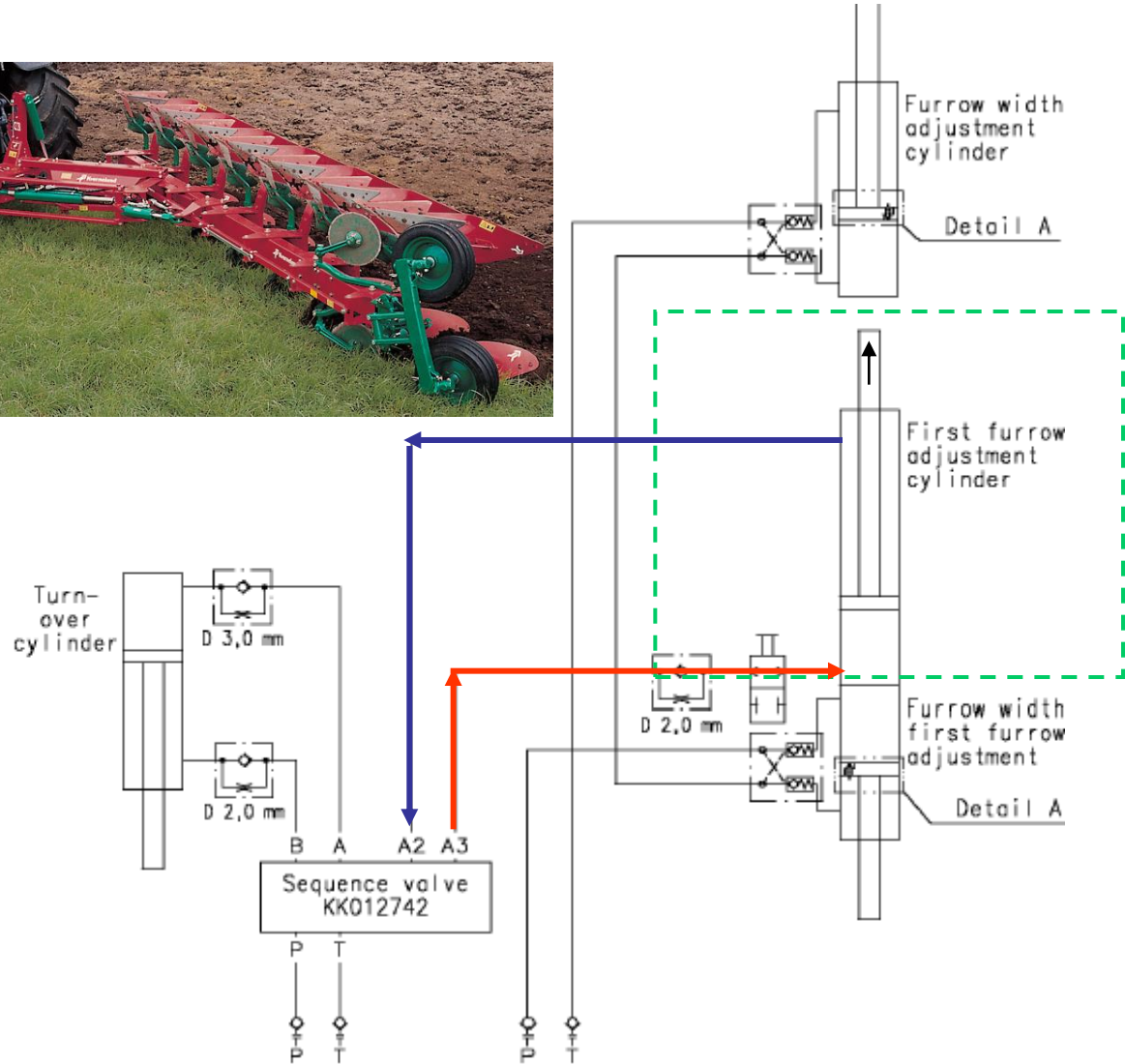
Plough reversing section via 300 headstock

Frame alignment section for 'in-furrow' to 'on-land' and front furrow width adjustment when the plough is used 'in-furrow'

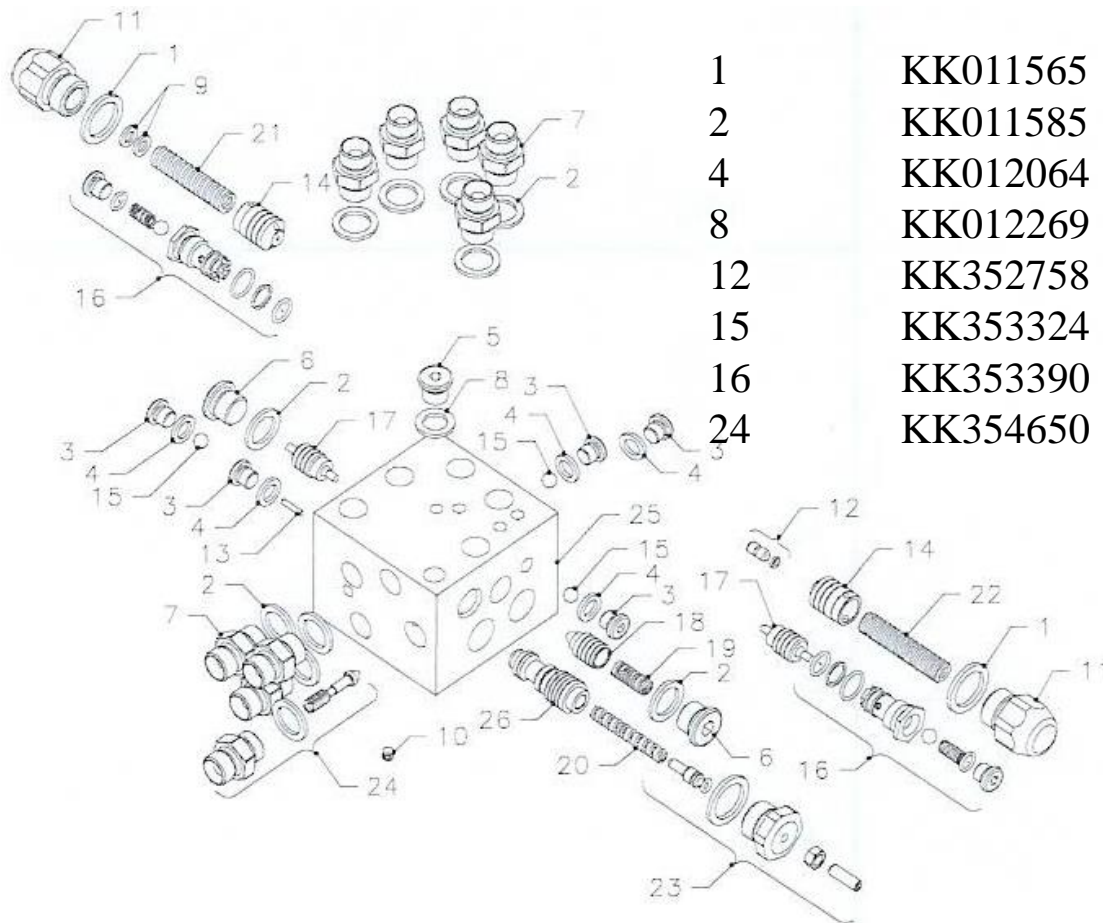
Vari-Width section adjustment using master & slave

LO/EO hydraulics with sequence option – ‘in-furrow’

1st = plough frame aligns to the ‘on-land’ position via port A3



KK013645 Repair Kit for valves KK012740/41/42/43



- | | | |
|----|----------|-------------------------------|
| 1 | KK011565 | Bonded seal G1/2 |
| 2 | KK011585 | Bonded seal G3/8 |
| 4 | KK012064 | Bonded seal G1/8 |
| 8 | KK012269 | Bonded seal G1/4 |
| 12 | KK352758 | Plunger D6 c/w green 'O' ring |
| 15 | KK353324 | Ball D8 |
| 16 | KK353390 | Lock valve cartridge |
| 24 | KK354650 | Back pressure valve (new) |

End