

## SAPAG

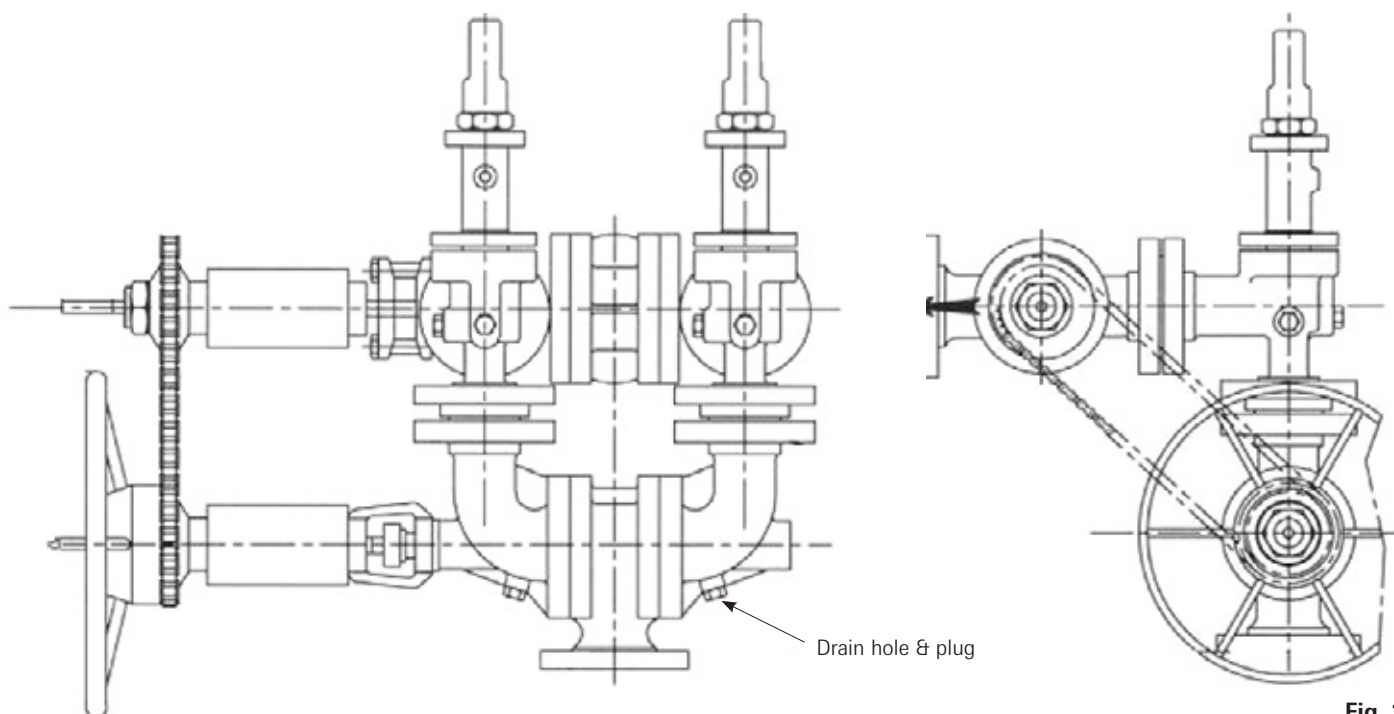


Fig. 1

### 1. Associated instructions

A Sapag Interlock is the association of two Changeover Valves plus the interlocking system. Each individual Changeover Valve is to be operated and maintained as per the Changeover Valve Installation and Maintenance Instructions SAPDR 0009 EN. All related instructions must be read and understood before undertaking any action!

### 2. Site erection

The Sapag Interlocks are shipped either fully assembled with the associated safety relief valves or separately.



Sapag Interlocks are fitted with plugged drain holes on each of the four branches. It is advisable to connect these drain holes to appropriate stop and drain valves so that the fluid contained in a closed branch can be drained before a safety relief valve is removed from the installation

When the Interlock is shipped separately, the following assembly instruction shall be followed:

1. The piping must be absolutely clean from foreign matters.
2. Remove the flange protectors at the very last moment.
3. Handle the changeover valves and the safety valves with extreme care, avoid chocks and damages.
4. Take care of the unbalance of these valves and use appropriate and secure lifting devices.
5. The changeover valves are shipped in the as-tested conditions and are normally tight and closed; it might be necessary to tighten the packing rings at the time of pressurisation.
6. Ensure that the two changeover valves are in a position where the discs close the port opposite to the stem and wheel.
7. Install the inlet changeover valve onto the piping.

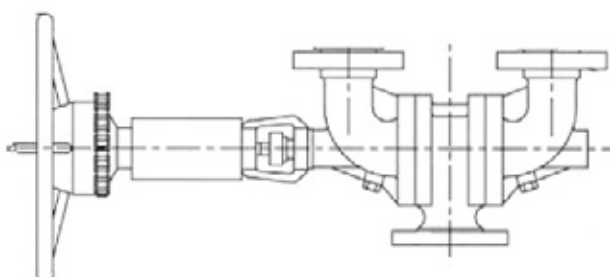


Fig. 2

8. Install the two safety relief valves. (See Fig. 3)
9. Install the outlet changeover valve; take care of the unbalance and support the weight of the valve until it is securely fastened on both sides, safety relief valve outlets and exhaust piping. (See Fig. 4)
10. Make sure that the two discs are in the corresponding starting position.
11. Adjust (if required) and assemble the chain (2) onto the appropriate cog wheels.
12. The chain should be lubricated using an appropriate mechanical lubricant.
13. Assure that the tension of the chain is loose enough not to increase the required torque, and tightened enough to avoid the chain to be derailed.
14. Torque limiter adjustment:
  - a) The torque is calibrated by tightening three pressure screws located on each torque limiter nut.
  - b) Adjust the pressure of the screws of the limiter nuts so that the torque overcomes the friction of the stems into their respective packing.
  - c) Finally, tighten the inlet changeover valve torque limiter harder than the outlet changeover valve; it must remain possible to turn the hand-wheel when the outlet valve disc has reached its seat and the inlet disc is still travelling to position.
  - d) The Interlock is securely and fully operated when:
    - the position indicators show the correct location of both discs, and
    - both torque limiters are slipping while the hand-wheel is operated.
15. The required testing can be performed when all connections have been securely fastened.)

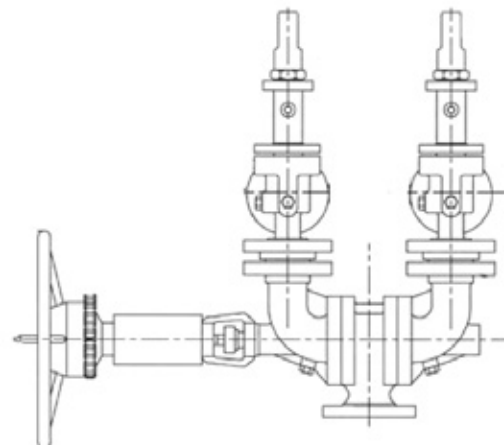


Fig. 3

### 3. Operation

1. The Sapag Interlock is a safe and simple device. However it must be operated only by trained personnel knowing exactly its operation.
2. Start-up: after satisfactory completion of tightness tests on the circuit, and assuring the correct position and closure of the discs of the two changeover valves, the system can be pressurised.
3. The position index at the end of each stem shows the disc position when the index protrude out of the stems, the discs are in the position close to the wheel and the corresponding safety valve is in operation, and vice versa.
4. To change the safety valve in operation:
5. The operator must be trained
6. Turn the wheel to move the discs
7. The two indicators must move together
8. When the first disc comes into the opposite position, go on turning the wheel until both friction discs are slipping on their respective cog wheels, thus showing that both discs have reached their respective closing positions.
9. The corresponding safety valve is isolated and can be serviced.

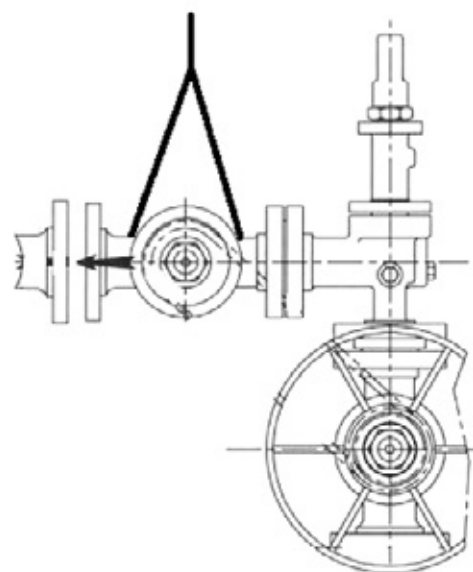


Fig. 4



Make sure that the residual fluid contained in the dead branches of the changeover valves is securely drained before removing the safety valve !

10. When a safety valve is removed from the Interlock, the corresponding ports shall be protected carefully against all foreign matters entry.
11. Operating with only on safety relief valve is service shall remain exceptional and as limited in time as feasible all required warning, labels and operation precautions shall apply.
12. The bearing box is fitted with a lubricator bearing grease should be injected when necessary on a regular basis. The chain shall also be lubricated as necessary based on site conditions.

### 4. Disassembly instructions

#### Assembly dismantling

1. When feasible the Interlock assembly, together with the associated safety relief valves, should be removed from its location as an complete assembly.
2. If this is not feasible, then the weight and unbalance of the device needs to be carefully managed in order to avoid damage and injuries.
3. It is advisable to use a colour marker to indicate all the settings and orientations to facilitate the re-assembly.
4. Remove the chain.
5. While holding the outlet changeover valve with an appropriate lifting device, the inlet of the assembly being securely fastened, disconnect the outlets of the safety relief valves, thus releasing the outlet changeover valve. Carry the outlet changeover valve with care to the repair area.
6. Remove the inlets of the safety Relief Valves and carry with care the inlet changeover valve to the repair area.

### Interlock trim disassembly

1. Put the valve disc in the position opposite to the stem.
2. Remove the hand-wheel (1) and its screws (10).
3. Loosen the three torque limiter nut adjusting screws and remove the Belleville washer centring ring and the Belleville washer.
4. Remove friction disc, the cog wheel and the second friction ring.
5. To remove the torque limiter bottom flange (4):
6. Drive the three radial pins into the clutch bushing (5).
7. Unscrew the hex screw from the hub of the torque limiter bottom flange (4).
8. Remove the bottom flange (4).
9. Remove the radial stop screw (10) locking the bearing nut (6).
10. Remove the bearing nut (6).
11. Unscrew the bushing (5) and the bearing (8) out.

### Bearing box and yoke dismantling

1. The bearing box (9) is tack-welded onto the yoke. Use a grinder to remove the tack weld.
2. While taking care not to damage the indicator (14), unscrew the bearing box (9) and collect the key (12) when it comes out of the box (9).
3. Remove the indicator (14).
4. Loosen the gland flange studs and bolts.
5. The yoke is tack-welded onto the side body; it is normally not necessary to dismantle the yoke; however if required, it can be done by using a grinder to remove the tack weld. Loosen the yoke and remove it together with the gland flange.

## 4. Repair and maintenance

Refer to SAPDR 0009 EN to maintain and repair each individual changeover valve.

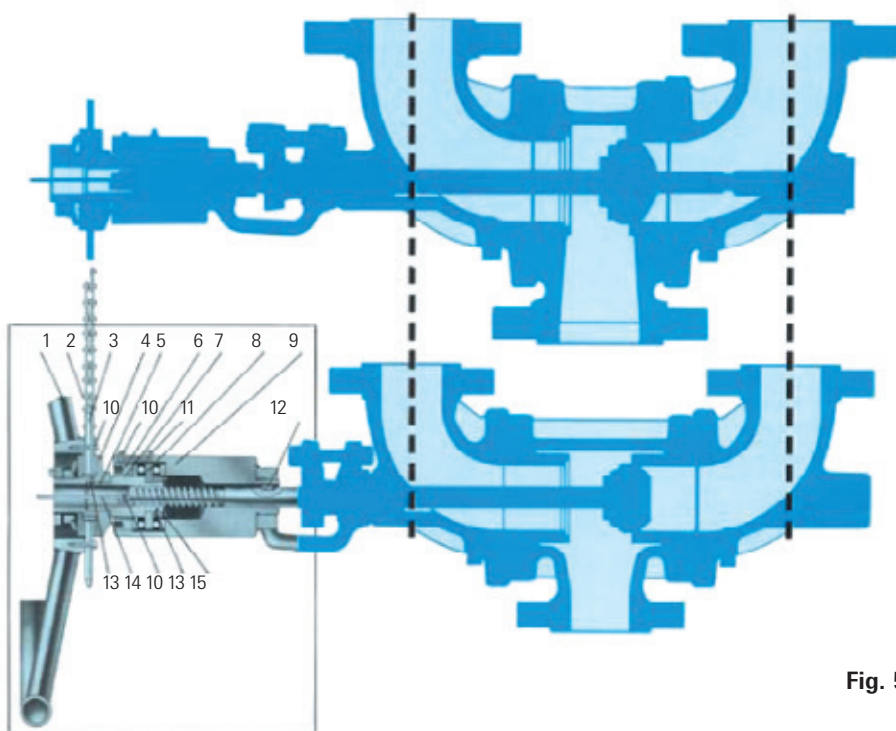


Fig. 5

## Assembly Instructions

### Changeover valves assembly

1. Assemble the two changeover valves separately after completion of maintenance duties.
2. Follow the changeover valve instructions SAPDR 0009 EN for assembly.
3. The changeover valves are assembled: side bodies, main body, disc assembly, stem and stem guides.
4. Insert the packing ring stop rings and the new packing rings.
5. Insert the glands.
6. Locate the discs in the position opposed to the stem.

### Position indicators

1. Mount the valve position indicators (14) at the edge of each stem.

### Interlocking trim assembly

1. Insert the gland flange (and the yoke if removed; the yoke is screwed all the way in on the side body neck, and then back to the correct orientation with regards to the holes of the gland flange; the yoke will be further tack-welded in the right position).
2. Assemble the gland flange studs and bolts; they will be tightened at the final stage.
3. Details of the assembly of the entire Morse torque limiter systems is outlined in appendix.

### Valve testing

1. Perform the pressure tests of each individual changeover valve as per the Installation & Maintenance Instructions, Change-Over Valves, reference SAPDR 0009 EN

### Overall assembly and settings

1. After satisfactory completion of the tests, assemble the changeover valves and their associated safety relief valves. The mounting of the safety valves shall be as per the appropriate Safety Relief Valve Instructions Manuals.
2. Make sure that the two discs are in the corresponding starting position.
3. Adjust (if required) and assemble the chain (2) onto the appropriate cog wheels.
4. The chain should be lubricated using an appropriate mechanical lubricant.
5. Assure that the tension of the chain is loose enough not to increase the required torque, and tightened enough to avoid the chain to be derailed.
6. Assemble the hand-wheel on the inlet changeover valve cog wheel side.
7. Tack-weld the yokes (if required) and bearing boxes (9).
8. Torque limiter adjustment:
  - e) The torque is calibrated by tightening three pressure screws located on each torque limiter nut.
  - f) Adjust the pressure of the screws of the limiter nuts so that the torque overcomes the friction of the stems into their respective packing.
  - g) Finally, tighten the inlet changeover valve torque limiter harder than the outlet changeover valve; it must remain possible to turn the hand-wheel when the outlet valve disc has reached its seat and the inlet disc is still travelling to position.
  - h) The Interlock is securely and fully operated when:
    - the position indicators show the correct location of both discs, and
    - both torque limiters are slipping while the hand-wheel is operated.

### Morse torque limiter and Bearing box sub assembly

1. The clutch bushing and bearing box can be assembled either before installing it onto the valve stem or on the valve stem itself, depending on the operator. It is recommended to assemble the box on the valve directly.
2. Screw the bearing box (9) into the yoke thread ensure the indicator (14) is not damaged during the assembly; when the bearing box comes to the key groove, insert the key (12); screw the bearing box all the way in; it shall be tack-welded at the final stage.
3. Prepare the clutch bushing (5): engage the ball bearing centring ring (8) onto the clutch bushing (5).
4. Lock the centring ring (8) with the ball bearing nut (15) affix the bearing nut (15) with a pin into the clutch bushing (5); the pin must not perforate the bushing and just allow to stop the bearing nut.
5. Assemble the ball bearing with its two rows of balls and plates. The bearing shall be greased using an appropriate MoS2 lubricant or equivalent.
6. The thread of the stem shall be lubricated using an appropriate MoS2 lubricant or equivalent
7. Engage the clutch bushing (5) and its bearing (8) into the bearing box (9) and screw it onto the stem threaded end.
8. Lock the bearing (8) into the bearing box (9) with the bearing nut (6) screw the nut (6) all the way in and then unscrew to allow sufficient clearance (approximately 1/8 to 1/4 turn).
9. Lock the bearing nut in position with a stop screw (10).
10. Insert the torque limiter bottom flange (4) onto the clutch bushing (5) locate the pin holes of the flange (4) in front of each of the three holes drilled into the clutch bushing (5) affix the flange (4) with three pins on the clutch bushing (5); stop the flange (4) using the hex stop screw.
11. Caution ! the friction discs and their counterparts must be absolutely dry and exempt from any lubricant !
12. Pile the first friction disc up on the torque limiter bottom flange (4) together with the centring ring.
13. Pile the cog wheel (3) up on the centring ring.
14. Pile the second friction disc up on the cog wheel (3).
15. Pile the bearing plate (with the oblong hole) up on the friction disc.
16. Insert the Belleville washer onto the bearing plate and the Belleville washer centring ring on top of it.
17. Engage the torque limiter nut all the way to the contact with the assembly and tighten it moderately. Tighten the three nut adjusting screws evenly and moderately these screws will be adjusted later.

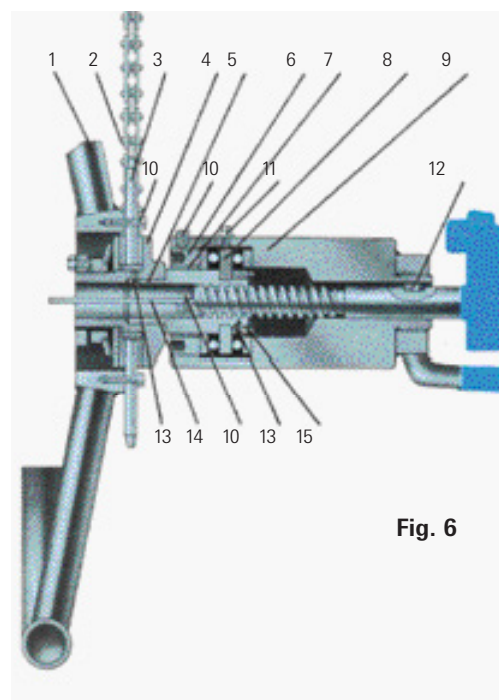


Fig. 6