

### SAPAG

#### Delivery conditions

The Change-Over valves are tested in factory at 1.5 time the maximum pressure of the connecting flange rating.

The discs are tested with air under water at 1.1 time the maximum working pressure.

The Change-Over valves are delivered ready to be assembled.

Our Change-Over valves are delivered with protections in accordance with customer requirements, or in accordance with our standard Quality Plan. Packing and protection caps shall remain in position up to the very last moment prior to the assembly of the Change-Over valve in the piping in order to protect end connections of any damage

#### Storage

When the change over valves are to be stored some time before their installation, the storage shall be made in the original crates of delivery with a watertight protection and/or with desiccant bags. Storage shall be done above ground, indoor in a dry and clean place.

If the storage period is above 6 months, the desiccant bags (if any) shall be replaced at this date.

#### Selection

The materials of change over valves are selected in taking into account the working temperature, the fluid characteristics and any other relevant data that is given at quotation stage.

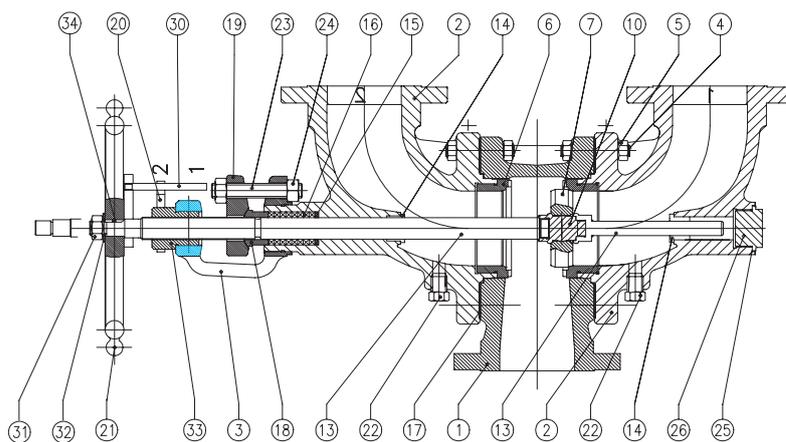
Before to install a change over valve, the compatibility of materials as well as pressure/temperature limitations that are mentioned on the tag plate are suitable to the fluid and process operating conditions.

#### Limitations

The change over valve has been design to install two safety relief valves in parallel. It can not be used for other purposes than to isolate safety relief valves.

#### Operation

The change over valve is a globe valve with one inlet and two outlets. It is used to fit two safety relief valves in parallel; if the change over valve is closed on one end, one safety relief valve is in operation and the other one is isolated, as safe spare; also, if the change over valve is set in the intermediary position, the two safety relief valves are in operation simultaneously. While one safety relief valve is isolated, regular maintenance can be carried out.



The change over valve is manually operated thanks to a wheel. An index located on the stem states which side is open. With no index, the turning clockwise of the hand-wheel is making the opposite side of the hand-wheel to be closed; turning the hand-wheel anti-clockwise is closing the side of the change over which is near the hand-wheel.

When a safety relief valve is isolated for maintenance purposes, it is extremely important to check that the outlet of the change over valve on which it is fitted is well depressurised before proceeding to its disassembly. In order to depressurised the relevant outlet, the drain plug may be used.

The design of the change over valve is such that there is always at least one safety relief valve in operation in order to insure safety of the system.

### Installation

1. The Change-Over valve is to be installed upstream the connected safety valves.
2. The Change-Over valve has one inlet (upstream) and two outlets (downstream) in parallel.
3. Generally the Change-Over valve has one inlet and two outlets of identical size and rating; in some cases the inlet size can be one or two NPS greater than the outlets, the two outlets being always of the same size.
4. The inlet flange (upstream) is generally horizontal; other mountings are possible, consult the factory.
5. Check if the inlet flange and the two downstream flanges are compatible with respectively the upstream flange and the inlet flanges of the safety valves. Check the shape and cleanness of seating surfaces, gaskets, bolting.
6. The Change-Over valve is to be fitted on the upstream flange, its shaft shall be horizontal.
7. Once the Change-Over valve is in place, its two outlet flanges must be absolutely horizontal.
8. Check if the wheel is at a location such that the access is free and the operation possible.
9. The two connected safety valves must be mounted vertically, spring up side, in parallel on the two Change-Over valve outlet flanges.
10. It is highly recommended to fit a device allowing the drainage of each of the branches of the Change-Over valve when they are isolated; a drain hole (NPT thread) plugged with a steel plug, is located on each branch; it is recommended to fit a drain valve and also of a pressure gage.
11. Start up the unit only when the correct assembly and leak test of the Change-Over valve and the attached safety valves has been successfully completed.
12. Check if the gland nuts are securely fastened before operation (the fastening can be released when starting up or in service).
13. If the Change-Over valve is insulated, the access to the packing gland must remain free.

### Operation

For safety reasons it is important to follow the precautions as listed below before initiating any work on a Change-Over valve:

1. The Change-Over valve is a safety device, essential for the plant safety.
2. Operating a Change-Over valve shall be made only by authorised personnel, according to a known procedure, and on a definite schedule.
3. A Change-Over valve is a speciality valve, requiring from the operator a perfect knowledge of its principle of operation.
4. When the Change-Over valve is not to be operated, the wheel of the Change-Over valve shall be duly locked.
5. Operating the Change-Over valve on a regular schedule (recommended: once every six months) should improve the valve operation and the plant safety.
6. Before the initial start up it is recommended to proceed with a pneumatic test at low pressure to check the tightness; to achieve this test, open the Change-Over valve to mid-way position in reference to the index on the shaft and slowly build up the pressure. Check for eventual leaks at the inlet connection and at the safety valves connections, and at the packing gland.
7. Once this test has been successfully completed then the Change-Over valve can be put into operation.
8. According to local regulation there are two ways to operate the Change-Over valve:
  - Either one branch in operation, one branch in back up;
  - Either both branches in simultaneous operation.
  - The type of operation should be clearly stated on the site procedure for operation and maintenance.
9. Operation one branch in service, one in back up:
  - One single safety valve (1) provides the site protection.
  - The second safety valve (2) is a back-up.
  - On a scheduled basis, or in case of failure (leakage of safety valve), the Change-Over valve is operated to isolate one of the two safety valves.
  - Check through the drain hole that the isolated branch has zero pressure.
  - The damaged safety valve can be removed and repaired.
  - During that period when one of the valve is removed and maintained it is recommended to fit a blind flange onto the branch from where the safety valve is removed.
  - Once the repaired valve is in place again, proceed if necessary with a pneumatic test (leak test) of the isolated branch on which the safety valve has been mounted through the drain hole.
  - The Change-Over valve can then be operated to isolate the safety valve in service and put back into service the repaired safety valve.
  - Lock the wheel of the Change-Over valve when procedure is completed.

### 10. Operation 2 ways simultaneously:

This is typical configuration for fire protection of storage tanks of liquefied or liquid hydrocarbon.

- The two safety relief valves (1) and (2) insure simultaneously the installation protection.
- Operation with one safety relief valve alone is allowed only during maintenance period of the second safety relief valve.
- On a regular basis, or for an incident on a safety relief valve (such as leakage) the Change-Over valve is operated in order to isolate one of the two safety valves.
- It needs to be checked, through the drain hole, that the way on which the safety relief valves is installed is not under pressure.
- It is then possible to take the safety relief valve out and carry out its maintenance.
- During the complete period during which the safety valve is not in operation, which shall be as short as possible, it is recommended to install a blind flange on the outlet of the Change-Over valve.
- Once the safety relief valve is back in place, a pneumatic test may be carried out for tightness verification on the isolated channel on which the safety valve has been re-fitted, using the drain hole.
- Then, the Change-Over valve can be operated and the disc placed back into its midway position to get back the original configuration.
- Lock the wheel of the Change-Over valve when completed.

### Maintenance

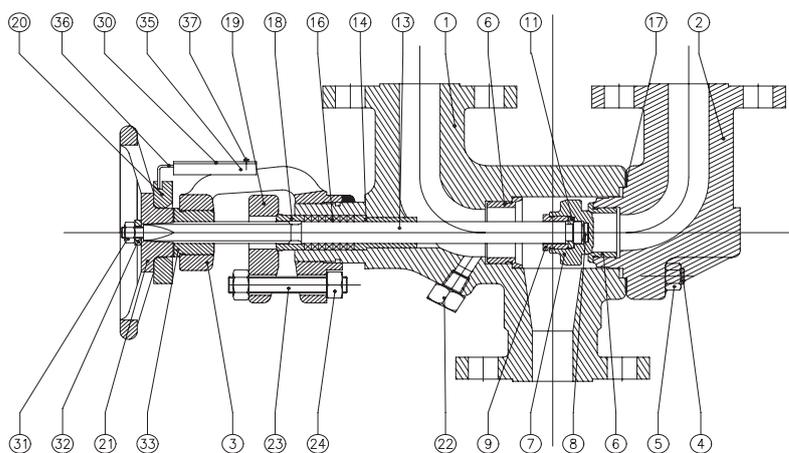
Depending on the dimensions, the Change-Over valves feature the following design characteristics:

- (Body - Elbow) + Elbow with cantilever shaft (type I)
- One intermediate body and two side elbows with cantilever shaft (type II)
- One intermediate body and two side elbows with supported shaft (type III)

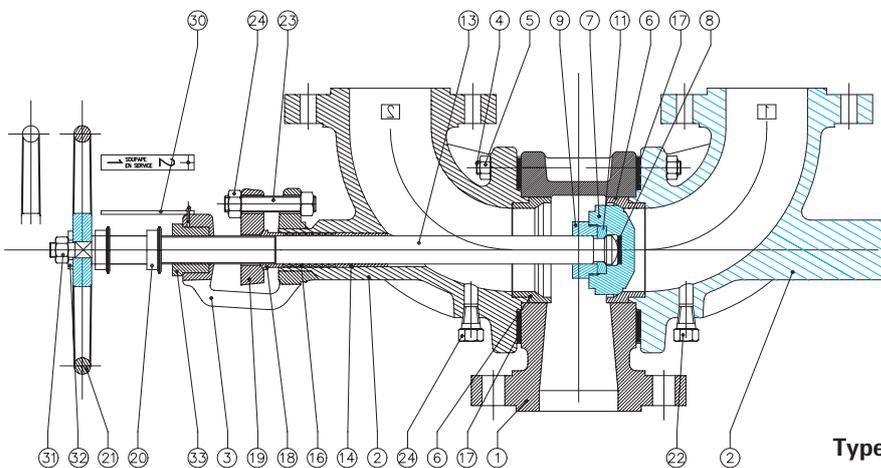
### Parts list

| No.     | Part name          |
|---------|--------------------|
| 1       | Intermediate body  |
| 2       | Side elbow         |
| 3       | Yoke               |
| 4       | Stud               |
| 5       | Nut                |
| 6       | Seat (*)           |
| 7       | Disc (*)           |
| 8       | Grain (*)          |
| 9       | Disc nut (*)       |
| 10      | Swivel (*)         |
| 11      | Retaining ring (*) |
| 13      | Shaft (*)          |
| 14      | Shaft guide (*)    |
| 15      | Bottom ring (*)    |
| 16      | Packing rings (*)  |
| 17      | Gasket (*)         |
| 18      | Packing gland      |
| 19      | Gland flange       |
| 20 & 36 | Index              |
| 21      | Wheel              |
| 22 & 24 | Plugs              |

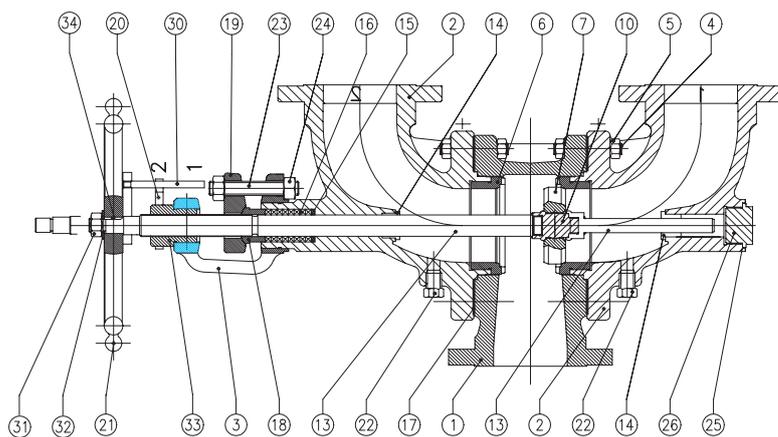
(\*) Recommended spare parts



Type I



Type II



Type III

### Dismantling

1. Loosen the packing gland(18-19)
2. Remove the body elbow on the packing side (2)
3. Remove the wheel (21)
4. Remove the position index (20-36)
5. Remove the shaft (13)
6. remove the disc (7) by removing the disc nut (9) and collect the two half retaining rings (11)
7. If the size is more than 4", design III, loosen the swivel (10)
8. Remove the seats (6) with a special tool (may be ordered from SAPAG).

### Repair

1. Replace if required the moving parts: disc, disc nut, grain, retaining ring, seat.
2. Rework if required the seats using the classic techniques of lapping globe valve discs and seats.
3. Check and rework if necessary the gasket seating surfaces on the flanges.
4. Always replace gaskets and packing rings.

### Assembly

1. Parts shall be clean and in good shape.
2. Check carefully the shaft and the seats.
3. Lubricate the threads with an appropriate lubricant; do not grease the shaft where it goes through the packing.
4. Use new gaskets and new packing rings.
5. Assemble backwards from dismantling instructions.
6. Tighten the body bolts evenly.
7. Check the free movement of the shaft.
8. Tighten the packing gland.

### Tests before start up

1. Place the Change-Over valve on a test rig fed in dry air or Nitrogen.
2. Close channel 1 (opposite to wheel) by turning the wheel clockwise. Close channel 2 (close to wheel) using a blind flange and a gasket. Built up pressure into channel 2 (2 to 6 bar).
3. Check tightness on channel 2 with a bubble solution; check carefully the assembly between the central body and the elbow and the packing gland. Tighten the bolts if required.
4. Fill in the orifice of channel 1 and check that no bubble appears for a duration of 1 minute. If bubbles appear, tighten the wheel clockwise; if leakage is still there the lapping of the disc is not correct.
5. Close channel 2 (wheel side) by rotating the wheel all the way anti-clockwise. Close channel 1 (opposite to wheel) using a blind flange and a gasket. Built up pressure into channel 2 (2 to 6 bar).
6. Check tightness on channel 1 with a bubble solution; check carefully the assembly between the central body and the elbow. Tighten the bolts if required.
7. Fill in the orifice of channel 2 and check that no bubble appears for a duration of 1 minute. If bubbles appear, tighten the wheel clockwise; if leakage is still there the lapping of the disc is not correct.
8. Fill in a test report and put the valve back to service.
9. If the Change-Over valve is not placed back to operation immediately, pack the Change-Over valve in order to keep it clean and to preserve the flange seating areas from damage or impurities.

### Contact

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