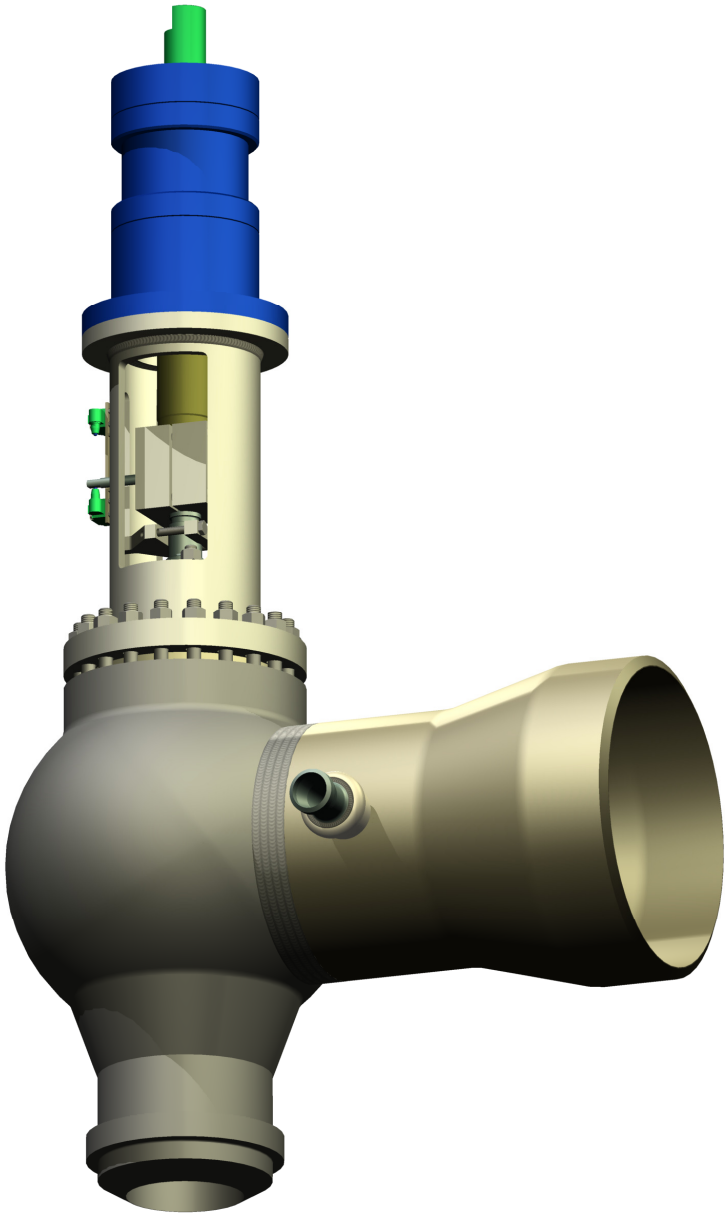
GS valve ENGINEERING GmbH

High Pressure Bypass System
Type SOV acc. to TRD 421



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1. Application

The safety overflow valve combination covers the ranges resulting from the operation of a power station system where the turbine cannot or can only partly absorb the steam produced by the boiler.

In the following cases of operation, the safety overflow valve ensures that the steam passing through is cooled before reaching the reheater system.

a) When starting up the boiler (cold, hot, superheated start): The safety overflow station controls the free orifice cross-section of the main valve so that the maximum permissible pressure and temperature change velocity in the boiler is not exceeded and the vapour pressure is maintained at or, during a cold start-up, reduced to a minimum.

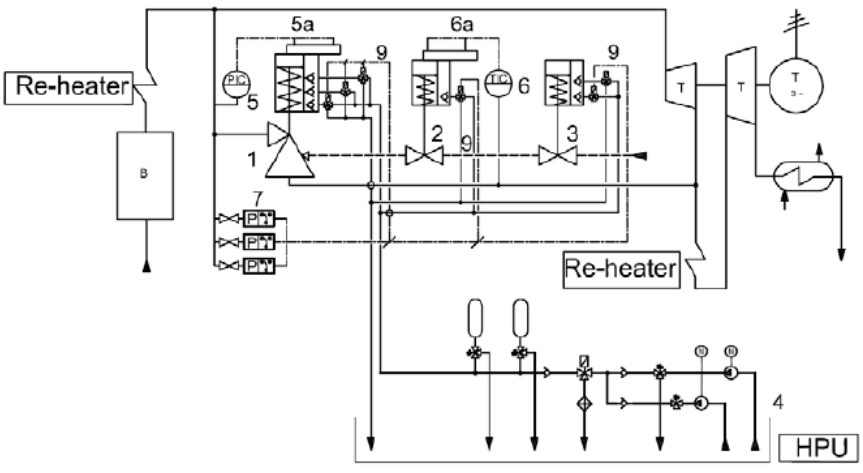
b) During start-up of the turbine, the function of the safety overflow valve is to control the transfer of the generated vapour output of the boiler to the turbine. The free orifice cross-section of the main valve is closed as the turbine inlet valves open.

   The transfer process is completed when the turbine has absorbed all the generated steam and the safety overflow valve is closed.

c) Control during output operation: The valve has the function of discharging the excess vapour in the event of relatively rapid drops in output and of absorbing pressure peaks.

d) The safety devices must ensure that, in the event of all possible failures during operation, the vapour pressure in the boiler and in the live steam system of the station does not exceed the maximum permissible value.

   The safety overflow valve must satisfy the safety function and be able to discharge the maximum supply of vapour generated by the boiler into the cold reheater station.

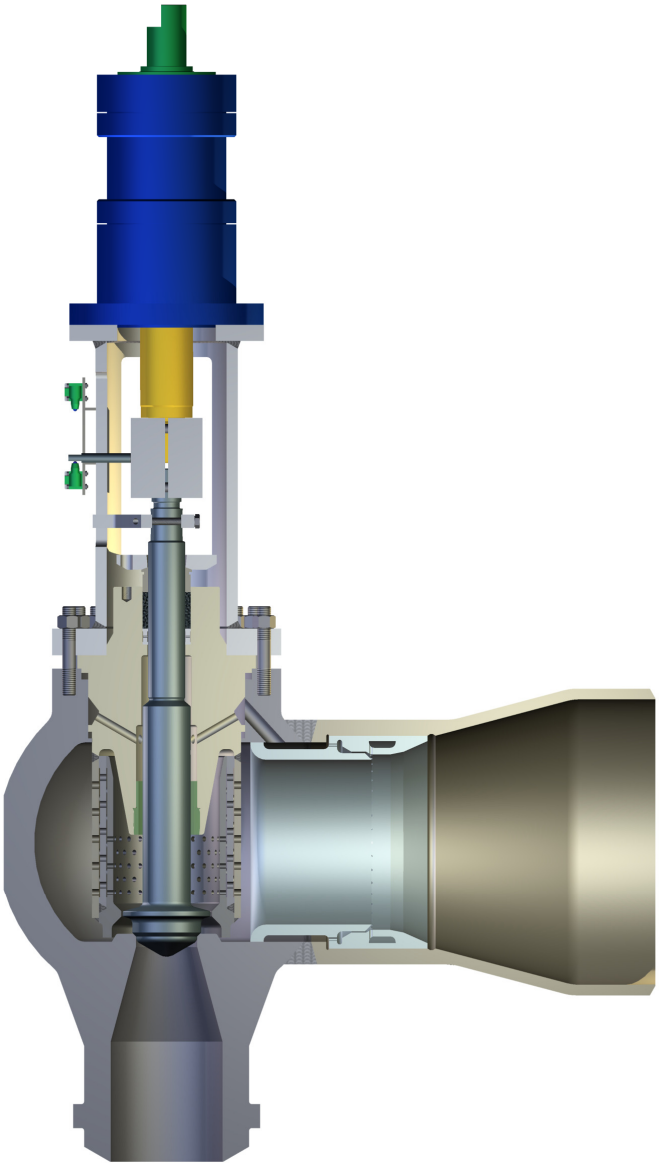


1 Overflow safety valve
2 Injection control valve
3 Injection stop valve
4 Oil supply
5 Pressure regulator
5a Proportional pressure control valve
6 Temperature regulator
6a Proportional temperature control valve
7 Pressure switch for fail-to-safety function
1 Emergency control system
9 Solenoid valves for fail-to-safety function

2. Construction and Function

2.1 Safety Overflow Valve (SOV):

The valve with its electro-hydraulic control system corresponds, as regards its construction and function, to the safety recommendations of the German vapour' boiler commission
(Deutscher Dampfkesselausschuß).



It closes against the vapour pressure and the conical surface and against the opening spring assembly with its centrally positioned oil cylinder which is subjected to pressure from above.

The valve thus operates on the pressure relief principle. The reduction in the pressure of the vapour is effected with the proven principle of stepped relief which guarantees low noise and vibration levels

The cooling water is injected via two lateral studs on the outlet stud downstream of the silencer where it is immediately atomized by high-pressure atomising steam coming through the valve stem and top flange into the ring nozzle

A particular advantage of this design is that in every control position, the water supply is effected in a high-velocity partial vapour stream. This guarantees perfect fine water atomization combined with the vapour cooling.

As experience in many power stations has shown, damage due to thermal shock is thus practically impossible.

In addition, the performed cage and the outlet side protects the pressure-bearing valve outlet housing against thermal shock.

Subsequent adjustment of the valve stroke, and thus of the output, can be performed (in the presence of personnel of the German Industrial Safety Authority, TÜV) with a simple screwed connection.

2.2 Injection Control Valve (SPV):

The design of the injection control valve is based on the type proven for many years.

The valve seat can be replaced without the valve itself having to be removed from the line.

Control operation is effected by a centrally mounted hydraulic piston actuator. The valve is closed as the oil pressure is increased.

A central spring assembly operates in opening direction. It also serves the rapid opening of the valve in the case of safety operation, irrespective of the particular control position selected.

The use of limit switches permits the valve stroke to be limited so that in the event of safety action, an excess of water is not supplied.

Independently of this fact, the control system is able to drive the valve beyond this stroke limit to a position required to achieve the nominal temperature required in the cold reheater station.

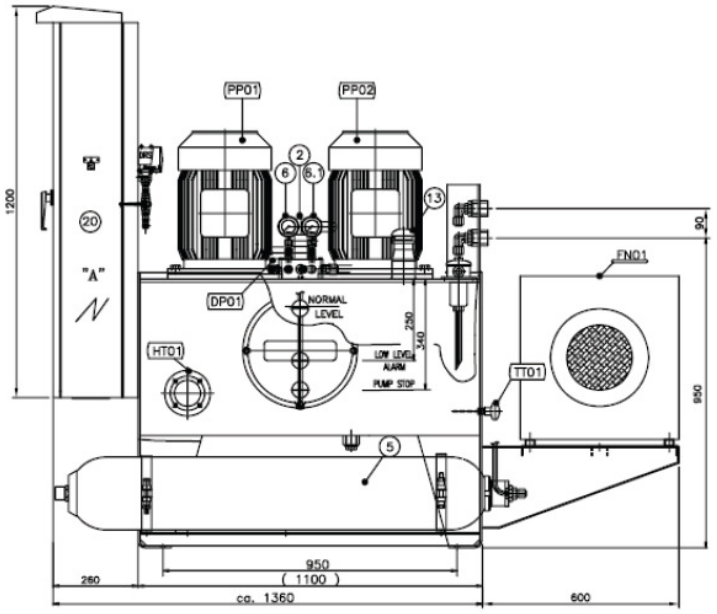
2.3 Injection Shut-Off Valve (STV):

This open-closed valve is normally installed in front of the injection control valve (2.2) for advance shut-off and, with the exception of the inner trim, is identical to it.

The purpose of the shut-off valve is to prevent water from entering the cold reheater station in the event of a leak in the control valve.

2.4 Electro-Hydraulic Control System with Safety and Test Device:

The electro-hydraulic control system consists primarily of the common oil supply for all the valves, the hydraulic cylinders required to operate.the valves and the separate hydraulic link-up for control and regulation of each valve In accordance with the demands for greater availability, the oil supply system has two pump aggregates, each of which is dimensioned for the entire output required. If the pump or electric motor of the aggregate currently in operation fails, a hydraulic switch automatically turns on the second aggregate.



The actuation cylinders of the valves are loaded on the one side against springs with oil pressure. Control is effected continuously via proportioning valves or in steps via solenoid valves.
The electric modules for control, regulation and safety switching are installed in a separate control cabinet mounted on the side of the oil supply unit.
The outside of the control cabinet contains signalling elements for all the important functional equipment which indicates the defective unit in the event of a failure.
The collective failure signal on the control cabinet can also be signalled in the control room.
If the vapour pressure increases beyond the permissible value, the safety device is actuated via bourdon tube switches in the vapour test sampler. In accordance with the safety regulations, this device is designed on the three-line principle and is circuited at least twice in accordance with the closed-circuit principle.
Furthermore, it is possible to actuate the safety device via an additional relay, independently of the vapour test sample. When the signal for rapid opening of the valves has been cancelled, the valves return to their preset control position.
After the safety device is actuated, the oil from the operating cylinder of the valves is forced back into the oil tank in the desired time (min. 1.5 seconds, adjustable via throttles in the return line).