

### 6.11.4. Steam converting valves

The conversion of superheated high pressure steam into steam at lower temperatures and pressures is a common practice in process industries. This technology is also used in power stations to utilize the steam energy leaving the turbine for other purposes (e. g. for heating). Some applications use two different valves for the steam conversion process: the first for the reduction of the steam pressure and the second for the control of the cooling water (Figure 6.11.4.-1). The pressure control valve ③ reduces the steam pressure according to the set point provided by the controller ②. The cooling water valve ④ adds water until the set point of the temperature measured by the transducer ① is reached. The steam cooling effect is produced by injecting cooling water into the steam flow. This requires special methods, in order to achieve a fine spray of cooling water. Often nowadays only a single valve is used. This solves both tasks simultaneously (Figure 6.11.5.-1 and Figure 6.11.5.-2). The plug regulates both the steam supply and the quantity of cooling water. The two  $C_v$ -values of the steam and the water flow path have a fixed relationship which limits, of course, the rangeability of the low pressure steam volume. If pressure and steam temperature have to be variable on the low pressure side, then two separate control valves are necessary. At high pressure ratios a multistage pressure reduction trim and an extended valve outlet is required. Since the cooled steam is not homogeneous immediately behind the throttling area, a baffle plate is frequently used to protect the internal valve walls from impingement of droplets.

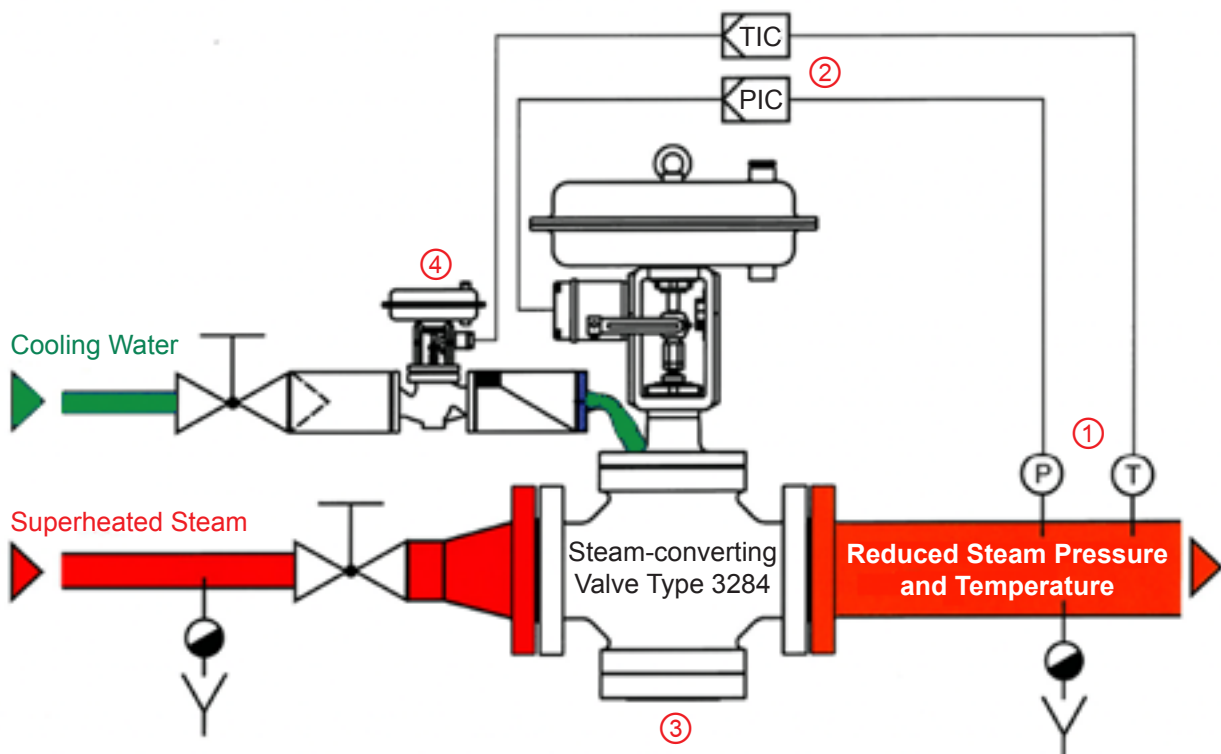
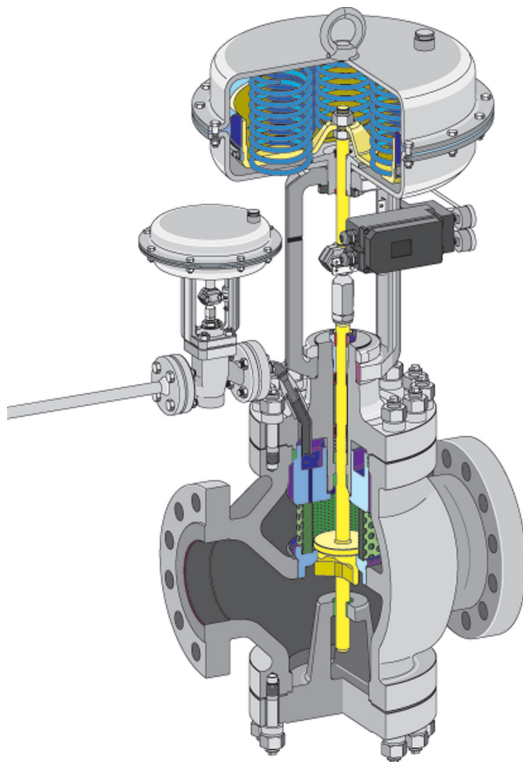


Figure 6.11.4.-1: Principle of steam conversion using two valves

Another proven construction which also has a noise reducing effect is represented in Figure 6.11.4.-2. The cooling water is kept away from the hot walls of the conversion valve and meets firstly a wire gauze of stainless steel which is an excellent mixing device and improves the homogeneity of the steam on the low pressure side over the entire load range.

**Example: Power-Station Tianjin in China****For the following applications:**

- For pressure and temperature reduction
- Max. temperature reduction down to  $t_s + 10^\circ\text{K}$
- Min.  $\Delta p$  5 bar between steam inlet and outlet
- Min.  $\Delta p$  3 bar between cooling water and steam
- Valve size DN 50 to 400
- Max. nominal pressure PN 160

Figure 6.11.4.-2: Control valve Type 3284 Steam converter with non return and cooling water valve.