

Turbine Ventilation Valve Type TVV

- **Compact, robust design**
- **Safe opening by spring force**
- **Designed for frequent start-ups**
- **Shortest stroking times**
- **Custom design for conditions up to 300 bar / 600 °C**
- **Redundant control systems available**

Application

The Turbine Ventilation Valve TVV is used for large steam turbines, which are started up through the IP-turbine. While in IP turbine operation mode, the HP turbines require cooling. This cooling is provided by cold steam flow through the HP turbine.

HP Turbine cooling during start-up (Reverse Flow mode)

During the start-up sequence of the power plant, the HP Turbine Control Valves as well as the Turbine Shut-off Valves are closed in order to eliminate any damage to the HP-Turbine caused by improper steam conditions. Meanwhile the HP Turbine Bypass Stations are in operation, leading the steam to the IP/LP Turbine for the start-up process (up to approx. 7% load).

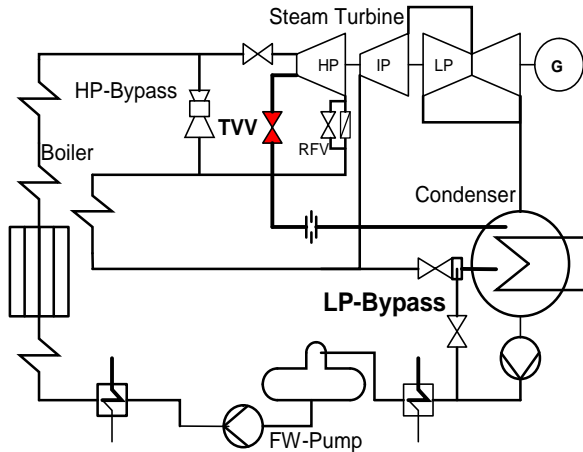
During this process, the *HP turbine requires continuous cooling in order to avoid overheating*. Opening the Reverse Flow Valve (RFV) bypasses the Turbine Check Valve. Opening the Turbine Vent Valve (TVV) at the same time forces steam to circulate from the cold reheater line through the HP Turbine to the condenser, providing the required cooling effect.



HP Turbine depressurizing at turbine trip or full load rejection (depressurization mode)

In case of load rejection or turbine trip, the Turbine Safety Valves close immediately and the HP Bypass System takes over the steam flow.

To avoid overheating of the still rotating HP turbine, the turbine must be depressurized immediately. The Turbine Control System usually triggers Turbine Safety Valves and the Turbine Vent Valve TVV at the same time. Opening the Turbine Vent Valves will evacuate the trapped steam to the condenser, which leads to an immediate depressurization of the turbine.



Material concentrations and abrupt changes of wall thickness are avoided.

A welded-in, replaceable seat provides leakage rates according to ANSI/FCI Class V as a minimum.

In order to keep opening forces low and predictable, the stem is sealed by labyrinths with single or double exhaust.

Function

The valve is kept close by a hydraulic actuator, fed through the turbines' own hydraulic actuation system whereas it opens by spring force. The hydraulic pilot system – triggered through the turbine safety system – shuts the hydraulic pressure line and bypasses upper and lower chamber of the actuator, allowing the pre-tensioned spring to open the Vent Valve in less than 1 second.

The unique hydraulic control unit allows the mounting of multiple and/or different types of solenoid in order to fulfill customer specified redundancy requirements.

Design

The Turbine Ventilation Valve TVV is an angle body type, incorporating a pressurized seal bonnet. Usually in flow-to-close configuration, it can also be supplied in a flow-to-open configuration.

With the range of available body materials, the Turbine Ventilation Valve TVV can be applied for the operating temperatures of today's most advanced thermal power plants. The valve body with its spherical shapes is designed for cyclic operation and frequent start-ups.

Technical Specification

Body style	Angle, flow to close or flow to open
	Spherical shaped body
	Pressurized seal bonnet
Pipe connection	For steam pipes: butt-welding according to customer's requirement
	For exhaust: flanged according to DIN or ASME
Steam data range	Temperature: ~ 500 - 600 °C
	Pressure: 300 bar
Trim	Unbalanced, Welded-in or clamped seat
	Pressure seal bonnet
Seat/stem tightness	ANSI B16-104, class V
	DIN 3230, rate 2 / MSS-SP61 (optional)
Actuation	Double-acting hydraulic piston actuator for closing
	Spring to open the valve
Options	Transition pieces for large pipe diameters and material compatibility
	Prewarming and drain connection available on request
Orientation	No restrictions

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